NEPTUNE CITY SCHOOL DISTRICT

Everyday Mathematics
Curriculum
Grade 5

NEPTUNE CITY SCHOOL DISTRICT
Office of the Chief School Administrator, Principal
210 West Sylvania Avenue
Neptune City, NJ 07753

The Neptune City School District is appreciative and proud to accept and align the curriculum of the Neptune Township School District to properly prepare the Neptune City students for successful integration into the Neptune Township High School Educational Program.

August 1, 2022 Document *

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SCHOOL DISTRICT MISSION STATEMENT

The Neptune City School District, in partnership with the parents and the community, will support and sustain an excellent system of learning, promote pride in diversity, and expect all students to achieve the New Jersey Student Learning Standards at all grade levels to become responsible and productive citizens.

NEPTUNE CITY SCHOOL DISTRICT

EVERYDAY MATHEMATICS
CURRICULUM
GRADE 5

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Curriculum

NEPTUNE TOWNSHIP SCHOOL DISTRICT

Everyday Mathematics
Grade 5

Acknowledgements

The Grade 5 Mathematics curriculum was revised for use by the Neptune Township Elementary Schools by the Curriculum Steering Committee, inclusive of Dawn Reinhardt, Department Chairperson, Heba Abdo, Ed.D., Supervisor of STEM, and Sally A. Millaway, Ed.D., Director for Curriculum, Instruction and Assessment.

This curriculum represents the shift in instruction to the New Jersey Student Learning Standards for Mathematics and the increased rigor that those standards bring to the teaching and learning of mathematics. It is our hope that this curriculum will serve as a valuable resource for the staff members who teach this course and that they will continue to make recommendations for improvement to the document.

NEPTUNE TOWNSHIP SCHOOL DISTRICT

DISTRICT MISSION STATEMENT

The primary mission of the Neptune Township School District is to prepare students for a life-long learning process in a complex and diverse world. It is with high expectations that our schools foster:

• A strong foundation in academic and modern technologies.

• A positive and varied approach to teaching and learning.

• An emphasis on critical thinking skills and problem-solving techniques.

• A respect for and an appreciation of our world, its resources, and its people.

• A sense of responsibility, good citizenship, and accountability.

• An involvement by the parents and the community in the learning process.

Neptune Township School District

Educational Outcome Goals

The students in the Neptune Township schools will become life-long learners and will:

- Become fluent readers, writers, speakers, listeners, and viewers with comprehension and critical thinking skills.
- Acquire the mathematical skills, understandings, and attitudes that are needed to be successful in their careers and everyday life.
- Understand fundamental scientific principles, develop critical thinking skills, and demonstrate safe practices, skepticism, and open-mindedness when collecting, analyzing, and interpreting information.
- Become technologically literate.
- Demonstrate proficiency in all New Jersey Student Learning Standards (NJSLS).
- Develop the ability to understand their world and to have an appreciation for the heritage of America with a high degree of literacy in civics, history, economics and geography.
- Develop a respect for different cultures and demonstrate trustworthiness, responsibility, fairness, caring, and citizenship.
- Become culturally literate by being aware of the historical, societal, and multicultural aspects and implications of the arts.
- Demonstrate skills in decision-making, goal setting, and effective communication, with a focus on character development.
- Understand and practice the skills of family living, health, wellness and safety for their physical, mental, emotional, and social development.
- Develop consumer, family, and life skills necessary to be a functioning member of society.
- Develop the ability to be creative, inventive decision-makers with skills in communicating ideas, thoughts and feelings.
- Develop career awareness and essential technical and workplace readiness skills, which are significant to many aspects of life and work.

Everyday Math - Grade 5 - Daily Pacing Guide

Day	Unit & Lesson	Topic / Activity	NJSLS-M	Day	Unit & Lesson	Topic / Activity	NJSLS-M
1		**Routines Overview**		16	1.10	Visualizing Volume Units	5.MD.1, 5.MD.3.a, 5.MD.3.b, 5.MD.4, 5.MD.5.b
2		**EM4 Beginning of Year Assessment**		17		Flex Day Games	
3	1.1	Intro to SRB	5.MD.1, 5.NBT.1, 5.OA.1, 5.OA.2	18	1.11	Volume Explorations	5.MD.1, 5.MD.3.a, 5.MD.3.b, 5.MD.4, 5.MD.5.a, 5.MD.5.b, 5.MD.5.c, 5.OA.1, 5.OA.2
4	1.2	Area of a Rectangle Part 1	5.NF.4.b	19	1.12	Playing Prism Pile Up	5.MD.1, 5.MD.3.a, 5.MD.3.b, 5.MD.4, 5.MD.5.a, 5.MD.5.b, 5.MD.5.c, 5.OA.1, 5.OA.2
5	1.3	Quilt Area Day 1	5.MD.1 5.NF.4.b	20	1.13	**Unit 1 Progress Check**	5.MD.1, 5.MD.3, 5.MD.3.a, 5.MD.3.b, 5.MD.4, 5.MD.5.a, 5.MD.5.b, 5.MD.5.c, 5.OA.1, 5.OA.2
6	1.3	Quilt Area Day 2	5.MD.1 5.NF.4.b	21	1.13	**Unit 1 Progress Check**	5.MD.1, 5.MD.3, 5.MD.3.a, 5.MD.3.b, 5.MD.4, 5.MD.5.a, 5.MD.5.b, 5.MD.5.c, 5.OA.1, 5.OA.2
7		Flex Day Games		22		Flex Day Games	
8	1.4	Area of a Rectangle Part 2	5.NF.4.b	23	2.1	Understanding Place Value	5.NBT.1
9	1.5	Intro to Volume	5.MD.3, 5.MD.4	24	2.2	Exponents and Powers of 10	5.NBT.1, 5.NBT.2
10	1.6	Exploring Non-Standard Volume	5.MD.3. 5.MD.4	25	2.3	Applying Powers of 10	5.NBT.2
11	1.7	Measuring Volume by Counting Cubes	5.MD.3, 5.MD.3.a,, 5.MD.3.b, 5.MD.4	26	2.4	US Traditional Multiplication Part 1	5.NBT.5
12		Flex Day Games		27		Flex Day Games	
13	1.8	Measuring Volume by Iterating Layers	5.MD.3.a, 5.MD.3.b, 5.MD.4	28	2.5	US Traditional Multiplication Part 2	5.NBT.5
14	1.9	Two Forumlas for Volume	5.MD.3.a, 5.MD.3.b, 5.MD.4, 5.MD.5.a, 5.MD.5.b	29	2.6	Application: Unit Conversions	5.Md.1, 5.NBT.5, 5.OA.1, 5.OA.2
15		**District Pre Assessment in LinkIt!**		30	2.6	Application: Unit Conversions	5.MD.1, 5.NBT.5, 5.OA.1, 5.OA.2

Day	Unit & Lesson	Topic / Activity	NJSLS-M
31	2.7	US Traditional Multiplication Part 3	5.NBT.5, 5.OA.2
32		Flex Day Games	
33	2.8	US Traditional Multiplication Part 4	5.NBT.5
34	2.9	Open Response - One Million Taps	5.NBT.2, 5.NBT.5
35	2.9	Open Response - One Million Taps	5.NBT.2, 5.NBT.5
36	2.10.	Mental Division Strategy	5.NBT.2, 5.NBT.6
37		Flex Day Games	
38	2.11	Reviewing Partial-Quotiencts	5.NBT.6
39	2.12	Strategies for Choosing Partial Quotients	5.NBT.6
40	2.13	Interpreting the Remainder	5.NBT.6
41	2.14	**Unit 2 Progress Check**	5.MD.1, 5.NBT.1, 5.NBT.2, 5.NBT.5, 5.NBT.6, 5.OA.1
42	2.14	**Unit 2 Progress Check**	5.MD.1, 5.NBT.1, 5.NBT.2, 5.NBT.5, 5.NBT.6, 5.OA.1
43		Flex Day Games	
44	3.1	Connecting Fractions and Division Part 1	5.NF.3
45	3.2	Connecting Fractions and Division Part 2	5.NF.3
46	3.2	Connecting Fractions and Division Part 2	5.NF.3
47		Flex Day Games	
48	3.3	Applications Interpreting Remainders	
49	3.3	Applications Interpreting Remainders	
50	3.4	Fractions on a Number Line	5.NF.2, 5.NF.3
51	3.5	Game Strategies (Open Response)	5.NBT.6, 5.NF.3
52	3.5	Game Strategies (Open Response)	5.NBT.6, 5.NF.3
53		Flex Day Games	
54	3.6	Fraction Estimation with Number Sense	5.NF.2
55	3.7	Fraction Estimation with Benchmarks	5.NF.2
56	3.7	Fraction Estimation with Benchmarks	5.NF.2
57		Flex Day Games	
58	3.8	Renaming Fractions and Mixed Numbers	5.NF.3
59	3.8	Renaming Fractions and Mixed Numbers	5.NF.3
60	3.9	Intro to Adding and Subtractions Fractions	5.NF.2

Day	Unit & Lesson	Topic / Activity	NJSLS-M
61	3.10.	Exploring Addition of Fractions Unlike Denominators	5.NF.1, 5.NF.2
62	3.10.	Exploring Addition of Fractions Unlike Denominators	5.NF.1, 5.NF.2
63		Flex Day Games	
64	3.11	Play Fraction Capture	5.NF.1, 5.OA.2
65	3.12	Solving Fraction Number Stories	5.NF.1, 2,3
66	3.13	Fractoin-Of Problems Part 1	5.NF.4.a, 5.NF.6
67	3.14	Fraction -Of Problems Part 2	5.NF.4.a, 5.NF.6
68		Flex Day Games	
69	3.15	**Unit 3 Progress Check**	5.NBT.6, 5.NF.1,2,3, 5.NF.4.a, 5.NF.6
70	3.15	**Unit 3 Progress Check**	5.NBT.6, 5.NF.1,2,3, 5.NF.4.a, 5.NF.6
71	4.1	Decimal Place Value	5.NBT.1, 5.NBT.3.a
72	4.2	Representing Decimals through Thousandths	5.NBT.1, 5.NBT.3.a
73		Flex Day Games	
74	4.3	Representing Decimals in Expanded Form	5.NBT.1, 5.NBT.3.a
75	4.4	Comparing and Ordering Decimals	5.NBT.1, 5.NBT.3.a, 5.NBT.3.b
76	4.5	Rounding Decimals	5.NBT.1, 5.NBT.3.a, b, 5.NBT.4
77	4.5	Rounding Decimals	5.NBT.1, 5.NBT.3.a, b, 5.NBT.4
78		Flex Day Games	
79	4.6	Introduction to the Coordingate System	5.G.1
80	4.7	Playing Hidden Treasure	5.G.1,2
81	4.8	Solving Problems on a Coordinate Grid Part 1	5.G.1,2, 5.NF.5.a
82	4.9	Solving Problems on a Coordinate Grid Part 2	5.G.1,2, 5.NF.5.a
83		Flex Day Games	
84	4.10.	Folder Art (Open Response)	5.G.1,2
85	4.11	Folder Art (Open Response)	5.G.1,2
86	4.12	Decimal Addition Algorithms	5.NBT.4,7
87	4.13	Decimal Subtraction Algorithms	5.NBT.4,7
88		Flex Day Games	
89	4.14	Addition and Subtraction of Money	5.NBT.7
90	4.14	Addition and Subtraction of Money	5.NBT.7

Day	Unit & Lesson	Topic / Activity	NJSLS-M	Day	Unit & Lesson	Topic / Activity	NJSLS-M
91	4.15	**Unit 4 Progress Check**	5.NF.1,2, 5.NF.4.a, b	106	5.8	Area Models for Fraction Multiplication	
92	4.15	**Unit 4 Progress Check**	5.NF.1,2, 5.NF.4.a, b	107	5.9	Understanding an Algorithm for Fraction Multiplication	
93		Flex Day Games		108	5.9	Understanding an Algorithm for Fraction Multiplication	
94		**District Mid Year Assessment in LinkIt**		109		Flex Day Games	
95	5.1	Using Equivalent Fractions for Common Denominators	5.NF.1	110	5.10.	Sharing Breakfast (Open Response)	
96	5.2	More Strategies for Finding Common Denominators	5.NF.1	111	5.10.	Sharing Breakfast (Open Response)	
97	5.2	More Strategies for Finding Common Denominators	5.NF.1	112	5.11	Explaining the Equivalent Fraction Rule	
98		Flex Day Games		113	5.12	Fraction Multiplication Number	
99	5.3	Addition of Fractions and Mixed Numbers	5.NF.1	114		Flex Day Games	
100	5.4	Subtraction of Fractions and Mixed Numbers	5.NF.1	115	5.13	Fraction Division Part 1	
101	5.5	Connecting Fraction-Of Problems to Multiplication		116	5.14	Fraction Division Part 2	
102	5.6	Multiplication of Fractions and Whole Numbers		117	5.15	**Unit 5 Progress Check**	
103		Flex Day Games		118	5.15	**Unit 5 Progress Check**	
104	5.7	Fractions of Fractions		119		Flex Day Games	
105	5.7	Fractions of Fractions		120	6.1	Multiplying and Dividing Decimals Power of 10	5.NBT.1, 5.NBT.2, 5.NBT.3.a

Day	Unit & Lesson	Topic / Activity	NJSLS-M	Day	Unit & Lesson	Topic / Activity	NJSLS-M
121	6.1	Multiplying and Dividing Decimals Power of 10	5.NBT.1, 5.NBT.2, 5.NBT.3.a	136	6.12	Division of Decimals by Decimals	5.NBT.6,7
122	6.2	Playing Exponent Ball	5.NBT.1,2, 5.NBT.3.b, 5.OA.2	137	6.12	Division of Decimals by Decimals	5.NBT.6,7
123	6.3	Application: Converting Measurements Metric System	5.MD.1, 5.NBT.2	138	6.13	Application: Estimating Your Reaction Time	5.MD.2, 5.NBT.3.b, 5.NBT.7
124		Flex Day Games		139		Flex Day Games	
125	6.4	Line Plots	5.MD.1,2, 5.NF.1,2	140	6.14	**Unit 6 Progress Check**	5.NBT, 5.NF, 5.MD
126	6.5	Working with Data in Line Plots	5.MD.2, 5.NBT.6, 5.NF.2	141	6.14	**Unit 6 Progress Check**	5.NBT, 5.NF, 5.MD
127	6.6	Applying Volume Concepts	5.MD.3, 5.MD.5.b,5.MD.5.c	142		**NJSLSA-M**	
128	6.7	Measuring Volume by Displacement	5.MD.3, 5.MD.4, 5.MD.5.b	143		**NJSLSA-M**	
129		Flex Day Games		144		**NJSLSA-M**	
130	6.8	Estimating Decimal Products and Quotients	5.NBT.7, 5.OA.2	145		**NJSLSA-M**	
131	6.9	Multiplication of Decimals	5.NBT.2,5,7	146		**NJSLSA-M**	
132	6.10.	Fundraising (Open Response)	5.NBT.2,5,7	147	7.1	Multiplication of Mixed Numbers Part 1	5.NF.1, 5.NF.4.a, 5.NF.4.b, 5.NF.5a, 5.NF.6, 5.OA.2
133	6.10.	Fundraising (Open Response)	5.NBT.2,5,7	148	7.2	Multiplication of Mixed Numbers Part 2	5.NF.1, 5.NF.4.a, 5.NF.4.b, 5.NF.5a, 5.NF.6, 5.OA.2
134		Flex Day Games		149	7.2	Multiplication of Mixed Numbers Part 2	5.NF.1, 5.NF.4.a, 5.NF.4.b, 5.NF. 5a, 5.NF.6, 5.OA.2
135	6.11	Division of Decimals by Whole Numbers	5.NBT.6,7	150	7.3	Rectangles with Fractional Side Lengths	5.NF.4.b, 5.NF.6

Day	Unit & Lesson	Topic / Activity	NJSLS-M	Day	Unit & Lesson	Topic / Activity	NJSLS-M
151	7.3	Rectangles with Fractional Side Lengths	5.NF.4.b, 5.NF.6	166	7.14	**Unit 7 Progress Check**	5.NF, 5.OA, 5.MD, 5.G
152		Flex Day Games		167		**District End Of Year Assessment**	
153	7.4	Using Common Denominators for Fraction Division	5.NF.5.b, 5.NF.7a, 5.NF.7b, 5.NF.7c	168	8.1	Planning an Athletic Center	5.NBT.4, 5.NBT.7, 5.NF.4, 5.NF.5, 5.NF.6, 5.MD.1, 5.G.1, 5.G.2
154	7.5	A Heirarchy of Triangles	5.G.3, 4	169	8.2	Applying the Rectangle Method for Area	5.NF.1, 5.NF.4, 5.NF.4b
155	7.6	A Heirarchy of Quadrilaterals	5.G.3, 4	170	8.3	Planning an Aquarium	5.NF.4, 5.NF.4b, 5.NF.6, 5.MD.3, 5.MD.5, 5.MD.5a, 5.MD.5b, 5.MD.5c
156	7.7	Playing Property Pandemonium	5.G.3, 4	171	8.4	Treasure Hunt	5.MD.3, 5.MD.5.b
157		Flex Day Games		172	8.4	Treasure Hunt	5.MD.3, 5.MD.5.b
158	7.8	A Heirarchy of Polygons	5.G.3, 5.G.4	173	8.5	Spending a Million	5.MD.1, 5.NBT.4.,5
159	7.9	Collecting and Using Fractional Data	5.MD.2, 5.NF.1, 5.NF.2, 5.NF.4	174	8.6	Earning a Million	5.MD.1, 5.NBT.5, 5.NBT.6, 5.NBT.7
160	7.10.	Identifying and Visualizing Patterns	5.G.1, 5.G.2, 5.OA.3	175	8.7	Paying Off the National Debt	5.NBT.2, 5.NBT.5, 5.NBT.6, 5.NBT.7, 5.MD.1
161	7.11	Rules Tables and Graphs Part 1	5.G.1, 5.G.2, 5.OA.3, 5.MD.1	176	8.8	A Footstep Problem	5.NBT.2, 5.NBT.5, 5.NBT.6, 5.NBT.7, 5.MD.1
162		Flex Day Games		177	8.9	Finding Your Heart Rate	5.MD.1, 5.OA.3
163	7.12	Rules Tables and Graphs Part 2	5.G.1, 5.G.2, 5.OA.3, 5.MD.1	178	8.10	Finding your Cardiac Output	5.NBT.5, 5.NBT.6, 5.NBT.7, 5.MD.1, 5.G.1, 5.G.2
164	7.13	Old Faithful's Next Eruption	5.NBT.7, 5.OA.3, 5.G.1, 5.G.2, 5.NF.4	179	8.11	Pendulums, Part 1	5.NBT.2, 5.NBT.4, 5.G.1, 5.G.2
165	7.14	**Unit 7 Progress Check**	5.NF, 5.OA, 5.MD, 5.G	180	8.12	Pendulums, Part 2	5.NBT.2, 5.NBT.4, 5.G.1, 5.G.2

Unit Plan Title	Area and Volume
Suggested Time Frame	19-20 Days (Approximately the month of September), including flex/game days

Stage 1: Desired Results

Overview / Rationale

In this unit, students build on their prior work with area and explore ways to find the area of rectangles with fractional side lengths. Students also learn about volume as an attribute of solid figures. Using improvised units, they explore volume and build toward using cubic units and volume formulas.

New Jersey Student Learning Standards for Mathematics

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.NF.4b Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5.MD.3a A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume and can be used to measure volume.

5.MD.3b A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.

5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units.

5.MD.5a Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.

5.MD.5b Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.

5.MD.5c Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Technology Integration
__X__ **8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
- Student Websites - Teacher Websites - SMART board
____**8.2 Technology Integration, Engineering, Design and Computational Thinking – Programming** All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES
The following social and emotional competencies are integrated in this curriculum document:

Self-Awareness
_____Recognize one's own feelings and thoughts
_____Recognize the impact of one's feelings and thoughts on one's own behavior
_____Recognize one's personal traits, strengths and limitations
_____Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management
__x__Understand and practice strategies for managing one's own emotions, thoughts and behaviors
__x__Recognize the skills needed to establish and achieve personal and educational goals
__x__Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness
__x__Recognize and identify the thoughts, feelings, and perspectives of others
_____Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
_____Demonstrate an understanding of the need for mutual respect when viewpoints differ
_____Demonstrate an awareness of the expectations for social interactions in a variety of setting

Responsible Decision Making
__x__Develop, implement and model effective problem solving and critical thinking skills
_____Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills
_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
_____Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

In this unit plan, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – 21st Century Themes			**Indicate whether these skills are:** ● **E – encouraged** ● **T – taught** ● **A – assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**			CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
X	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing			CRP5. Consider the environmental, social and economic impacts of decisions.
X	Becoming a Critical Consumer			CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
	Career Exploration			CRP11. Use technology to enhance productivity.
	Career Preparation			CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

NJ Student Learning Standards for English Language Arts

RI.4.3 - Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.4 - Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

RI.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.4.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Essential Questions:	**Enduring Understandings:**
● How can measurements be used to solve a problem? ● What can measurements are used to find?	***Students will understand that…*** ● Shape and area can be conserved during mathematical transformations. ● Everyday objects have a variety of attributes each of which can be measured in many ways. ● What we measure affects how we measure it.
Knowledge:	**Skills:**

Students will know…	**Students will be able to…**
● Area concepts and units of area ● Rectangle method for finding areas of polygons ● Strategies for using formulas for the area of triangles and parallelograms ● The use of sampling to make estimates ● Strategies for using formulas for the volume of rectangular prisms and right prisms. ● The meanings of appropriate math vocabulary: ● Grouping symbols and expressions ● Area, unit squares, square units ● 3-Dimensional, volume, conjecture ● Rectangular prism ● Unit cube, cubic unit ● Mathematical model ● Nested parentheses, brackets, braces	● Understand the purpose of grouping symbols and evaluate expressions with one set of symbols; place one set of grouping symbols to make a number sentence true. ● Find the area of a rectangle with one fractional side length by tiling it with unit squares of side length 1 and counting full and partial tiles; understand that unit squares with fractional side lengths can be used to measure area, but that the count of unit squares with fractional side lengths is different from the measure of area in square units. ● Understand that cubes can be used to measure volume. ● Use unit cubes to pack a solid figure with no gaps and no overlaps. ● Find volume by counting the number of unit cubes in a fully-packed prism; find the volume of a partially-packed prism when the dimensions of the prism are clearly shown. ● Understand that packing with unit cubes and multiplying dimensions are two strategies for finding the volume of a rectangular prism. ● Apply the appropriate volume formula when given the formulas and a set of whole-number dimensions. ● Understand that the volume of figures composed of two or more right rectangular

	prisms can be found by adding the volumes of individual parts.

Student Resources	
Finding Volume	http://www.harcourtschool.com/activity/elab2004/gr5/28.html
Games/Demos ALL Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Websites	www.abcya.com www.sheppardsoftware.com www.coolmath.com

Teacher Resources	
Games/Lessons ALL Topics	http://littletonpublicschools.net/Default.aspx?tabid=539
Demo Lessons/Activity Sheets	http://www.learnalberta.ca/content/me5l/html/math5.html
Finding Volume	http://www.harcourtschool.com/activity/elab2004/gr5/28.html
Quizzes/Practice	http://littletonpublicschools.net/Default.aspx?tabid=539
Games/Demos ALL Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Khan Academy	www.khanacademy.com
Mentor Texts	● *Sir Cumference and the Sword in the Cone* ● *Perimeter, Area and Volume* ● *Spaghetti and Meatballs for All*

Stage 2: Acceptable Evidence

Assessments

Formative:	**Summative:**
● Math Message ● Oral Mental Math Fluency ● Math Journal ● Slates ● Lesson Assessment Check-In ● Collins Writing ● Exit Slips ● Home Link ● Teacher Observation ● Games/Activity Cards	● Beginning of Year Assessment ● Benchmark Assessment ● Quizzes ● Unit Progress Check ● Open Response Assessments ● Student Work Products

Stage 3: Learning Experiences

Lesson 1.1 Introduction to the Student Reference Book

Standards: 5.MD.1, 5.NBT.1, 5.OA.1, 5.OA.2

Warm-Up-Mental Math: Students write numerical expressions

Focus: Math Message:

- Students read and discuss an introduction to *Fifth Grade Everyday Mathematics.*
- Read journal page 1. Underline any words or terms that you don't know or you think are interesting. Talk with a partner about one thing you are excited to learn about in math class this year.

Math Message Follow-Up:

- Students examine the *Math Journal* and *Student Reference Book* and read about grouping symbols.
- Ask students to share terms they either found interesting or have questions about. Then have them talk about some of the mathematical ideas they want to explore this year.
- **MJ p. 2-3** Students use the *Student Reference Book* to solve problems.
- Differentiate: If students struggle locating information in the *Student Reference Book*, have them create tabs for each section of the book using stick-on notes. The tabs will help them quickly locate relevant sections
- If students struggle locating information in the *Student Reference Book*, have them create tabs for each section of the book using stick-on notes. The tabs will help them quickly locate relevant sections

Games: SRB page 315, MM page G2 Introduce Name That Number. Students practice writing expressions for calculations and writing expressions with grouping symbols.

Practice:

- MJ page 4 Math Boxes are paired with Math Boxes 1-3,
- Home Link 1-1(Family Letter)

Assessment:

Observe as students use the *Student Reference Book* to find information while solving the problems on the journal pages. Some will have used the *Student Reference Book* in prior grades, so expect them to be familiar with the organization of the book and how to find relevant information. If students struggle locating relevant pages, consider reviewing reference skills, such as using a table of contents, glossary, and index.

Differentiation:

- **Readiness: Exploring Text Features of the Student Reference Book**
- **Extra Practice: Writing and Answering Mathematical Questions. Activity Card 1.** For additional practice navigating the *Student Reference Book*, students write mathematical questions and use the book to help them find solutions to a partner's questions
- **Enrichment:** To extend their understanding of a mathematics reference book, students design and write a reference book page. Have students brainstorm interesting mathematical topics and then create a reference book page about a topic of their choice. Encourage them to use precise mathematical language and to design their page to be a mathematical tool that others can use
- **ELL Support:** Point to numerals on a number line and provide pictorial vocabulary cards illustrating the meaning of plus, times, sum, double, product, quotient, minus, and triple.

Lesson 1.2 Area of a Rectangle (Part 1)

Standards: 5.NF.4.b
Warm-Up: M**ental Math** - Students add simple fractions
Focus: Math Message - Students read about area and find the area of rectangles
Math Message Follow-Up:

- MJ page 5, SRB page 221 Students review area and discuss strategies for finding areas of rectangles with and without fractional side lengths.
- Invite students to share what they wrote about area. Guide a discussion covering the following points:
- **Area** is a measure of the surface, or region, inside a closed boundary. It is the number of whole or partial **unit squares** that fit inside the boundary.
- The whole or partial unit squares should cover the region completely, without extending outside the boundary.
- The whole unit squares should all be the same size.
- The unit squares should not overlap.
- There should be no gaps between the unit squares.
- MJ page 6, Students find areas of rectangles with fractional side lengths.
- Students find areas of rectangles with fractional side lengths.

Games: SRB page 292, MM page G3. Introducing Baseball Multiplication. Students practice multiplication facts to prepare for multi-digit multiplication in Unit 2.
Assessment: Expect most students to find the correct areas and write appropriate numbers sentences for 1 and 2 on MJ page 6. Some may be able to find the correct areas for 3 and 4. If students struggle, suggest that they start by partitioning each rectangle into squares
Practice:

- Math Boxes page 7
- Home Link 1-2

Differentiation:

- **Readiness: Reviewing Equal Groups**
- **Extra Practice: Finding Areas of Rectangles. Activity Card 2, MM page TA 3**. To practice finding areas of rectangles with fractional side lengths, students generate dimensions of rectangles by rolling dice. They draw and find the area of the rectangles they generate. Then they explain their strategies to a partner and try to apply their partners' strategies**.**
- **Enrichment: Finding the Area of Figures with Fractional Side Lengths. MM page 8.** To extend their work finding areas of rectangles with fractional side lengths, students solve problems on *Math Masters*, page 8 involving rectilinear figures with fractional side lengths. They use precise language to explain their strategies**.**
- **ELL Support**: Provide a visual of a rectangle with some whole and partial square units on the inside. Label the key words students will hear and see during the lesson, including the

following terms: boundary, closed boundary, unit squares, whole, partial, area, region, overlap, and gap.

Lesson 1.3 Quilt Area (Open Response 2-Day Lesson)

Standards: 5.MD.1, 5.NF.4, 5.NF.4b

Day 1: Review students' work. Use the Re-engagement Planning Form (Math Masters, page TA4) and the rubric in the Day 2 Focus activity: *Revising Work* to plan ways to help students meet expectations for both the content and practice standards.

- Students review the open response problem and discuss what a good response might include. They also discuss how to talk about others' work respectfully
- Students discuss and compare various strategies and explanations.
- Students re-engage in the problem by analyzing and critiquing other students' work in pairs and in a whole-group discussion. Have students discuss with partners before sharing with the whole group. Guide this discussion based on the decisions you made in Getting Ready for Day 2.

Day 2:

- Students revise their work
- Have students reflect on their work and revisions. Ask: *What did you do to improve your explanations?*

Assessment:
Collect and review students' revised work. Expect students to improve their work based on the class discussion. For the content standards, expect most students to agree with Allyson's answer and show how to find the area of 312 square feet by partitioning the square and counting groups of 4 smaller squares.

Practice:

- MJ page 9 Math Boxes
- Home Link 1-3

Differentiate – Adjusting the Activity: For students who may be unsure how to determine the number of square inches in the square because the dimensions are given in feet, pose questions relating inches to a foot. Help students use a ruler to draw an actual square foot on chart paper, mark 12 inches on each side, and then begin to partition the larger square into square inches.

Differentiation - ELL Support: Some students may struggle with the everyday language of the problems context (quilt, fabric, design or to design, sketch), the mathematical language of finding area (dimension, square foot, square inch, area), and the language of interpreting another student's thinking (agree, disagree). Prior to the lesson, pre-teach and review this vocabulary. Use Total Physical Response commands along with pictures and sketches to review the three types of vocabulary.

Lesson 1.4 Area of a Rectangle, Part 2

Standards: 5.NF.4.b

Warm-Up: Mental Math: Students add mixed numbers

Focus: Math Message: MJ page 10, Students determine how many squares with a side length of 1/3 foot fit in 1 square foot.

Math Message Follow-Up:

- Students find and justify a pattern about how many squares with fractional side lengths fit in 1 square foot.
- Invite volunteers to share their strategies and answers to the Math Message problem. Guide a discussion to cover the following ideas:
- Because the smaller square has a side length of 1/3 foot, 3 of the smaller squares will fit horizontally along the side of a square foot.
- Similarly, 3 squares with a side length of 1/3 foot will fit vertically along the side of a square foot.
- This means that 3 rows of 3 squares with a side length of 13 foot will fit inside a square foot. Since $3 * 3 = 9$, there are 9 squares in all.
- MJ p. 10/11, Students find and justify a pattern about how many squares with fractional side lengths fit in 1 square foot.
- Have students share with a partner their favorite method for finding the area of a rectangle with a fractional side length.

Assessment:

Expect most students to use the tick marks to tile the rectangles and count to find the number of tiles on journal page 11. Most should also realize that the count of squares is not the area measurement. Some students may struggle trying to apply the pattern from the Math Message Follow-Up to find the correct area. If students have trouble tiling the rectangles, refer them to the squares at the top of journal page 10 for help visualizing the row-and-column structure.

Practice:

- MJ page 12 Math Boxes
- Home Link 1-4

Differentiation:

- **Readiness: Tiling with Squares with Fractional Side Lengths**
- **Extra Practice: Finding Areas of Rectangles. MM page 14** - To apply their understanding of tiling with squares with fractional side lengths, students create a poster showing area unit conversions. Consider inviting groups to present their posters to the class.
- **Enrichment: Showing Area Unit Conversions. Activity Card 3, SRB page 218-219.** To apply their understanding of tiling with squares with fractional side lengths, students create a poster showing area unit conversions. Consider inviting groups to present their posters to the class.

- **ELL Support:** Provide scaffolding for students when introducing the term side length by explaining the individual words. Use a think-aloud to describe the number of sides of various shapes. Have students measure the sides of various shapes, using the sentence frames in ELL Support to report their measurements.

Lesson 1.5 Introduction to Volume

Standards: 5.MD.3, 5.MD.4

Warm-Up-Mental Math: Students write numerical expressions

Focus: Math Message: Students explain how they know which object is largest.

Math Message Follow-Up:

- Students explore the attribute of volume.
- **SRB page 270,** Remind students that in previous lessons they explored the 2-dimensional attribute of area. Invite volunteers to explain what makes the objects displayed for the Math Message **3-dimensional** objects. Have students read *Student Reference Book,* page 270 to review the difference between 2- and 3-dimensional objects.
- MJ page 13. Students predict which container has a greater volume and test their predictions.
- Ask a volunteer to summarize the meaning of volume in the activity they just finished. Then give students 30 seconds to list as many items as they can for which the attribute of volume could be measured. Share ideas as time permits.

Assessment: Circulate and observe as students conduct the pouring experiment and complete the journal page. Ask: *What are you comparing when you pour the items into the cylinders?* Expect most to report that they are comparing volume or comparing the amount that each cylinder holds. If anyone describes the activity in vague terms, such as "We're trying to see which is bigger," follow up with questions such as: *In what way is one bigger than the other?* If necessary, focus on the term *volume* to help students incorporate it into their vocabulary.

Games: SRB page 315. MM G2. Playing Name That Number - Students practice writing expressions for calculations and writing expressions with grouping symbols.

Practice:

- MJ page 14
- Math Boxes 1-5
- Home Link 1-5

Differentiation:

- **Readiness: Identifying Measureable Attributes**
- **Extra Practice: Detecting Volume by Touch. Activity Card 5** - For more practice with volume comparisons, students order containers by volume, using only touch to make their predictions.
- **Enrichment: Creating Prisms. The Volume Challenge. Activity Card 4** - To further explore volume, students use index cards to create prisms with the greatest and least possible volumes
- **ELL Support:** Students may have heard the term hold used in everyday contexts, such as holding hands or holding your breath. Demonstrate other everyday uses of the term using

contexts with which you think your students are familiar. Then demonstrate the meaning of the term as related to volume in the sense of containing.

Lesson 1.6 Exploring Nonstandard Volume Units

Standards: 5.MD.3, 5.MD.4

Before You Begin: For the Focus activities, each small group will need an empty, open rectangular prism, such as a small box for paper clips, crayons, or tea bags. If your pattern block supply is limited, consider having groups rotate through stations—one with squares, one with triangles, and one with hexagons—with enough blocks to completely pack the prisms. For the optional Extra Practice activity, each student or partnership will need two small empty rectangular prisms.

Warm-Up: Mental Math: Students convert among units of length

Focus: Math Message:

- Students discuss whether a rectangle has volume.
- Draw a rectangle on a piece of paper. Think about what you would do if someone asked you to find the volume of your rectangle. Record your ideas and then talk about them with a partner.

Math Message Follow-Up:

- **MJ page 15.** Students use three different kinds of pattern blocks to measure the volume of a rectangular prism
- Invite students to share the ideas they discussed with their partners, encouraging them to explain their own thinking clearly and to ask questions to be sure they understand each other's thinking. Guide the discussion to emphasize the idea that volume is an attribute of 3-dimensional objects only. Because a drawing of a rectangle is 2-dimensional, it does not have volume. Ask: *What objects in our room do you see that have the attribute of volume?* Sample answers: desk; tissue box; pencil case; garbage can. *What attributes does the 2-dimensional rectangle have that we can measure?* Sample answers: length; width; perimeter; area. Explain that in today's lesson, students will review how to accurately measure attributes of 2-dimensional objects and then apply similar techniques when measuring the volume of 3-dimensional objects
- **Differentiate:** If students have difficulty tightly packing the pattern blocks into the prism, suggest that they draw an outline of the base of the prism. Encourage them to experiment with different configurations to determine the best way to arrange the blocks in just one layer, minimizing gaps as much as possible. Students will likely find it easier to tightly pack the prism if they approach the task as a layering exercise.
- Students compare nonstandard units used to measure the volume of a rectangular prism.
- Ask partners to explain to each other their thinking about the final question on the journal page: What 3-dimensional shape do you think would be easiest to pack tightly into a

rectangular prism without gaps or overlaps? Why do you think so? Invite volunteers to summarize their partner's thinking. Tell students that in the next lesson they will use another unit—cubes—to measure the volume of different rectangular prisms.

Assessment: Observe students as they pack their prisms and complete problems 1 and 2 on page 15. Expect that most will be able to minimize gaps and overlaps when packing their prisms and report the volume measurement by counting the individual blocks.

Practice:

- MJ page 16 (Finding Areas of Rectangles)
- MJ page 17 Math Boxes
- Home Link 1-6

Differentiation:

- **Readiness: Measuring with Nonstandard Units**
- **Extra Practice: Estimating Volume in Nonstandard Units**. Activity Card 7. MM page 19. For more practice with nonstandard volume units, students estimate the number of pattern blocks required to fill 3-dimensional objects.
- **Enrichment: Building and Measuring the Volume of a Polyhedron.** Activity Card 6. SRB pages 272-274. MM page 18. To extend their work with nonstandard volume units, students build polyhedrons with one kind of pattern block, recording the volumes in pattern-block units. They figure out how to express that same volume using other pattern-block units. For example, a polyhedron made from 10 hexagons would have a volume of 60 triangles because there are 6 triangles in 1 hexagon.
- **ELL Support:** Students may have seen and heard the consonant cluster "sm" in everyday terms such as small. Extend their knowledge of English spelling conventions by having them repeat the term prism several times, pointing out the pronunciation of the "s" as a "z sound" and explaining that the "sm" blend has a different pronunciation in this context.

Lesson 1.7 Measuring Volume by Counting Cubes

Standards: 5.MD.3, 5.MD.3.a, 5.MD.3.b, 5.MD.4

Before You Begin: Consider assembling the prisms on *Math Journal 1,* Activity Sheet 1 for students in advance. You can make extra prisms from *Math Masters*, page 21. Place centimeter cubes near the Math Message.

Warm-Up: Mental Math: Students evaluate expressions with grouping symbols

Focus: Math Message:

- **MJ page 18.** For more practice with nonstandard volume units, students estimate the number of pattern blocks required to fill 3-dimensional objects.
- For more practice with nonstandard volume units, students estimate the number of pattern blocks required to fill 3-dimensional objects.

Math Message Follow-Up

- Students determine the volume of rectangular prisms by counting the number of cubes it takes to fill them.
- Show students a square pattern block and a cube. Ask: *Could both shapes be used to pack a prism without gaps or overlaps?* (Yes). *Could both shapes fit into the corners of a prism?* (Yes). *Do you think a cube or a square pattern block is better for measuring volume? Why?* Sample answer: A cube is better. Since each edge length is exactly the same, the same number of cubes will fit in a row in the prism no matter which way you turn it. The edges on a square pattern block are not all the same length. Because the height is smaller than the length and the width, it fits differently if it is on its side than if it has the square part on the bottom. Tell students that today they will use cubes to measure the volume of rectangular prisms. Remind them that when they packed prisms with pattern blocks, they reported their results as a number of *pattern-block units*. Explain that when cubes are used to measure, each cube has a side length of 1 unit and is called a **unit cube.** Its volume is 1 **cubic unit.** Explain that cubic units can also be written as units3.
- **MJ pages 18-19,** Students determine the volume of rectangular prisms by counting the number of cubes it takes to fill them.
- **Differentiate:** To help students who struggle solving cube-stacking problems, provide grid paper (*Math Masters*, page TA3) and centimeter cubes. Have them go through the following steps: Refer to the picture and reproduce the configuration of cubes of *just the bottom layer* on grid paper. Draw the outline of the entire base on the grid paper. Remind students that the base of a rectangular prism is always a rectangle. Fill in the base with cubes. Refer to the picture and determine the height of the prism. Reproduce a column with cubes, connecting it

to the base. Fill in with cubes, remembering not to go beyond the base or higher than the column. Count the total number of cube

- Ask partners to share their thoughts about which cube-stacking problem was the easiest to solve and which was the most difficult. Summarize by recalling how in today's lesson they found volume by counting cubes. In the next lesson they will continue to measure volume with cubes, but they will explore a new method for doing so.

Assessment:
Expect most students to be able to determine the number of cubes needed to fill Prism 3 on journal page 19 by looking at the picture or by building the prism with centimeter cubes. Most will also understand that the number of cubes needed to pack the prism is the volume of the prism in cubic units. Some students may be able to find the number of cubes that would fill Prisms 4–6. To support students who struggle, refer to the Adjusting the Activity note.

Games: SRB page 292. MM page G3. Playing Multiplication Baseball. Students practice multiplication facts to prepare for multi-digit multiplication in Unit 2.

Practice:
- MJ page 20 Math Boxes
- Home Link 1-7

Differentiation:
- **Readiness: Solving 1-Layer Prism Problems**
- **Extra Practice: Creating Prism Patterns and Finding Volume with Cubes.** MM TA3. For additional experience using cubes to find volume, students create prism patterns on grid paper. Demonstrate how to draw a pattern for an open box on grid paper. Instruct students to create a box pattern of any dimension they choose with a height of at least 2 units. Have students exchange patterns with a partner, cut out the pattern, fold up the sides, and tape it together. Students use centimeter cubes to find the volume.
- **Enrichment: Exploring Penticubes.** Activity Card 8. MM page 23. Students practice multiplication facts to prepare for multi-digit multiplication in Unit 2.
- **ELL Support**: Help student understand the meaning of the terms partial and partially by displaying them with the base word part underlined. Display visuals line a complete and a partially eaten apple and use a think-aloud to describe them.

Lesson 1.8 Measuring Volume by Iterating Layers

Standards: 5.MD.3.a, 5.MD.3.b, 5.MD.4

Warm-Up: Mental Math: Students interpret expressions.

Focus: Math Message:

- MJ 1, Activity Sheet 2, Students assemble rectangular prisms and estimate the number of cubes that will fit into each one
- Cut out and assemble Rectangular Prisms D, E, and F. Take 25 cubes. Estimate how many cubes will fit in each prism.

Math Message Follow Up:

- Students fill a single layer of a prism and use the number of cubes in one layer to determine the volume
- Invite students to share their estimation strategies. Explain that when mathematicians have a new problem to solve, they think about how they have solved similar problems in the past. Ask: *Did you find it easier to make estimates today than in the previous lesson? Why or why not?* Have partnerships use the layering strategy with Prism E. They should find the number of cubes that will fit in one layer and then think about how many layers of cubes would fill the prism. Have students record their results on slates. Invite a few students to explain their thinking and share their results. Discuss the solution and strategies until everyone is in agreement.
- **MJ pages 22-23,** Students find volumes of prisms that show one layer completely filled.
- Ask students to choose one problem from the journal pages and explain to a partner how they solved it. Invite a few volunteers to explain their partner's strategy. Remind students that whether they count individual cubes or add or multiply the number of cubes in a single layer, the result is the same: they are calculating volume in cubic units.

Assessment: Expect most students to find the number of cubes in 1 layer and use either repeated addition or multiplication to find the volumes of Prisms H, I, and J on journal pages 22 and 23. Some students may be able to find the volumes of Prisms K and L. For students who struggle, translate the problem into a real-world scenario. For example: *Pretend you are a builder. Prism J is your project and the first floor is completed. Each cube is a room. How many rooms are on the first floor? You build a second floor. How many rooms are in the building now?* Continue until all 7 floors are built, concluding with a statement like this: *The building has_____ rooms. Its volume is_____ room **units.*** **Encourage students who excel to try the Enrichment activity.**

Practice:

- MJ page 21 (Converting Measurements)
- Math Boxes page 24 (preview for Unit 2, optional)
- Home Link 1-8

Differentiation:

- **Readiness: Laying Down Layers**
- **Extra Practice: Rolling for Prisms.** Activity Card 9. MM page 27. For additional experience measuring volume by iterating layers of cubes, students roll dice to determine the dimensions of prisms. They use cubes to partially build the prisms and then calculate and compare volumes.
- **Enrichment: Finding the Volume of One Stick-On Note.** MM page 26. To apply their understanding of finding the volume of a rectangular prism, students determine the volume of a single stick-on note. Have them record their work on *Math Masters*, page 26. If time permits, invite volunteers to share their answers and solution strategies. For an additional challenge, have students find the volume of one sheet of notebook paper.
- **ELL Support:** Use visual aids and demonstrations to explain the meaning of the term layer. Display pictures or segments of a cooking video showing layers in food items, like casseroles or desserts. Speak in simple sentences. Ask questions with one-word answers.

Lesson 1.9 Two Formulas for Volume

Standards: 5.MD.3.a, 5.MD.3.b, 5.MD.4, 5.MD.5.a, 5.MD.5.b

Before You Begin:
For the Focus activities students will need Prisms E and F from Lesson 1–8. If students do not have them, make one copy of *Math Masters*, page 25 for each student and have them cut out and assemble the prisms before the lesson begins. Place a box of centimeter cubes near the Math Message.

Warm-Up: Students evaluate expressions with grouping symbols.

Focus: Math Message:

- Students use cubes to find the volume of a rectangular prism and compare strategies with a partner.
- Take 40 cubes and Prisms E and F from Lesson 1-8. Find the volume of Prism E. Talk with a partner about the strategy you used to find the volume. Did you and your partner use the same strategy?

Math Message Follow-Up:

- Students discuss how to find the height of a rectangular prism and the area of its base without using cubes. They use this information to generalize the formula $V = B \times h$.
- Display one of the cubes you placed near the Math Message. Tell students that it is called a centimeter cube because all of its edges are 1 centimeter in length. Have students use a ruler to confirm that every edge is 1 centimeter long. Ask: *What is the volume of this cube? How do you know?* 1 cm3. It is a unit cube with a length of 1 cm on each edge, so its volume is 1 cubic centimeter, or 1 cm3.
- D**ifferentiate**: The two formulas introduced in this lesson contain many different variables. To help students remember what each letter means, have them create posters illustrating the meaning of each one. They can draw several rectangular prisms and label the length (l), width (w), height (h), and the area of the base (B) on each prism. Display the posters for student reference as they apply the formulas for volume.
- **MJ page 25 -** The two formulas introduced in this lesson contain many different variables. To help students remember what each letter means, have them create posters illustrating the meaning of each one. They can draw several rectangular prisms and label the length (l), width (w), height (h), and the area of the base (B) on each prism. Display the posters for student reference as they apply the formulas for volume.

Assessment:
Expect most students to be able to find the volume of the prisms in Problems 1–5 on journal page 25 by referring to the formulas displayed in the lesson and multiplying the dimensions shown. If students have difficulty deciding which formula to use, suggest that they list the information they know and match their lists to the two formulas. For a challenge, have students list as many dimensions as they can for Problem 6.

Practice:

- MJ page 26 (Writing and Interpreting Expressions)
- MJ page 27 Math Boxes
- Home Link 1-9

Differentiation:

- **Readiness: Reviewing an Area Formula**
- **Extra Practice: Using Volume Formulas.** MM page 29. For additional practice using volume formulas, students find the volumes of rectangular prisms and list possible dimensions of rectangular prisms with a given volume.
- **Enrichment: Finding Dimensions for a Given Volume**. Activity Card 10. To apply their understanding of volume, students find all possible combinations of base area and height for a rectangular prism with a volume of 24 cm 3. They consider whether prisms with the same base area but different lengths and widths are still the same prism
- **ELL Support:** Extend students' comprehension of the word find beyond the everyday association with something being lost. Use the phrase solve for the answer as you point to the bland space or to the V (volume) before or after the equal sign so that students will understand the directions "finding the volume" as meaning to "solve for the answer."

Lesson 1.10 Visualizing Volume Units

Standards: 5.MD.1, 5.MD.3a, 5.MD.3b, 5.MD.4, 5.MD.5b

Before You Begin:
For the Focus activities, assemble a partial frame of a cubic meter by placing two meter sticks on a flat surface at right angles to each other and using packing tape to hold them in place. Tape a third meter stick perpendicular to the other two so that all three meter sticks meet in one corner. See the illustration in the Focus Activity: Converting Volume Units.

Warm-Up: Mental Math: Students convert units of length.

Focus: Math Message:

- Students compare units of length, area, and volume.
- A unit you can use to measure length is a centimeter. A unit you can use to measure area is a square centimeter. A unit you can use to measure volume is a cubic centimeter. Talk with a partner about how these units are similar and how they are different. Record your ideas to share.

Math Message Follow-Up:

- Students generate a list of length, area, and volume units and discuss the relationships between them.
- Ask several students to share their responses to the Math Message. As they discuss the units, hold up a centimeter cube and use it to show the length 1 centimeter (the length of an edge), the area 1 square centimeter (the area of a face), and the volume 1 cubic centimeter (the volume of the cube). Display the notation for each unit (cm, cm 2, cm3) and make sure students are comfortable with each one.
- Students determine the number of cubic centimeters in a cubic decimeter and the number of cubic decimeters in a cubic meter.
- **MJ pages 28-29.** Students convert between cubic units.
- Have students work in small groups or partnerships to complete the journal pages, where they determine the number of cubic inches in a cubic foot and the number of cubic feet in a cubic yard. They also think about what volumes it makes sense to measure using different cubic units. You may want to have a representation of each unit for students to have a visual understanding of unit size.
- Ask partners to tell each other two things they learned about cubic units and measuring with cubic units.

Assessment:

- Expect most students to understand the relative size of units of volume given on journal pages 28 and 29 and to name objects with volumes they might reasonably measure with each unit. For those who struggle, offer as many visual supports as possible. For example, consider making a frame of a cubic foot using rulers, similar to the frame of a cubic meter.
- Do not expect students to be fluent in converting between cubic units of measure. This is the first time they have encountered unit conversions for volume, and they will continue to practice unit conversions in upcoming lessons.

Practice:

- MJ page 30 (More Cube Stacking Problems)
- MJ page 31 Math Boxes
- Home Link 1-10

Differentiation:

- **Readiness: Converting Linear Measurements**
- **Extra Practice: Estimating the Volume of Your Classroom.** Activity Card 11. To practice choosing volume units, finding volume, and converting volume units, students choose a unit of volume and estimate the volume of the classroom in that unit. GMP6.2 - They convert the volume measurement to a different unit**.**
- **Enrichment: Packing Cubes in a Box.** MM page 32. To extend their work converting between units of volume, students solve a problem involving converting between cubic inches and cubic centimeters. They explain their thinking using clear labels, units, and mathematical language.
- **ELL Support:** For the Math Message, aid students by showing a labeled display.

Lesson 1.11 Volume Explorations

Standards: 5.MD.1, 5.MD.3a, 5.MD.3b, 5.MD.4, 5.MD.5a, 5.MD.5b, 5.MD.5c, 5.OA.1, 5.OA.2

Warm-Up: Mental Math: Students interpret numerical expressions.

Focus: Math Message:

- Students find the volume of a suitcase
- You have a suitcase that is 14 inches long, 8 inches wide, and 20 inches tall. What is the volume of the suitcase? If you lay the suitcase on its side, does it still have the same volume? You may use a calculator. Be ready to explain your answer.

Math Message Follow-Up:

- Students use a rectangular prism to model the suitcase and show that the volume of the suitcase stays the same if the suitcase is turned.
- Before students share their Math Message responses, ask: Why might you want to know the volume of a suitcase? Sample answer: To figure out how much you can pack Have students confirm the volume and share a formula they could use to find it. $\mathbf{V = l \times w \times h}$
- **Differentiate:** Students use a rectangular prism to model the suitcase and show that the volume of the suitcase stays the same if the suitcase is turned.
- **MM page 34 (for display).** Students find volumes of figures composed of rectangular prisms by adding the volumes of the prisms
- Sketch a rectangular prism and label it with the suitcase dimensions. (See below.) Point out that the sketch is a **mathematical model** of the suitcase. The model does not look exactly like a suitcase because it does not include details like pockets or handles. Explain that when an object is about the same shape as a geometric figure, mathematicians often adopt a simplified picture as a model and use the model to help them solve problems.
- Ask: When solving real-world volume problems, why is it useful to model objects with rectangular prisms?

Assessment:

- Expect most students to be able to use a strategy to break apart the model and apply a volume formula to the prisms to estimate the volume of the trombone case in Problem 1 on journal page 32. Some may be able to estimate the volumes of the more complex cases in Problems 2 and 3. If students struggle finding the volumes of the cases, encourage them to think about breaking the models into rectangular prisms and to sketch the prisms separately before finding the volume
- ***In lieu of this lesson, you may want to make a real world connection - look at the volumes and sizes of luggage that is allowed on an airplane. Give students total volume and have them design their own luggage and explain the choices to the class.***

Games: SRB page 294 - Playing Buzz. Students practice finding multiples of numbers to prepare for multi-digit division in Unit 2.

Practice:

- MJ page 33 Math Boxes
- Home Link 1-11

Differentiation:

- **Readiness: Using Cubes to Find Volume**
- **Extra Practice: Adding to Find Volumes.** Activity Card 13. For additional practice finding volumes of figures composed of rectangular prisms, students roll dice to determine dimensions of figures and then find volumes.
- **Enrichment: Estimating the Volume of a Classroom Object.** Activity Card 12. MM page 35. To extend their work with modeling real-world objects and finding volumes of figures composed of rectangular prisms, students model objects in the classroom using prisms and use the models to estimate the volume of the object**s**
- **ELL Support:** For the Math Message, display a picture of a suitcase with the three dimensions from the problem labeled and indicated by arrows. Build on students' understanding of suitcases as used for transporting clothes to explain the use of cases to carry other items, such as musical instruments.

Lesson 1.12 Playing Prism Pile-Up

Standards: 5.MD.1, 5.MD.3a, 5.MD.3b, 5.MD4, 5.MD.5a, 5.MD.5b, 5.MD.5c, 5.OA.1, 5.OA.2

Warm-Up: Mental Math: Students answer true/false questions about volume.

Focus: Math Message: Students list strategies for finding volume

Math Message Follow-Up

- Students share their strategies for finding volume and clearly and precisely explain how to apply them.
- Have students share the strategies they listed. Record them on the Class Data Pad. Strategies may include the following:
- Pack the prism with unit cubes and count the cubes. Pack one layer with unit cubes. Multiply the number of cubes that fit in one layer by the number of layers. Use the formula $V = l * w * h$. Find the area of the base and then use the formula $V = B * h$.
- Ask a volunteer to explain the strategy he or she used to find the volume of the prism
- Have volunteers explain how they found the volume of one of the figures on the game cards. Encourage other students to give suggestions about how to make the explanation clearer or more precise.

Games: SRB page 319. Play Prism Pile-Up - Students practice finding volumes of rectangular prisms and figures composed of rectangular prisms**.**

Assessment: Expect most students to be able to apply a strategy to correctly find the volumes of the figures on *Prism Pile-Up* Cards 1–3 and 7–9. Most should also be able to use a displayed formula to find the volumes of the figures on Cards 10–15. Some students may be able to find the volumes of the figures composed of prisms on Cards 4–6 and 16–18. (*See above for volumes.*) Some students may be able to write number sentences for the volumes of the figures. If students struggle trying to find volumes, provide cubes so they can build the figures and count the cubes

Practice:

- MJ page 34 (Understanding Grouping Symbols)
- MJ page 35 Math Boxes
- Home Link 1-12

Differentiation:

- **Readiness: Choosing Volume Strategies**
- **Extra Practice: Solving Volume Problems.** MM page 37
- **Enrichment: Creating Prism Pile-Up Cards.** To extend their work finding volumes of rectangular prisms and figures composed of rectangular prisms, students create additional Prism Pile-Up cards and find the volumes of the figures on their cards. If time permits, have students play the game with their new cards.
- **ELL Support:** To scaffold student participation in the Math Message discussion, encourage students at the pre-production stage of English acquisition to use drawings or unit cubes to demonstrate their strategies for finding the volume of the prism.

Lesson 1.13 Unit 1 Progress Check (2 days)

Warm Up / Self-Assessment: Complete Self-Assessment. Some students may benefit from recalling the types of problems cited in each row on the Self-Assessment. Show students where these pointers appear on their Self-Assessments. In Unit 2 students begin using these pointers themselves.

Assessment:

- **Unit 1 Assessment:** These items reflect mastery to expectations to this point
- **Unit 1 Challenge** (Optional): Students may demonstrate progress beyond expectations
- **Solving the Open Response**: After a brief introduction students solve a volume problem and explain their thinking.
- **Discussing the Problem:** After completing the problem, students share strategies.

Looking Ahead:

- **Math Boxes** 1.13: Preview for Unit 2
- **Home Link** 1.13: Students take home the Family Letter that introduces Unit 2.

Differentiation Options: Adjusting the Assessment: See TE for adjustments to the assessment

To further enhance student problem solving, understanding and increase stamina work on the following project for Unit 8:

Unit Plan Title	Whole Number Place Value and Operations
Suggested Time Frame	18-20 Days/Approximately the month of October including flex/game days

Stage 1: Desired Results

Overview / Rationale

In this unit, students explore patterns in the base-10 place-value system and ways of representing large numbers. They apply their understanding of place value when estimating and computing with multi-digit whole numbers. Students are introduced to U.S. traditional multiplication and review partial-quotients division.

New Jersey Student Learning Standards for Mathematics

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

5.NBT.5 Fluently multiply multi-digit whole numbers using the standard algorithm.

5.NBT.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Technology Integration
__X__ **8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
- Student Websites - Teacher Websites - SMART board
____**8.2 Technology Integration, Engineering, Design and Computational Thinking – Programming** All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES
The following social and emotional competencies are integrated in this curriculum document:

Self-Awareness
_____Recognize one's own feelings and thoughts
_____Recognize the impact of one's feelings and thoughts on one's own behavior
_____Recognize one's personal traits, strengths and limitations
_____Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management
__x__Understand and practice strategies for managing one's own emotions, thoughts and behaviors
__x__Recognize the skills needed to establish and achieve personal and educational goals
__x__Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness
__x__Recognize and identify the thoughts, feelings, and perspectives of others
_____Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
_____Demonstrate an understanding of the need for mutual respect when viewpoints differ
_____Demonstrate an awareness of the expectations for social interactions in a variety of setting

Responsible Decision Making
__x__Develop, implement and model effective problem solving and critical thinking skills
_____Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills
_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
_____Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

In this unit plan, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – 21st Century Themes			**Indicate whether these skills are:** ● **E – encouraged** ● **T – taught** ● **A – assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**			CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
X	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing			CRP5. Consider the environmental, social and economic impacts of decisions.
X	Becoming a Critical Consumer			CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
	Career Exploration			CRP11. Use technology to enhance productivity.
	Career Preparation			CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

NJ Student Learning Standards for English Language Arts

RI.4.3 - Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.4 - Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

RI.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.4.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Essential Questions:	**Enduring Understandings:**
● How does understanding place value help you solve a problem? ● How are place value patterns repeated?	***Students will understand that…*** ● Making an estimate helps us identify reasonable answers. ● We can represent numbers in many ways.
Knowledge:	**Skills:**

Students will know…	**Students will be able to…**
● Place value, standard notation, expanded form ● Exponent, base, power of 10, exponential notation ● Extended multiplication fact, estimate ● Partial-products multiplication, U.S. traditional multiplication area model ● Measurement units, convert, number model, relation symbol, expression ● Area model ● Algorithm ● Efficient ● Dividend, divisor, quotient, multiple, remainder ● Partial-quotients division, partial quotient, area model ● Multiple ● Mathematical model, remainder, quotient, dividend, divisor	● Write simple expressions to model situations in which no more than two operations are involved; reason about the relative value of simple expressions without evaluating them. ● To use place-value understanding to write whole numbers in expanded form; identify the values of digits in a given whole number; write whole numbers in which digits represent given values; recognize that in a multi-digit whole number, a digit in one place represents 10 times what it represents in the place to its right. ● To translate between powers of 10 in exponential notation and standard notation; correctly multiply a whole number by a power of ten; notice patterns in the number of zeros in a product when multiplying a whole number by a power of ten. ● To use a strategy to multiply whole numbers; understand the basic steps of the U.S. traditional multiplication algorithm and successfully apply it to 1-digit by multi-digit problems and 2-digit by 2-digit problems in which one factor is less than 20. ● To use the partial-quotients algorithm with up to 3-digit dividends and 1-digit or simple 2-digit divisors; make connections between written partial-quotients work and a given area model representing the same solution. ● To perform one-step unit conversions within the same measurement system; use conversions to solve real-world problems when necessary conversions are identified.

Student Resources	
Decimal Switch	http://www.interactivestuff.org/sums4fun/switch.html
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
	www.abcya.com www.sheppardsoftware.com www.coolmath.com

Teacher Resources	
Games/Lessons Topics	http://littletonpublicschools.net/Default.aspx?tabid=539
Decimal Switch	http://www.interactivestuff.org/sums4fun/switch.html
Demo Lessons/Activity Sheets	http://www.learnalberta.ca/content/me5l/html/math5.html
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Quizzes/Practice	http://littletonpublicschools.net/Default.aspx?tabid=539
Khan Academy	www.khanacademy.com
Mentor Texts	One Grain of Rice Fractions, Decimals and Percent One Hundred Hungry Ants A Remainder of One Sir Cumference and All the King's Tens G is for Googol The Multiplying Menace Divides Amanda Bean's Amazing Dream How Much is a Million?

Stage 2: Acceptable Evidence

Assessments

Formative:	**Summative:**
● Math Message ● Oral Mental Math Fluency ● Math Journal ● Slates ● Lesson Assessment Check-In ● Collins Writing ● Exit Slips ● Home Link ● Teacher Observation ● Games/Activity Cards	● Benchmark Assessment ● Quizzes ● Unit Progress Check ● Open Response Assessments ● Student Work Products

Stage 3: Learning Experiences

Lesson 2.1 Understanding Place Value

Students explore the multiplicative relationships between places in multi-digit numbers.

Standards: 5.NBT.1

Warm-Up: Mental Math: Students find volumes of rectangular prisms.

Focus: Math Message: *Complete Problems 1 and 2 on journal page 37. Talk with a partner about the patterns you notice in the values of the 2 and 6 in each number* (recording the value of digits in numbers).

Math Message Follow-Up

- **MJ page 37,** Invite several students to share what they noticed about the position, or place, of the 2 in each number in Problem 1. Then discuss the value of the 2 in each number, using students' responses to highlight how each 2 has a value that is 10 times the value it would have one place to the right. For example, the 2 in 23 is worth 20 because it is in the tens place, but the 2 in 230 is worth 200 because it is in the hundreds place.
- **Differentiate**: For students who confuse changes in magnitude to the left and right, suggest that they act out a place-value machine using base-10 blocks. Line up four students and label them 1,000s; 100s; 10s; and 1s. The student labeled 1s chooses a small number of cubes, states the value, and passes them to the "10s" student, saying, "times 10." The "10s" student trades the cubes for longs, states the value, and passes them to the "100s" student, saying, "times 10," and so on. Repeat the process beginning with the student labeled 1,000s and the largest place value block, saying, " 110 of" or "divided by 10" when passing them back to the "100s" student.
- Display the number 65,582 and explain that it is written in standard notation. **Standard notation** is the most common way of representing numbers. Another way to represent a number is by writing it in **expanded form**. Expanded form represents a number as the sum of the values of each digit. Compare and contrast different versions of expanded form, highlighting how the value of each digit is represented Guide the discussion to include these points:

Games: SRB page 316. Introduce and play Top-It.

Practice:

- MJ pages 37-38
- Math Boxes 2-1
- Home Link 2-1

Assessment: Expect that most students will be able to write numbers in expanded form in Problem 3 and identify values of digits in Problem 6 on journal pages 37 and 38. Some will be able to apply the *10 times* and 110 *of* relationships to solve Parts b and c of Problems 8 and 9. If students struggle, suggest that they write the numbers on a place-value chart (*Math Masters,* page TA5) or use base-10 blocks to visualize the value of the numbers in each place.

Differentiation:

- **Readiness: Modeling Numbers with Base-10 Blocks**
- **Extra Practice: Calculating to Explore Place-Value Relationships.** Activity Card 15, MM page T45. For more practice describing place-value relationships, students use calculators to multiply and divide numbers by 10 and record the results.
- **Enrichment: Exploring Base-5 Place Value.** MM page 43. To extend their understanding of base-10 place-value relationships, students explore the base-5 number system. They study a table of numbers in base-5 and then practice converting between base-10 and base-5. They represent base-5 numbers in expanded form.
- **ELL Support:** Use everyday experiences and terms to help students actively understand and make connections between the terms value and worth. Show examples of car advertisements featuring new and used cars from several years. Point to the prices, making think-aloud statements.

Lesson 2.2 Exponents and Powers of 10

Students explain patterns in the number of zeros when multiplying by powers of 10. They use whole-number exponents to denote powers of 10.

Standards: 5.NBT.1, 5.NBT.2

Warm-Up: Mental Math: Students use place value relationships to write numbers.

Math Message: Students study numbers in exponential notation.

Math Message Follow-Up:

- **MJ page 41. SRB page 68.** Have students share their answers to the Math Message, pointing out instances in which they used patterns to solve the problem. $10^6 = 10 * 10 * 10 * 10 * 10 * 10 = 1{,}000{,}000$ Explain that the small raised number is called an exponent and that the number before the exponent is the base. The exponent tells how many times the base is multiplied. When the base is 10, the number is called a power of 10.
- Remind students about their recent work with standard notation and expanded form. Explain that today they will use powers of 10 to write numbers in exponential notation.
- Read and discuss *Student Reference Book,* page 68. Have students examine the Powers of 10 chart and share patterns they notice in the chart.
- Students write numbers in expanded form in different ways.
- Have students talk with a partner about any patterns they notice on their completed High-Number Toss record sheets. Encourage them to clearly explain how they determined the standard notation of their number.

Games: SRB page 312. MM page G10. Introduce and play High-Number Toss. Students practice reading, writing, and comparing numbers in standard and exponential notation.

Practice:

- MJ page 43 (Solving a Real-World Volume Problem)
- Math Boxes page 44
- Home Link 2-2

Differentiation:

- **Readiness: Exploring Multiplication by Powers of 10**
- **Extra Practice: Playing Power Up**. SRB page 318. MM page G11. Play Power Up.
- **Enrichment: Solar System Sightseeing.** Activity Card 16. MM page 45-46. To extend their understanding of exponential notation and powers of 10, students create multiplication expressions representing distances in the solar system.
- **ELL Support:** Have students prepare a vocabulary card for each of the new terms introduced in the lesson. Have students use their cards to respond to Total Physical Response commands.

Assessment:

Expect most students to be able to correctly write the numbers they create while playing *High-Number Toss* in standard notation. Refer those who struggle to the Powers of 10 chart in the *Student Reference Book,* page 312. Encourage them to write out the standard notation for the power of 10 above the exponential notation before multiplying to find the total.

Resources: SRB page 68

Lesson 2.3 Applying Powers of 10

Students estimate with powers of 10 to solve multiplication problems and check the reasonableness of products. For this lesson note the word **reasonable**. This word appears often on PARCC for reasoning mathematical problems.

Standards: 5.NBT.2

Before You Begin: For the Focus activities, copy and cut apart enough Exit Slips (*Math Masters*, page TA6) for each student to have one. For the optional Enrichment activity, each partnership will need a sheet of poster paper.

Warm-Up: Mental Math - Students convert between standard notation and exponential notation for powers of 10.

Focus: Math Message - Students use Powers of 10 to mentally calculate extended multiplication facts.

Math Message Follow-Up:

- Students use Powers of 10 to solve multiplication fact extensions.
- Explain to your partner how you could do the following problems in your head: $5 * 40$; $50 * 40$; $50 * 400$.
- Discuss the strategies partners shared during the Math Message.
- **MJ page 45** Students use Powers of 10 and estimation to solve number stories and check answers.
- Remind students that when solving problems they should always think about whether their answer makes sense. One way to do this is to make an **estimate**, or an answer that is close to the exact answer. This is an important step in determining whether their thinking is on the right track. Pose this problem: *Miles solved $492 * 63$ and got 480,992. Is Miles' s answer **reasonable**?* Encourage students to use their knowledge of powers of 10 to think through the reasonableness of the answer. Guide them to pay attention to the factors. Ask: *What power of 10 would we have to multiply 492 by to come close to 480,992?*
- Invite volunteers to share their solutions and strategies from journal page 45.

Assessment:

Distribute an Exit Slip (*Math Masters,* page TA6) to each student. Ask: *Is the product of $284 * 79$ closer to 2,400; 24,000; or 240,000?* Have students answer the question and explain their thinking on the Exit Slip

Differentiation:

- **Readiness: Practicing Extended Multiplication Facts**
- **Extra Practice: Playing Multiplication Top-It Extended Facts.** SRB page 325. For more practice with extended multiplication facts, students play *Multiplication Top-It: Extended Facts*. See the rules on *Student Reference Book*, page 325. Students draw two number cards, attach a zero to the first card, and multiply by the second card. For example, with 5 as the first card and 9 as the second, students compute $50 * 9 = 450$.
- **Enrichment: Freight Train Wrap-Up.** Activity Card 17. To extend their understanding of multiplication by powers of 10, students estimate whether all of the freight train cars in the United States, placed end to end, would wrap all the way around Earth. They make a poster to explain their thinking
- **ELL Support:** Use concrete objects such as a Slinky or an extension cord to teach the terms extend and extension.

Lesson 2.4 U.S. Traditional Multiplication (Part 1)

Students use U.S. traditional multiplication to multiply 2-digit numbers by 1-digit numbers.

Standards: 5.NBT.5

Before You Begin: If your students are not comfortable using partial-products multiplication, have them complete the Readiness activity.

Warm-Up: Mental Math: Students use powers of 10 to solve extended multiplication facts.

Focus: Math Message: Students multiply a 2-digit number by a 1-digit number.

Math Message Follow-Up:

- Students share strategies and use U.S. traditional multiplication to multiply 2–digit numbers by 1–digit numbers.
- Invite several students to share their strategies for finding the product. If no one mentions partial-products multiplication, be sure to demonstrate it yourself. *Sample strategies:* Use partial-products multiplication. First write 34 in expanded form: 30 + 4. Then multiply each part of 34 by 9: $30 * 9 = 270$ and $4 * 9 = 36$. Finally, add the two partial products: 270 + 36 = 306.
- First find $34 * 10 = 340$. I know that $34 * 10$ is 34 more than $34 * 9$, so I have to subtract 34. I subtracted to find 340 – 34 = 306.
- Double 34, and then double the result two more times. $34 * 2 = 68$; $68 * 2 = 136$; and $136 * 2 = 272$. That's 8 [34s] so far. Add one more [34] to find the answer: 272 + 34 = 306.
- Tell students that today they will explore a new strategy for solving multiplication problems called **U.S. traditional multiplication** and learn how this strategy relates to partial-products multiplication.
- **See the Teacher's Manual or website for a more detailed explanation of each strategy.
- Have students complete journal page 48 individually or in partnerships. Remind them to check that their answers make sense **(or are reasonable)**. For Problems 4–7, students write number models using a symbol for the unknown. They have done this in Grades 2, 3, and 4. An example is provided on the journal page. If students struggle writing number models, you may want to write the number model for Problem 5 together as a class.
- Have students tell a partner one similarity they noticed between U.S. traditional multiplication and partial-products multiplication.
- **Differentiate:** If students struggle lining up the digits when they are multiplying, provide a computation grid (*Math Masters,* page TA7) and demonstrate how to use it to keep the digits in the numbers aligned.

Games: SRB page 316. MM pages G7-G9. Play Number Top-It. Students use place-value understanding to practice building and comparing multi-digit numbers.

Practice:

- MJ page 48
- Math Boxes page 49
- Home Link 2-4

Assessment:

Expect most students to correctly solve the multiplication problems on journal page 48 when they choose their own strategy. Most will also be able to describe how they know their answers make sense in Problem 3. This is the first exposure to U.S. traditional multiplication, so some students may struggle using it. They will have plenty of opportunities throughout the year to practice U.S. traditional multiplication.

Differentiation:

- **Readiness: Reviewing Partial-Products Multiplication**
- **Extra Practice: Practicing Multiplication Strategies.** Activity Card page 18. SRB pages 100-102. For additional practice with U.S. traditional multiplication, students generate problems using number cards. They solve the problems using both U.S. traditional multiplication and partial-products multiplication, and then compare the strategies.
- **Enrichment: Using Place Value to Multiply.** MM page 50. Students use place-value understanding to practice building and comparing multi-digit numbers.
- **ELL Support:** Introduce the term partial by building on concrete examples of parts of a whole. Display the written term and pronounce it for students to hear. Then have them chorally repeat the term. Underline the base word part and show a picture of a whole pizza divided into parts.

Lesson 2.5 U.S. Traditional Multiplication (Part 2)

Students use U.S. traditional multiplication to multiply multi-digit numbers by 1-digit numbers.

Standards: 5.NBT.5

Before You Begin: Copy and cut apart enough Exit Slips (*Math Masters,* page TA6) for each student to have one.

Warm-Up: Mental Math: Students evaluate with expressions with grouping symbols.

Focus: Math Message: Students study a problem using U.S. Traditional multiplication.

Math Message Follow-Up:

- **SRB age 102.** Students discuss the worked example and use U.S. traditional multiplication to multiply 1-digit numbers by multi-digit numbers.
- Remind students that in the previous lesson they multiplied 2-digit numbers by 1-digit numbers using U.S. traditional multiplication. Encourage them to think about how they can use what they learned to solve the Math Message problem. Discuss how to use U.S. traditional multiplication, recording the steps as follows.
- **Differentiate:** Some students may benefit from solving these problems using partial-products multiplication so they can compare their work with partial products to their work with U.S. traditional multiplication, as shown in Lesson 2-4. Here is how $264 * 7$ can be solved using partial-products multiplication. Students may also benefit from sketching or looking at an area model for the problem.
- Review the directions for **Multiplication Top-It**: Larger Numbers on Student Reference Book, page 325. Students are familiar with Top-It games from previous years of Everyday Mathematics. In this variation of Multiplication Top-It, partners draw 4 cards and use them to make a 3-digit number and a 1-digit number. They multiply the numbers and compare products. The student with the larger product wins the round. Demonstrate a sample round, and then have partnerships or small groups play the game.
- Students may use whatever multiplication strategy they wish during this game. However, to provide additional practice with U.S. traditional multiplication, you may want to suggest that students use this strategy for at least one round.

Assessment:

Expect most students to be able to solve $423 * 3$, which does not involve writing any digits above the line, using U.S. traditional multiplication. Some may also be able to solve $2{,}681 * 5$, which does involve writing digits above the line and remembering to add them.

Practice:

- MJ page 50 (Practicing With Powers of 10)
- Math Boxes page 51
- Home Link 2-5

Differentiation:

- **Readiness: Playing Baseball Multiplication.**
- **Extra Practice: Solving Silly Multiplication Number Stories.** Activity Card 19. MM page 53. For additional practice with multiplication, students work in partnerships to create and solve silly number stories.
- **Enrichment: Multiply Larger Numbers.** MM page 52. To extend their work with U.S. traditional multiplication, students describe how to use the strategy to multiply a 1-digit number by a number of any size. They use U.S. traditional multiplication to solve number stories involving large numbers.
- **ELL Support:** Build students' mathematical vocabulary by explicitly pointing out terms that belong to the same word family. Display the terms multiply and multiplication. Pronounce the words and then have students repeat them chorally.

Lesson 2.6 Application: Unit Conversions

Students use unit conversions within the U.S. customary system to solve multistep problems.

Standards: 5.MD.1, 5.NBT.5, 5.OA.1, 5.OA.2

Before You Begin: For the Focus Activities, prepare a two-column table labeled *miles* and *feet*. Decide how you will display the number stories from pages 143 and 144. If additional sets of *Prism Pile-Up* cards are needed for Part 3, copy and cut apart *Math Masters,* pages G4 and G5.

Warm-Up: Mental Math: Students convert between units of length.

Focus: Math Message: Students solve a number story about converting miles to feet.

Math Message Follow-Up:

- **SRB page 328. Students complete a table of conversions for miles to feet.** Have students share answers. Ask: *What information did you need to know before you could solve the problem?* Discuss how students found the number of feet in 1 mile, and then ask: *Which is longer, a 1-mile section of path or a 5,280-foot section of path?* Explain that 1 mile and 5,280 feet are the same distance expressed in different measurement units. Explain to students that when they change the unit in which a measurement is expressed, they are converting a measurement to a different unit.
- **MJ page 52. SRB page 328.** Students solve number stories involving conversions of units within the U.S. customary system.
- Remind students that when solving problems, they should start by *making sense* of the problem, or thinking about what the problem asks and what information they need to solve it. Techniques for making sense of a problem might include making a table or drawing a picture in addition to determining what information they need. Read or display the following number story. Have students solve it in partnerships or small groups. Tell them to refer to *Student Reference Book,* page 328 as needed.
- **Differentiate:** Some students may find it easier to record number sentences to model the problems than to record expressions. For the multistep problems, some students may wish to record number sentences for each step. For example: Convert yards to feet: $3 * 3 = 9$. Add the two lengths: $9 + 7 = 16$
- Invite students to share and explain the number models they wrote for the problems on journal page 52.

Games: Playing Prism Pile-Up. SRB page 329. MM page G6. Students practice finding volumes of rectangular prisms and figures composed of rectangular prisms.

Assessment:
Expect most students to be able to use U.S. customary unit conversions to solve Problems 1 and 2 on journal page 52. Some may be able to solve Problems 3 and 4, which do not identify the necessary conversions. Some students may also be able to write expressions to model the problems. For students who struggle to solve the problems, suggest that they make a two-column table relating the units in the problem, similar to the table of mile and feet equivalencies for the Math Message Follow-Up.

Practice:

- MJ page 53 Math Boxes
- Home Link 2-6

Differentiation:

- **Readiness: Counting to Convert Inches to Feet**
- **Extra Practice: Converting Units.** Activity Card 21. SRB page 328. For more practice with unit conversions, students roll dice and draw number cards to generate unit conversion problems. They write expressions recording their calculations and number sentences recording their conversions.
- **Enrichment: Writing Unit Conversion Number Stories**. Activity Card 20. SRB page 328. MJ page 52. To extend their work with unit conversions, students write unit conversion number stories using the problems on journal page 52 as examples. Partners solve each other's number stories.
- **ELL Support:** To familiarize students with U.S. customary measurement units and measuring tools, display everyday measuring tools labeled by name and showing common conversions.

Resources: SRB page 328

Lesson 2.7 U.S. Traditional Multiplication (Part 3)

Students use U.S. traditional multiplication to multiply 2-digit numbers by 2-digit numbers.

Standards: 5.NBT.5, 5.OA.2

Before You Begin: If your students are unfamiliar with partial-products multiplication, you may want to review *Student Reference Book,* page 100 as a class before starting this lesson. Some students may benefit from completing the Readiness activity before reviewing the *Student Reference Book* page.

Warm-Up: Mental Math: Students write numbers in expanded form.

Focus: Math Message: Discuss how to solve multiplication problems.

Math Message Follow-Up:

- Students multiply 2-digit numbers by 2-digit numbers
- Ask partnerships to share their responses to the Math Message. Then display a divided rectangle as shown below. Explain that this is an area model for the problem $54 * 18$, and point out that the model divides the product into two parts.
- **Differentiate:** To help students focus on the digits being used in each step, suggest covering the 2 with a slip of paper while working on Step 1 and the 5 while working on Step 2. It may be helpful for some to cover the 5 with a 0 so that they keep in mind that they are multiplying by 20. Students may also benefit from writing the labels 1s, 10s, and 100s over the appropriate place-value columns.
- Students compare area models for multiplication methods.
- **MJ page 54.** Students estimate to check whether products make sense.
- Have partners discuss why it is important to make estimates when solving multiplication problems.

Games: Introducing Multiplication Bull's Eye. Students practice making estimates and solving multiplication problems

Assessment:
This is the first exposure to U.S. traditional multiplication with two 2-digit factors. Some students may successfully solve the problems on journal page 54, but expect that many will struggle. Plenty of additional practice with U.S. traditional multiplication will be provided throughout the year.

Practice:

- MJ page 55 Math Boxes
- Home Links 2-7

Differentiation:

- **Readiness: Playing Multiplication Wrestling.**
- **Extra Practice: Practicing U.S. Traditional Multiplication.** MM page 58. For additional practice with U.S. traditional multiplication, students use the algorithm to fill in missing numbers in multiplication problems on Math Masters, page 58.
- **Enrichment: Using an Ancient Multiplication Strategy.** MM pages 66-67. To extend their work with multiplication, students use an ancient multiplication strategy and compare it to U.S. traditional multiplication
- **ELL Support:** Display models and corresponding real-life objects. Explain that a model is sometimes used to represent a real object. Extend the idea to an understanding of using area models for multiplication by using base-10 blocks to model the numbers being multiplied. Use the blocks to cover the area of different parts of a rectangle as you multiply numbers.

Lesson 2.8 U.S. Traditional Multiplication (Part 4)

Students use U.S. traditional multiplication to multiply multi-digit numbers.

Standards: 5.NBT.5

Warm-Up: Mental Math: Students solve extended multiplication facts with exponents**.**

Focus: Math Message: Students solve a multiplication number story.

Math Message Follow-Up:

- Students learn to multiply multi-digit numbers using U.S. traditional multiplication
- Have students share their strategies for solving the Math Message problem. Expect that many will have chosen partial-products multiplication. If a student used U.S. traditional multiplication, invite him or her to explain how to use it to multiply a 3-digit number by a 2-digit number. If no one used U.S. traditional multiplication, have partners talk briefly about how it might be used to multiply 365 and 18.
- **MJ page 56.** Students choose strategies for solving multiplication problems and explain their choices
- Explain that U.S. traditional multiplication is an example of an algorithm, or a set of steps that can be used to solve a certain kind of problem. Once students understand the patterns in an algorithm, they can use it to solve problems involving numbers of any size. Explain to students that when they are given a multiplication problem to solve, they will usually be able to choose the strategy they want to use. Two things to think about when choosing a strategy are ***accuracy*** **and** ***efficiency***.
- Have students share the strategies they chose on journal page 56 and their reasons for choosing the ones they did.

Games: Play Name that Number. SRB page 315. MM page G2. Students practice writing expressions for calculations and writing expressions with grouping symbols.

Assessment:
Expect most students to have a sense of the steps involved in the U.S. traditional multiplication algorithm and to make reasonable efforts using it to solve Problem 1 on journal page 56. However, many may still make minor computation errors. Ongoing practice should allow all students to develop fluency with U.S. traditional multiplication by the end of the year.

Practice:

- MJ page 57 Math Boxes
- Home Link 2-8

Differentiation:

- **Readiness: Using U.S. Traditional Multiplication with Large Numbers.**
- **Extra Practice: Playing Multiplication Top-It: Larger Numbers.** SRB page 325.
- **Enrichment: Comparing Multiplication Strategies.** MM page 22. To extend their work with multiplication, students make a poster comparing different multiplication strategies. They discuss why different strategies might be more efficient for different problems.
- **ELL Support:** To scaffold students' understanding of an algorithm as a set of steps used to solve a problem, display an example of illustrated step-by-step instructions, such as directions for putting together a model car or setting up a video game system. Extend by going through the steps of a familiar math algorithm like addition or subtraction with regrouping.

Lesson 2.9 Open Response: One Million Taps (2-day lesson)

Students estimate how much time it would take to tap their desks one million times.

Standards: 5.NBT.2, 5.NBT.5

Before You Begin: Solve the open response problem in as many ways as you can. If possible, schedule time to review students' work and plan for Day 2 of this lesson with your grade-level team.

Day 1:

Warm-Up: Mental Math - Students write numbers in exponential notation.

Focus: Math Message:

- Students estimate the amount of time it takes to address 10 and 100 envelopes based on the amount of time it takes to address 1 envelope
- Work with a partner to complete journal page 58. Estimating based on a piece of information.
- ***Differentiate:*** For students who have trouble getting started, suggest that they draw a picture to represent the amount of time it took to address each envelope. For example, they might draw 10 envelopes and label each 30 seconds for the time it takes to label one.
- Students discuss strategies for solving the Math Message and consider which ones are more efficient
- Have partners discuss how they solved Problem 1 on the journal page and then share strategies with the class. Strategies might include drawing a picture of the 10 envelopes, using repeated addition, or using multiplication
- Extend these strategies to complete *Math Masters,* pages 61 and 62. Read Problems 1–3 as a class and review the directions. Partners should work together to ensure that they understand the problems. For Problem 2, tell students that they can tap their desks at any speed as long as they are able to count each tap. One partner should keep time with a stopwatch or a clock with a second hand while the other taps to 100. Then they switch roles. Remind students that for Problem 3 they do not need to write anything, but they should discuss their thinking with a partner.
- **Differentiate:** If students have trouble developing a plan that is more efficient than Maya's, ask: Do you notice any patterns in the number of zeros? Can you use patterns to solve the problem more efficiently? Remind students of the table discussed in the Math Message Follow-Up.
- Ask: How does your guess for Problem 1 compare to the calculated estimate for Problem 5? Did you calculate the exact time it would take to make 1,000,000 taps? Why or why not?

Day 2:

Revisiting Guidelines for Re Engagement: To promote a cooperative environment, consider revisiting the class guidelines for discussion that you developed in Unit 1. After reviewing the guidelines, have students reflect on how well they are following them. Solicit additional guidelines from the class.

Revisit some of the sentence frames from Unit 1 to model using appropriate language and encourage students to do the same when discussing others' work. Add more frames to the list, such as the following: "I like how _____." Or "I wonder why ___."

Practice:

- Math Boxes page 59
- Home Link 2-9

Differentiation - Enrichment: Challenge students who successfully estimate the time of 1,000,000 taps in seconds to find the time in minutes, hours, or days. Ask: *Why might someone be interested in using a different unit than seconds?* Sample answer: We don't usually report time with this many seconds. Giving the time in minutes or hours would make more sense.

Differentiation – Adjusting the Activity: For students who have trouble getting started, suggest that they draw a picture to represent the amount of time it took to address each envelope.

Differentiation – Adjusting the Activity: If students have trouble developing a plan that is more efficient than Maya's, ask: Do you notice any patterns in the number of zeros? Can you use patterns to solve the problem more efficiently?

Lesson 2.10 A Mental Division Strategy

Students use the relationship between multiplication and division to mentally divide multi-digit numbers.

Standards: 5.NBT.1, 5.NBT.2, 5.NBT.5, 5.NBT.6

Warm-Up: Mental Math - Students convert to standard form from expanded notation.

Focus: Math Message - Students read about extended division facts and use patterns they notice to solve division problems. Read page 106 in your Student Reference Book. Use the patterns you notice to solve the Check Your Understanding problems.

Math Message Follow Up:

- Students describe and use patterns when dividing multiples of 10
- Remind students that in a division problem the number being divided is called the dividend; the number that divides the dividend is called the divisor; and the answer is called the quotient. Encourage students to use this language when sharing the patterns they used to solve the Math Message.
- **Differentiate:** To help students who struggle identifying patterns, ask questions like the following: What basic fact would help solve 32,000 / 4? How is the basic fact related to the extended fact? How can we check that our quotient has digits in the right place-value positions?
- Students generate equivalent names for dividends using multiples of the divisor.
- **MJ page 60.** Remind students that multiples are products of a given number and a counting number (1, 2, 3, and so on). Ask: What are some multiples of 3? What are some multiples of 30? Remind students that multiples can be found for any number, including numbers with two or more digits.
- **Differentiate:** If students are not fluent with basic multiplication facts, they may benefit from using the multiplication chart on the inside front cover of their journals to rename dividends. Point out that multiples of the divisor can be found by tracing the relevant row or column across or down the chart. To rename a dividend, students should locate a multiple of the divisor that is less than the dividend. They should be thinking: *How much more do I need to make the dividend?*

Games: Play Division Dash. SRB page 301. Students practice Solving Division Problems. Have students explain how they used multiples and extended facts while playing *Division Dash*

Assessment:
Expect most students playing *Division Dash* to use lists of multiples and written strategies to find quotients. Some might be able to use a mental strategy. If students struggle determining quotients accurately, suggest writing out multiples of the divisor and using them to rename the dividend before dividing. Consider providing blank Name-Collection Boxes (*Math Masters,* page TA8) as a scaffold.

Practice:

- MJ page 61 (Practicing Unit Conversions)
- MJ page 62 Math Boxes
- Home Links 2-10

Differentiation:

- **Readiness: Playing Division Arrays**
- **Extra Practice: Renaming Dividends to Divide Mentally.** Activity Card 24. MM page TA8. To practice applying extended facts in a mental division strategy, students multiply numbers by powers of 10 to generate dividends and divisors. They break up dividends into multiples of the divisor to help them solve the problems. They explain the patterns they see in the number of zeros in the problems.
- **Enrichment: A New Division Strategy**. Activity Card 23**.** To extend their work with mental division, students think of division problems as missing-factor multiplication problems. They draw cards and roll dice to generate division problems and then apply the missing-factor strategy. They compare it to the renaming strategy taught in the lesson
- **ELL Support:** Use think-alouds and objects to help students understand the terms divide, dividend, divisor, and quotient by connecting them to real-world contexts. Post a division problem chart with the dividend, divisor, and quotient labeled for reference. Include a sketch of 15 crayons with the caption dividend, 3 cups with the caption divisor, and 3 crayons with the caption quotient.

Lesson 2.11 Reviewing Partial-Quotients Division

Students will review and practice strategies for using partial-quotients division to divide whole numbers.

Standards:

5.NBT.5, 5.NBT.6

Warm-Up: Mental Math - Students solve extended division facts.

Focus: Math Message - Solve a division number story.

Math Message Follow-Up:

- Students review partial-quotients division and use it to solve the Math Message problem.
- Ask students to suggest a number model for the Math Message problem. Ask: *What operation would you use to solve this problem?* Division *Why?*
- Invite students to share strategies for carrying out the division. Expect that some will suggest renaming 156 using multiples of 12. Others may reason that $12 * 12 = 144$, which is 12 less than 156. That would mean $12 * 13 = 156$, and $156 / 12 = 13$.
- Tell students that today they will review how to use **partial-quotients division** to solve the Math Message problem.
- Remind students that in this problem 156 is the dividend and 12 is the divisor. Demonstrate how to divide 156 by 12 using partial-quotients division as students follow along on blank paper or computation grids
- **Differentiate:** Remind students to think about which multiplication facts they know when solving partial-quotients problems. Provide a partially completed number sentence, such as _____ * 12 = _____ to support their thinking. Encourage them to work with factors of 2 and 5
- Students create area models to represent solutions to the Math Message problem.
- **MJ page 63.** Students make estimates and solve division problems.
- Have students share the partial quotients they used for each problem.

Assessment:
Expect most students to be able to solve Problems 1 and 2 involving 3-digit dividends on journal page 63. Some may be able to solve Problems 3 and 4, which involve 4-digit dividends and divisors greater than 20. Students will learn strategies for efficiently solving division problems with larger numbers in the next lesson. For students who struggle solving Problems 1 and 2, suggest that they begin by using 100s, 10s, or 1s as their partial quotients. Some students may be able to create an area model in Problem 5. Expect many students to struggle when making quick estimates. With ongoing practice, they will become more fluent in choosing appropriate numbers to make division estimates.

Practice:
- MJ page 64 Math Boxes
- Home Link 2-11

Differentiation:
- **Readiness: Drawing Area Models for Division**
- **Extra Practice: Playing Division Top-It: Larger Numbers.** SRB page 325.
- **Enrichment: Dividing to Convert Units of Length.** Activity Card 25. To apply their division skills, students measure lengths in inches and convert their measurements to feet and yards. Provide copies of *Math Masters,* page TA7 for students who might benefit from using a computation grid
- **ELL Support:** Review the division terms on the chart created in Lesson 2-10. Build background knowledge for understanding the meaning of partial by using jigsaw pieces to demonstrate the meaning of part and partial.

Lesson 2.12 Strategies for Choosing Partial Quotients

Students use lists of multiples to find and choose partial quotients.

Standards: 5.NBT.6

Warm-Up: Fluency - Students write division problems related to multiplication problems.

Focus: Math Message - Students can decide whether 10 or 100 can be used as the first partial quotient in a division problem.

Math Message Follow-Up:

- Students discuss why lists of multiples might be useful when using partial-quotients division.
- Ask volunteers to share their answers. Display the problem 1,847 / 27 and begin dividing, using 10 as the first partial quotient. After subtracting the first time, ask: *Are there still 10 [27s] left?* Yes. *How do you know?* 1,577 is left, and that's more than 270. Repeat this process a few more times, taking out 10 [27s] at a time. Explain to students that they could continue taking out 10 [27s], but that it seems to be taking a long time. Suggest using a different first partial quotient to make the division go faster. Ask: *100 [27s] was too much to take out of 1,847, and 10 [27s] is too little. Could we use 50 [27s]?* Sample answer: I'm not sure because I can't multiply $27 * 50$ in my head. Explain that knowing some **multiples** of the divisor, 27, could help students determine whether 50 or some other number could be used as the first partial quotient.
- **Distribute *Math Masters*, page TA10.** Have students write 27 as the second factor in each of the number sentences in the first box and compute the products. Encourage them to use doubling and halving strategies to find the products mentally.
- **Differentiate:** Throughout the lesson, allow students to use calculators as needed to complete the lists of multiples
- **MJ page 65.** Students use lists of multiples to help them find partial quotients. They represent their solutions with area models.
- Have students discuss with a partner how lists of multiples can be helpful when solving division problems.

Assessment:

Expect most students to be able to solve Problems 1–4 on journal page 65 with the help of a list of multiples, although they may not yet be strategic in choosing the most efficient partial quotients. Some students may be able to interpret the area model in Problem 5. For students who struggle solving the problems, suggest thinking of them in real-world contexts. For example, for Problem 1 they might think: *How many boxes of 28 pencils can I make from 1,647 pencils?*

Games: SRB page 318. MM page G11. Introducing Power-Up. Students practice interpreting exponential notation and multiplying by powers of 10.

Practice:

- MJ page 66 Math Boxes
- Home Link 2-12

Differentiation:

- **Readiness: Playing *Buzz***
- **Extra Practice: Dividing with Lists of Multiples**. Activity Card 26. MM page 68. For additional practice using lists of multiples with partial-quotients division, students generate division problems with 4-digit dividends and 2-digit divisors. They make estimates; list multiples on Math Masters, page 68; and solve the problems using partial-quotients division. They discuss which partial quotients make dividing easier. Students draw area models as an extensio**n**
- **Enrichment: Exploring Life Spans.** MM page 67. To practice division in context, students convert ages of the world's oldest people from days to years. They also convert days to weeks and months.
- **ELL Support:** To prepare students for the word multiple as used in the lesson, skip count on a number grid, highlighting the multiples of a given number.

Lesson 2.13 Interpreting the Remainder

Students solve division number stories and practice interpreting remainders.

Standards: 5.NBT.6

Warm-Up: Mental Math: Students practice extended division facts.

Focus: Math Message: Students solve a division number story.

Math Message Follow-Up:

- **SRB pages 12-14, 30.** Students read about mathematical models and use them to reason through the Math Message problem.
- Have volunteers share how they solved the Math Message problem, and list the strategies used. Strategies might include drawing a picture or using partial-quotients division. Emphasize the idea that there are many valid ways to approach the problem.
- Point out that this Math Message problem required students not only to find a numerical answer but also to interpret the answer in the context of the problem. Tell students that in today's lesson they will use mathematical models to help them make sense of real-world problems.
- Have partners read *Student Reference Book,* page 12–14. When they have finished, ask them to list mathematical models they use to solve problems.
- **MJ pages 68-69.** Students solve division number stories and practice interpreting remainders.
- Provide problems in which students must interpret remainders like the ones suggested on the next page. Have students create a model for each number story and solve.
- Have students explain to a partner how they decided what to do with each remainder.

Games: Playing High Number Toss. SRB page 312. MM page G10. Students practice reading, writing, and comparing numbers in standard and exponential notations.

Assessment:
Expect most students to create models to help them solve Problems 1–3 on journal pages 68 and 69. Students should be able to distinguish situations in which it makes sense to ignore the remainder or round the quotient up.

Practice:

- MJ page 67 Math Boxes
- Home Link 2-13

Differentiation:

- **Readiness: Thinking About Remainders in Context**
- **Extra Practice: Interpreting Remainders in Division Number Stories.** MM page 71. To practice interpreting remainders in different contexts, students model and solve division number stories. They write explanations for why they rounded up the quotient or ignored the remainder.
- **Enrichment: Writing Division Number Stories.** Activity Card 27. MM page TA11. To extend their work interpreting remainders, students write their own number stories to match division problems. They roll a die to generate a 3-digit dividend and a 2-digit divisor. After finding the quotient and remainder, they write two different stories that match the division problem, one for which the remainder can be ignored and one for which the quotient should be rounded up
- **ELL Support:** Scaffold student understanding of the word remainder, meaning left over, by using think-alouds with a set of objects that cannot be evenly shared. Once sharing is complete, point to the remaining objects and say, “These are left over. We can’t share evenly. They are the remainder.”

Lesson 2.14 Assessment: Unit 2 Progress Check

Administer Unit Assessment.

Day 1:

- **Unit 2 Assessment:** Students complete the Unit 2 Assessment to demonstrate their progress on the New Jersey Student Learning Standards covered in this unit.

  Differentiation: Because this is the beginning of the school year, all of the content included on the Unit 2 Assessment was recently introduced and will be revisited in subsequent units. Differentiation materials are available online to help address students' needs.

- **Unit 2 Challenge** (Optional): Students may demonstrate progress beyond expectations after they complete the Unit 2 Assessment.

Day 2:

- **Cumulative Assessment:** These items reflect mastery expectations to this point.

  Differentiate: Adjusting the Activity
  View suggesting on TE page 204 for specific items to scaffold and how to do it.

Looking Ahead:

- **Math Boxes** 2.14: Preview for Unit 3
- **Home Link** 2.14: Students take home the Family Letter that introduces Unit 3.

Unit Plan Title	Fractions Concepts, Addition, and Subtraction
Suggested Time Frame	20 days including flex days

Overview / Rationale

In this unit, students build on fraction concepts from previous grades to understand fractions as division. They also use visual models to make estimates, add and subtract fractions and mixed numbers, and check the reasonableness of their answers. Finally, students explore strategies for solving fraction-of problems.

Stage 1: Desired Results

New Jersey Student Learning Standards for Mathematics

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.

5.NF.3 Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

5.NF.4.a Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$.

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

GMP.5.1 Choose appropriate tools.

GMP.5.2 Use tools effectively and make sense of your results.

GMP.8.1 Create and justify rules, shortcuts, and generalizations.

Technology Integration
__X__ **8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
- Student Websites - Teacher Websites - SMART board
____**8.2 Technology Integration, Engineering, Design and Computational Thinking – Programming** All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES
The following social and emotional competencies are integrated in this curriculum document:

Self-Awareness
_____Recognize one's own feelings and thoughts
_____Recognize the impact of one's feelings and thoughts on one's own behavior
_____Recognize one's personal traits, strengths and limitations
_____Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management
__x__Understand and practice strategies for managing one's own emotions, thoughts and behaviors
__x__Recognize the skills needed to establish and achieve personal and educational goals
__x__Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness
__x__Recognize and identify the thoughts, feelings, and perspectives of others
_____Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
_____Demonstrate an understanding of the need for mutual respect when viewpoints differ
_____Demonstrate an awareness of the expectations for social interactions in a variety of setting

Responsible Decision Making
__x__Develop, implement and model effective problem solving and critical thinking skills
_____Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills
_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
_____Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

In this unit plan, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – 21st Century Themes			**Indicate whether these skills are:** ● **E – encouraged** ● **T – taught** ● **A – assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**			CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
X	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing			CRP5. Consider the environmental, social and economic impacts of decisions.
X	Becoming a Critical Consumer			CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
	Career Exploration			CRP11. Use technology to enhance productivity.
	Career Preparation			CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

NJ Student Learning Standards for English Language Arts

RI.4.3 - Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.4 - Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

RI.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.4.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Essential Questions:	**Enduring Understandings:**
● How do I explain the meaning of a fraction using its numerator and denominator, and my understanding of it to represent and compare fractions? ● What does the remainder mean?	***Students will understand that…*** ● We can create and justify rules, shortcuts, and generalizations to solve problems. ● We can use tools and visual models to solve number stories involving addition and subtraction of fractions and mixed numbers with like denominators. ● We can identify benchmarks close to fractions less than or equal to 2 and use them to make reasonable estimates for fraction sums and differences.
Knowledge:	**Skills:**
Students will know… ● How to argue and support an answer ● Using benchmark numbers to estimate sums and differences of fractions ● Renaming numbers ● Adding and subtracting fractions and mixed numbers ● Problem solving strategies ● "Fraction-of" problems	***Students will be able to…*** ● Use tools and visual models to generate equivalent fractions and to add fractions with unlike denominators when only one fraction needs to be replaced with an equivalent fraction. ● Use tools and visual models to solve number stories involving addition and subtraction of fractions and mixed numbers with like denominators; identify benchmarks close to fractions less than or equal to 2 and use them to make reasonable estimates for fraction sums and differences. ● Recognize that a fraction ab is the result of dividing *a* by *b*; use tools and visual models to solve whole-number division problems that have fraction or mixed-number answers; use tools and visual models to rename mixed numbers and fractions greater than one. ● Solve fraction-of problems to build a conceptual foundation for multiplication of fractions by whole numbers. ● Find a unit fraction of a whole number by partitioning the whole number into the appropriate number of parts and taking one of the parts.

	• Use tools and visual models to solve real-world fraction-of problems with unit fractions and whole numbers. • Choose appropriate tools • Use tools effectively to make sense of your results • Create and justify rules, shortcuts, and generalizations.

Student Resources	
Add/Subtract Fractions	http://www.f unbrain.com/fractop/index.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Equivalent Fractions	http://www.funbrain.com/fract/index.html
Subtracting Fractions	http://www.harcourtschool.com/activity/elab2004/gr5/13.html
Unlike Fractions	http://www.harcourtschool.com/activity/elab2004/gr5/11.html
	www.abcya.com www.sheppardsoftware.com www.coolmath.com

Teacher Resources	
Games/Lessons ALL Topics	http://littletonpublicschools.net/Default.aspx?tabid=539
Games/Demos ALL Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Demo Lessons/Activity Sheets	http://www.learnalberta.ca/content/me5l/html/math5.html
Add/Subtract Fractions	http://www.funbrain.com/fractop/index.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Equivalent Fractions	http://www.funbrain.com/fract/index.html
Quizzes/Practice	http://littletonpublicschools.net/Default.aspx?tabid=539

Subtracting Fractions	http://www.harcourtschool.com/activity/elab2004/gr5/13.html
Khan Academy	www.khanacademy.com
Mentor Texts	Fraction Fun Fractions, Decimals and Percent Fractions in Disguise: A Math Adventure

Stage 2: Assessment Evidence	
Other Evidence: *Formative Assessments* ● Math Message ● Oral Mental Math Fluency ● Math Journal ● Slates ● Lesson Assessment Check-In ● Collins Writing ● Exit Slips ● Home Link ● Teacher Observation ● Games/Activity Cards	**Other Evidence:** *Pre-Assessments & Summative Assessments* ● Benchmark Assessment ● Quizzes ● Unit Progress Check ● Open Response Assessments ● Student Work Products

Stage 3: Learning Experiences

Lesson 3-1 Equal Sharing and Equivalence

Standards: 4.NF.1, 4.NF.2, 4.MD.2

Warm Up /Mental Math and Fluency: Read number names for large numbers

Focus:

- **Math Message:** Solve an equal-sharing problem
- **Exploring Equivalent Fractions through Equal Sharing:** Model equal-sharing situations and examine equivalent names for those models
- **Solving Equal-Sharing Problems**: Solve number stories in a variety of ways resulting in equivalent fraction situations

Practice:

- **Math Boxes** 3-1: MJ1 pg. 70
- **Home Link** 3-1: Solve equal-sharing number stories and generate equivalent-fraction answers

Assessment: MJ1 pgs. 68-69; Expect most students to recognize that on journal pages 68–69 they must subdivide shared quantities into equal fractional pieces in at least one way. Some may not be able to identify the fractional pieces into which leftovers must be subdivided in more than one way.

Differentiation Options:

- **Readiness:** Literature Link To provide exposure to basic fractions, read pages 3–9 of Give Me Half! by Stuart Murphy to a small group of students.
- **Enrichment:** To apply their understanding of equivalent fractions, students solve a proportional reasoning problem and show their work
- **Extra Practice**: For additional practice with equivalent fractions, students use drawings to solve each problem on MM pg. 98 in more than one way.
- **ELL Support:** Scaffold using the terms one-half, two-halves, one-third, three-thirds, etc., up to twelve-twelfths. Gather pictures of familiar examples of each term and caption them accordingly, such as one-half of an apple or four-fourths of a divided windowpane. Distribute pictures and use Total Physical Response prompts along with simple questions. Encourage students to repeat short sentences.

Lesson 3-2 Fraction Circles and Equivalence

Standards: 4.OA.4, 4.OA.5, 4.NF.1

Warm Up /Mental Math and Fluency: Practice rounding

Focus:

- **Math Message:** Use fractions circle pieces to model fractions equivalent to 1
- **Exploring Equivalent Fractions:** Share different want to model fractions equivalent to 12
- **Starting a Collection of Fraction Names**: Model and record names for fractions equivalent to 13
- **Continuing a Collection of Fraction Names**: Model and record names for equivalent fractions and look for number patterns in equivalent fraction pairs

Practice:

- **Math Boxes** 3-2: MJ1 pg. 72
- **Home Link** 3-2: Represent fractions equivalent to ¼ and describe patterns

Assessment: Expect most students to be able to use fraction circle pieces to find all equivalencies for ¼ from eighths through twelfths.

Differentiation Options:

- **Readiness:** To explore relationships among fraction circles prior to developing formal language for describing them, students complete MM pg. 103.
- **Enrichment:** To further explore equivalent fractions, students use a clock face to model equivalent fractions with denominators that are factors of 60.
- **Extra Practice:** Students play *Fraction Match* to practice identifying equivalent fractions.
- **ELL Support:** Use word cards, drawings, number models, and fraction circles to preview fraction-related vocabulary, including *top, bottom, denominator, numerator,* and *unit.* Use directions or questions like these: *Show me the top number in the fraction. Point to the denominator in this fraction. Make one-half using the fraction circles. How many dark green pieces fill the whole red circle?* Use gestures to emphasize connections between the different representations.

Lesson 3-3 Number Lines and Equivalence

Standards: 4.NF.1, 4.NF.2

Warm Up /Mental Math and Fluency: Read number names for large numbers

Focus:

- **Math Message:** Label number lines with fractions and mixed numbers
- **Using Number Lines:**
  - Use number lines to explore the relationship between fifths and tenths
  - Folding Number Lines for Thirds, Sixths, and Twelfths: Use number lines to explore the relationship between thirds, sixths, and twelfths
  - Solving Equivalence Problems with Number Lines: Use number lines to determine whether various fractions are equivalent

Practice:

- **Game - Buzz and Bizz-Buzz:** Practice naming multiples
- **Math Boxes** 3-3: MJ1 pg. 76
- **Home Link** 3-3: Students use number lines to work with equivalent fractions

Assessment: Circulate as students find pairs of equivalent fractions. Expect most students to be able to use number lines to accurately identify equivalent fractions for fifths.

Differentiation Options:

- **Readiness:** For experience recognizing the names of equivalent fractions, students find equivalent fractions by matching fractional parts of circles.
- **Enrichment:** To further explore fraction equivalency, students create equal parts by folding paper. They write fractions and equivalent fractions based on the number of parts.
- **Extra Practice:** To reinforce their understanding of equivalent fractions, students determine equivalence by comparing number lines.
- **Activity Cards:** 28
- **ELL Support:** Introduce students to the terms *fold, dash, dashed,* and *cut*. Give students a piece of paper with a dashed line, making sure the dashes are big enough to be clearly distinguished. Point to one dash and say: *This is a dash*. Ask students to point to dashes on the line. Then trace your finger along the length of the line, saying: *This is a dashed line*. Have students repeat the gesture. Use a think-aloud as you demonstrate folding the paper along the dashed line and cutting it. Ask students to fold their paper and then cut it.

Lesson 3-4 An Equivalent Fractions Rule

Standards: 4.OA.4, 4.OA.5, 4.NF.1

Warm Up /Mental Math and Fluency: List multiples of given numbers

Focus:

- **Math Message:** Color fraction circles and find missing numerators
- **Developing a Rule for Finding Equivalent Fractions:** Look for number patterns in and learn a rule for generating equivalent fractions
- **Applying the Equivalent Fractions Rule:** Generate equivalent fractions with the denominators of 10 and 100
- **Generating Equivalent Fractions:** Apply and analyze the Equivalent Fractions Rule to generate equivalent fractions

Practice:

- **Solve Multistep Number Stories:** Use the four operations to solve number stories
- **Math Boxes** 3-4: MJ1 pg. 80
- **Home Link** 3-4: Apply the Equivalent Fractions Rule

Assessment: MJ1 pg. 78; As students complete their work, circulate and observe. Since this is their first exposure to the Equivalent Fractions Rule, do not expect that students will use the rule accurately.

Differentiation Options:

- **Readiness:** To explore fractional parts of a whole, students divide circles into equal parts and color specified parts of the whole. Discuss how equivalent fractions can be used to solve the problems.
- **Enrichment:** To further explore strategies for finding equivalent fractions, students complete a matching activity.
- **Extra Practice:** To practice generating equivalent names for fractions, students complete name collection boxes. Encourage students to complete the boxes with equivalent fractions and mixed numbers with denominators 2, 3, 4, 6, 8, 10, 12, and 100. Create problems to meet the needs of individual students, or have them create and solve their own problems using the Equivalent Fractions Rule.
- **ELL Support:** Continue emphasizing the term *equivalent* by showing students 10 longs and 1 flat.

Lesson 3-5 (2-day lesson) Veggie Pizzas

Standards: 4.NF.2

Warm Up /Mental Math and Fluency: Compare numbers using <, >, or =

Focus:

- **Math Message:** Use benchmarks to match visual representations of fractions with fraction symbols
- **Matching Fraction Representations with Symbols:** Discuss how they used benchmarks and mathematical reasoning to match visual representations of fractions with symbolic representations
- **Solving the Open Response Problem:** Use mathematical models (for example, drawings and fraction circle pieces) to determine and compare the amount of pizza each student in four different groups receives on a field trip
- **Setting Expectations:** Discuss what constitutes a complete answer to the open response problem and what it means to use mathematical models to solve problems and explain their solutions
- **Reengaging in the Problem:** Analyze others' work and discuss different strategies and justifications
- **Revising Work:** Revise their answers and models based on the class discussion

Practice:

- **Math Boxes** 3-5: MJ1 pg. 82
- **Home Link** 3-5: Make sense of another student's drawing used to solve a fraction problem

Assessment: Open Response; Collect and review student's revised work. Except students to improve their drawings and explanations based on the class discussion. For the content standard, except most students to correctly decide that ⅞ pizza (the share of students in the wild Meadow group) is the largest share of pizza problem 1.

Differentiation Options:

- **Adjusting the Activity:** For students who have difficulty, ask them to determine the amount of pizza each student would get in two of the groups—the Forest Preserve group and the Farmer's Cornfield group. If they succeed with those two groups, have them go back to the full problem, involving all four groups.
- **ELL Support:** English language learners may have difficulty explaining their matches in the Math Message. Encourage them to use models to help illustrate their reasoning to a partner and to use gestures, such as pointing, as part of their explanations. Prior to the lesson, use role-play activities to introduce students to the context of the open response problem, including the ideas and vocabulary for field trips, dividing pizzas, and the different locations listed. Combine Total Physical Response commands with manipulatives

Lesson 3-6 Comparing Fractions

Standards: 4.NF.1, 4.NF.2

Warm Up /Mental Math and Fluency: Find multiples of numbers

Focus:

- **Math Message:** Compare two fractions
- **Exploring Fraction Comparisons**: Review multiple ways to compare fractions
- **Comparing Fractions in Number Stories:** Learn strategies to solve number stories that involve comparing fractions
- **Solving Comparison Number Stories:** Solve number stories that involve comparing fractions

Practice:

- **Practicing Place-Value Concepts**: Practice place-value concepts by reviewing the values of digits in numbers and their relationships
- **Math Boxes** 3-6: MJ1 pg. 85
- **Home Link** 3-6: Students compare fractions to solve number stories

Assessment: MJ1 pg. 83; Expect most students to correctly use a visual model to compare fractions, but encourage students to use alternative strategies modeled in the lesson.

Differentiation Options:

- **Readiness:** To explore comparing fractions with the same numerator or denominator, students use < and > symbols to identify fraction relationships. Then they solve a number story about different-size slices of birthday cake and compare the fractional sizes of the slices.
- **Enrichment:** To explore fraction-comparison number stories, students write their own problems. They exchange problems with partners, solve using more than one strategy, and then discuss and justify their solutions.
- **Extra Practice:** For experience solving and explaining solutions to fraction-comparison number stories, partners solve problems on MM pg. 119. Encourage students to use fraction circles and number lines to help them visualize the fractions.
- **Activity Cards:** 29
- **ELL Support:** Pre-teach the vocabulary of comparing quantities. Show students the number 5 displayed in a ten frame and the number 7 in a second ten frame. Say: *I am going to compare these two numbers. 5 is less than, or smaller than, 7.* Use gestures to show that 5 is smaller. Put a < symbol between the two ten frames. Do this for several pairs of numbers and have students create their own comparisons. Also include some simple fractions, such as *halves, fourths,* and *thirds.* Emphasize key vocabulary used regularly in the lesson: *greater/smaller than; more/less than.*

Lesson 3-7 Comparing and Ordering Fractions

Standards: 4.NF.2

Warm Up /Mental Math and Fluency: Compare multidigit numbers using < or > symbols

Focus:

- **Math Message:** Compare two fractions
- **Reviewing Fraction Comparison**: Share strategies for solving a fraction-comparison problem
- **Ordering Fractions:** Use various strategies to order fractions
- **Justifying the Order of Fractions**: Place fractions on number lines

Practice:

- **Games - Spin-and-Round**: Practice rounding numbers through the hundred-thousands
- **Math Boxes** 3-7: MJ1 pg. 88, fraction circles
- **Home Link** 3-7: Order fractions and place them on number lines

Assessment: MJ1 pg. 87; Observe students using a model to compare each fraction to the benchmark fraction ½. Expect most students to be able to correctly place the fractions in relationship to ½. For students who struggle, have them determine the fraction that is equivalent to ½ and has the same denominator as the fraction they are trying to place on their number line. This will allow them to focus on the numerators. Do not expect students to correctly order all the fractions in problems 3-5.

Differentiation Options:

- **Readiness:** To explore comparing fractions, students sort fractions represented both as area and as number-line models into groups according to their relative sizes.
- **Enrichment:** To create fractions compared to a given benchmark, students build specific fractions using only two digits. Have partners discuss how they interpreted the instructions and chose the digits to form each fraction.
- **Extra Practice:** To practice comparing and ordering fractions, students play *Fraction Top-It* with fraction cards cut from Activity Sheets in the back of MJ1. Have students describe why their fraction is the largest.
- Activity Cards: 30
- **ELL Support:** To help students understand comparison terms used in this lesson, provide vocabulary cards picturing a small object and a large object to illustrate the terms *smaller* and *larger*. Ask students to point to the smaller one.

Lesson 3-8 Modeling Tenths with Fraction Circles

Standards: 4.NF.1, 4.NF.3, 4.NF.3b, 4.NF.6, 4.NF.7, 4.MD.2

Warm Up /Mental Math and Fluency: : Express number written in expanded form to standard form

Focus:

- **Math Message**: Solve number story involving fractions
- **Exploring Tenths with Fraction Circles**: Experiments with fraction circles
- **Comparing Tenths:** Compare decimals
- **Using Decimal Notation for Tenths and Comparing Tenths**: Compare decimals and fractions in tenths

Practice:

- **Game - Rugs and Fences:** Find perimeters and areas of rectangles
- **Math Boxes** 3-8: MJ1 pg. 90
- **Home Link** 3-8: Translate between decimal and fraction notation for tenths

Assessment: MJ1 pg. 89; Expect that students should able to use a model to change from fractions with 10 in the denominator to decimals for Problems 1 and 2.

Differentiation Options:

- **Readiness:** To explore multiple ways fractions can be represented and to build a foundation for decimal work, students use paper, fraction circles, and number lines to represent a fraction.
- **Enrichment:** To explore hundredths using a concrete model, students construct a Fraction/ Decimal Wheel with 2 different-color circles.
- **Extra Practice:** To recognize the use of decimals in everyday life, students search for decimal notations in magazines, newspapers, and other print sources.
- **Activity Cards:** 31-32
- **ELL Support:** Preview concepts and vocabulary from the lesson by working with fraction circles, using Total Physical Response commands.

Lesson 3-9 Modeling Decimals with Base-10 Blocks

Standards: 4.NF.6

Warm Up /Mental Math and Fluency: Round numbers

Focus:

- **Math Message:** Write dollar and cents amounts
- **Exploring Tenths with Base-10 Blocks:** Discuss fractional parts of a dollar and explore tenths using base-10 blocks and a square grid
- **Exploring Hundredths Using Base-10 Blocks:** Represent hundredths with base-10 blocks
- **Using Decimal Notation for Fractions:** Write fractions and decimals for shaded parts of square grids, and shade grids to represent decimals

Practice:

- **Game - Fraction Match:** Practice identifying equivalent fractions
- **Math Boxes** 3-9: MJ1 pg. 92
- **Home Link** 3-9: Students represent decimals and fractions

Assessment: MJ1 pg. 91 Expect that most students will accurately represent decimals to the tenths in Problem 4. Many will be able to represent decimals to the hundredths in other problems.

Differentiation Options:

- **Readiness**: To explore decimals to the hundredths place using a concrete model, students make bill and coin combinations for given amounts.
- **Enrichment:** To explore the concept of the whole using a concrete model, students find wholes based on different tenths and hundredths. They identify the value of base-10 blocks when different combinations are designated as the whole and determine the whole given a fractional part.
- **Extra Practice:** To explore hundredths of a dollar, students turn coin amounts into pennies, shade in a hundredths grid and write both the fraction and decimal notations.
- **ELL Support**: Continue providing experience with the term *one-tenth* and add the term *one-hundredth.* Review the pictures used in Lesson 3-1 and combine with pictures of familiar examples of one-hundredth, captioned accordingly. Examples might include a penny, a cube, and a number grid. Distribute the pictures and use Total Physical Response prompts along with commands and questions that do not require extended answers.

Lesson 3-10 Tenths and Hundredths

Standards: 4.NF.5, 4.NF.6, 4.NF.7

Warm Up /Mental Math and Fluency: Compare numbers using < or >

Focus:

- **Math Message:** Name decimals using numerals
- **Representing Decimals:** Use base-10 blocks to show decimal representations
- **Exploring Place Value for Tenths and Hundredths**: Name and record decimals and fractions using words and numerals
- **Solving Place-Value Problems:** Shade grids and name decimal amounts using words and numerals

Practice:

- **Games - Polygon Capture:** Identify polygons by their properties
- **Math Boxes** 3-10: Preview for Unit 4 - MJ1 pg. 94
- **Home Link** 3-10: Write decimals for partially shaded 10 by 10 grids, write numerals for decimals expressed in words, and complete sequences of decimals

Assessment: MJ1 pg. 93; Observe students completing journal page. Expect that most will be able to represent the amount covered on the grids as a fraction and as a decimal.

Differentiation Options:

- **Readiness:** To explore the relationships among hundredths, tenths, and ones using a concrete model, students play *Base-10 Decimal Exchange.*
- **Enrichment:** To explore place value to the thousandths, students solve place-value puzzles using mathematical clues.
- **Extra Practice:** To practice using a tool to demonstrate decimal place value, students create a Decimal Place-Value Flip Book to complete the activities on Activity Card 34.
- **Activity Cards:** 33-34
- **ELL Support**: Prior to the lesson, prepare a set of index cards showing the name together with the corresponding numeral for each of the following: 4, 14, 40, 100, 0.01, 400, and 0.04. Show the cards one by one, pointing to the numeral or using other gestures as you say the number to highlight the connection between the spoken and written words. Then say the name and ask students to point to the correct numeral. Repeat as needed with other numbers, such as 3, 13, 30, 300, and 0.03.

Lesson 3-11 Tenths and Hundredths of a Meter

Standards: 4.NF.6, 4.NF.7, 4.MD.1

Warm Up /Mental Math and Fluency: Identify factor pairs

Focus:

- **Math Message:** Estimate the length of a meter
- **Exploring Decimals in the Metric Units:** Use a meterstick to explore decimals
- **Using Decimals for Measurement Equivalents:** Change measure in centimeters to meters
- **Writing Metric Measurements in Decimal Notation**: Write measurements using decimal notation and make connections between various representations

Practice:

- **Game - Fraction Top-It:** Practice comparing fractions
- **Math Boxes** 3-11: MJ1 pg. 97
- **Home Link** 3-11: Fill in missing decimal numbers on number lines and mark metric measures on a ruler

Assessment: MJ1 pg. 95; Observe students completing journal page 95. Expect most to be able to correctly represent decimals to the hundredths using longs and cubes.

Differentiation Options:

- **Readiness:** To review measuring length in metric units, students choose objects or distances in the classroom that they think are approximately 1 meter in length. They then estimate the length in centimeters and use a meterstick to measure it.
- **Enrichment:** To explore metric equivalencies of length involving decimals, students convert measures into larger and smaller units.
- **Extra Practice:** To practice measuring in centimeters and converting to meters, students complete MM pg. 134.
- **Activity Cards:** 35-36
- **ELL Support:** Prior to the lesson, review the measurement vocabulary used in this lesson. Display either a real or projected meterstick, using gestures to highlight how it is made up of 100 centimeters. Ask questions like these: *Where is _____cm on the meterstick? Show me _____cm. If time permits, students can pose similar questions to each other or to the class.*

Lesson 3-12 Tenths of a Centimeter

Standards: 4.OA.2, 4.NF.6, 4.NF.7, 4.MD.1, 4.MD.2

Warm Up /Mental Math and Fluency: Round whole numbers to various places

Focus:

- **Math Message:** Measure to the nearest centimeter and millimeter
- **Introducing Millimeters:** Students are introduced to millimeters
- **Reading decimals:** Practice reading decimals
- **Converting centimeters and millimeters:** Convert rainfall measurements from centimeters to millimeters and plot and compare data

Practice:

- **Reviewing Quadrilaterals and Right Triangles:** Identifying properties in polygons
- **Math Boxes** 3-12: MJ1 pg. 101, fraction circles
- **Home Link** 3-12: Measure objects in centimeters and millimeters and complete conversion tables

Assessment: MJ1 pg. 99; Expect that most students will accurately plot the cities on the scale in Problem 1.

Differentiation Options:

- **Readiness:** To compare millimeters and centimeters, students label a centimeter number line and record millimeter equivalencies on MM pg. 137.
- **Enrichment:** To explore metric unit language, students research how prefixes are used to identify length measured in meters.
- **Extra Practice:** To explore the relationship between centimeters and millimeters, students measure line segments and record the lengths in both centimeters and millimeters.
- **Activity Cards:** 37
- **ELL Support:** Preview the map on *SRB* pg. 284 and point to the locations of the cities cited in the lesson as you say their names: *Salt Lake City, Jacksonville, Birmingham, Topeka, San Diego, Mobile, Indianapolis,* and *Los Alamos.* Point to Chicago and say: *Is this Topeka? Show me Mobile.* Repeat as needed. Then show students a word card with a picture of rain and the words *rainfall* and *precipitation* below it. Point to the picture and then to the raindrops on the map. Have students pronounce some of the decimals, such as *nine and nine-tenths centimeters* or *zero and four-tenths centimeters.* Give them a copy of the word card for reference as they work through the journal pages

Lesson 3-13 Comparing Decimals

Standards: 4.NF.6, 4.NF.7, 4.MD.2

Warm Up /Mental Math and Fluency: Round numbers to various places

Focus:

- **Math Message:** Write a number sentence using <, > or =
- **Solving Decimal-Comparison Number Stories**: Explore decimal-comparison number stories
- **Comparing Decimals**: Solve number stories and other problems by comparing decimals

Practice:

- **Game - Fraction Match**: Practice identifying equivalent fractions
- **Math Boxes** 3-13: MJ1 pg. 103
- **Home Link** 3-13: Compare decimals, write the values of the digits in decimals, and continue decimal number patterns

Assessment: MJ1 pg. 102; Expect that most students will accurately compare decimals using a model in Problems 1 and 2.

Differentiation Options:

- **Readiness:** To compare decimals in a money context, students play *Coin Top-It* according to directions on Activity Card 38. Ask students to record their decimal comparisons and write < or > as appropriate on the *Top-It* Record Sheet.
- **Enrichment:** To explore comparing and ordering decimals, students record decimals between whole numbers and plot them on number lines. In partnerships, they discuss how they knew where to locate the decimals.
- **Extra Practice:** To practice comparing decimals to the hundredths place, students play *Decimal Top-It* on a decimal mat with number cards.
- **Activity Cards**: 38-39
- **ELL Support:** Prior to the lesson, review the symbols <, >, and =. Show the two numbers 1.4 and 2.6 with a < sign inserted between them. Use gestures to model the relationship, saying: *One and four-tenths is less than two and six-tenths.* Repeat with other pairs of numbers to give students experience with the terms *less than, greater than,* and *equal to.* Allow students to work in pairs to practice creating and solving their own problems.

Lesson 3-14 (2-day lesson) Unit3 Progress Check

Warm Up / Self-Assessment: Complete Self-Assessment

Assessment:

- **Unit 3 Assessment:** These items reflect mastery to expectations to this point
- **Unit 3 Challenge** (Optional): Students may demonstrate progress beyond expectations
- **Solving the Open Response**: After a brief introduction students make sense of two strategies for comparing fractions and then use drawing to explain each strategy
- **Discussing the Problem:** After completing the problem, students share their drawing and explanations

Looking Ahead:

- **Math Boxes** 3-14: Preview for Unit 4- MJ1 pg.104
- **Home Link** 3-14: Students take home the Family Letter that introduces Unit 4.

Differentiation Options: Adjusting the Assessment: See TE for adjustments to the assessment

Unit Plan Title	Decimal Concepts; Coordinate Grids
Suggested Time Frame	20 days including flex days

Stage 1: Desired Results

Overview / Rationale

In this unit, students extend their understanding of the base-10 place-value system to include decimals. They read, write, and represent decimals through thousandths in a variety of ways and learn strategies to compare, order, and round decimals. Students are also introduced to the first quadrant of the coordinate grid. Finally, they apply whole-number algorithms to add and subtract decimals.

New Jersey Student Learning Standards for Mathematics

5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

5.NBT.3a Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.

5.NBT.3b Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

5.NBT.4 Use place value understanding to round decimals to any place.

5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).

5.G.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

GMP2.1 Create mathematical representations using numbers, words, pictures, symbols, gestures, tables, graphs, and concrete objects.

GMP2.2 Make sense of the representations you and others use.

GMP2.3 Make connections between representations.

GMP7.1 Look for mathematical structures such as categories, patterns, and properties.

GMP7.2 Use structures to solve problems and answer questions.

Technology Integration
__X__ **8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
- Student Websites - Teacher Websites - SMART board
____ **8.2 Technology Integration, Engineering, Design and Computational Thinking – Programming** All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES
The following social and emotional competencies are integrated in this curriculum document:

Self-Awareness
_____Recognize one's own feelings and thoughts
_____Recognize the impact of one's feelings and thoughts on one's own behavior
_____Recognize one's personal traits, strengths and limitations
_____Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management
__x__Understand and practice strategies for managing one's own emotions, thoughts and behaviors
__x__Recognize the skills needed to establish and achieve personal and educational goals
__x__Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness
__x__Recognize and identify the thoughts, feelings, and perspectives of others
_____Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
_____Demonstrate an understanding of the need for mutual respect when viewpoints differ
_____Demonstrate an awareness of the expectations for social interactions in a variety of setting

Responsible Decision Making
__x__Develop, implement and model effective problem solving and critical thinking skills
_____Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills
_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
_____Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

In this unit plan, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – 21st Century Themes			**Indicate whether these skills are:** ● **E – encouraged** ● **T – taught** ● **A – assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**			CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
X	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing			CRP5. Consider the environmental, social and economic impacts of decisions.
X	Becoming a Critical Consumer			CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
	Career Exploration			CRP11. Use technology to enhance productivity.
	Career Preparation			CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

NJ Student Learning Standards for English Language Arts

RI.4.3 - Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.4 - Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

RI.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.4.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Essential Questions:	**Enduring Understandings:**
● How can you represent whole numbers and fractions? ● What does a decimal represent? ● What strategies can you use to compare, order, and round decimals?	***Students will understand that…*** ● A digit placed to the right of a number is 10 times the number to the left. ● A digit placed to the left of a number is one tenth the number to the right.
Knowledge:	**Skills:**
Students will know… ● Tenths, hundredths, thousandths, decimal point, decimal ● Representation, represent, thousandths grid ● Expanded form, digit, standard notation ● Compare, order ● Rounding, round down, round up ● Perpendicular, coordinate grid, intersect, origin, axes, x-axis, y-axis, coordinates, plot, x-coordinate, y-coordinate, ordered pair ● Ordered pair, coordinates ● Conjecture ● Extrapolate, interpolate ● Addend ● Partial-sums addition, algorithm, column addition, U.S. traditional addition, accuracy, efficiency ● Algorithm, trade-first subtraction, counting-up subtraction, U.S. traditional subtraction ● Balance	***Students will be able to…*** ● Recognize that in multi-digit whole numbers, a digit in one place represents 10 times what it represents in the place to its right and 110 of what it represents in the place to its left; recognize that place-value patterns with whole numbers extend to decimals. ● Use grids or place-value charts to compare and order decimals through thousandths when the decimals have the same number of digits after the decimal point; record comparisons using >, =, and < symbols. ● Use grids, number lines, or a rounding shortcut to round decimals to the nearest tenth or hundredth in cases when rounding only affects one digit. ● Use grids to add and subtract decimals; use algorithms to add and subtract decimals through tenths with regrouping and through hundredths without regrouping. ● Understand that an ordered pair of numbers identifies an exact location on a coordinate grid; use coordinates to graph points and to name graphed points in the first quadrant of the coordinate plane. ● Understand that information from some real-world and mathematical problems can be represented as ordered pairs and

	graphed on a coordinate grid; plot points to represent given information.

Student Resources	
Understanding Percent	http://www.harcourtschool.com/activity/elab2004/gr5/17.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Finding Volume	http://www.harcourtschool.com/activity/elab2004/gr5/28.html
Matching Fractions and Decimals	http://www.quia.com/mc/65724.html
	www.abcya.com www.sheppardsoftware.com www.coolmath.com

Teacher Resources	
Games/Lessons Topics	http://littletonpublicschools.net/Default.aspx?tabid=539
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Demo Lessons and Activity Sheets	http://www.learnalberta.ca/content/me5l/html/math5.html
Understanding Percent	http://www.harcourtschool.com/activity/elab2004/gr5/17.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Finding Volume	http://www.harcourtschool.com/activity/elab2004/gr5/28.html
Quizzes/Practice	http://littletonpublicschools.net/Default.aspx?tabid=539
Khan Academy	www.khanacademy.com
Mentor Texts	Fractions, Decimals and Percent

Stage 2: Acceptable Evidence

Assessments

Formative:	**Summative:**
● Math Message ● Oral Mental Math Fluency ● Math Journal ● Slates ● Lesson Assessment Check-In ● Collins Writing ● Exit Slips ● Home Link ● Teacher Observation ● Games/Activity Cards	● Benchmark Assessment ● Quizzes ● Unit Progress Check ● Open Response Assessments ● Student Work Products

Stage 3: Learning Experiences

Lesson 4-1 Extended Multiplication Facts

Standards: 4.OA.2, 4.NBT.1, 4.NBT.5

Warm Up / Mental Math and Fluency: Find factors and identify factors that are prime

Focus:

- Math Message: Extend multiplication facts to solve a problem
- Developing a Rule for Multiplying Ones by Tens and Hundreds: Develop a rule for multiplying ones by tens and ones by hundreds
- Extending the Rule for Multiplying Tens by Tens: Develop a rule for multiplying tens by tens

Practice:

- Game - Rugs and Fences: Practice finding the perimeters and the areas of rectangles using formulas
- Math Boxes 4-1: MJ1 pg. 107, fraction circles
- Home Link 4-1: Solve multiplication puzzles

Assessment: MJ1 pg. 106; Observe students completing journal page 106. Expect most to use basic facts to calculate fact extensions for problems multiplying 10s by 10s. Many students should also be able to clearly express the rule.

Differentiation Options:

- **Readiness:** To prepare for multiplying multi-digit numbers, students play *Multiplication Top-It.*
- **Enrichment**: To explore very large numbers, students determine how many dots there are on a sheet of paper full of dots 2,000, 5 sheets 10,000, and 50 sheets 100,000. Students use this information and look for patterns to calculate the number of dots in a ream of paper (500 pages) 1,000,000, 10 reams 10,000,000, 100 reams 100,000,000, and 1,000 reams 1,000,000,000.
- **Extra Practice:** For review and practice of extended multiplication facts, students apply the rules for multiplying 1s and 10s by 10s by playing *Beat the Calculator.*
- Activity Cards: 40
- **ELL Support:** To support students' understanding of the term *extend,* show a tape measure. As you extend it, make think-aloud statements like this: *I am extending the tape measure, so it is now longer.* Show an electrical cord that doesn't reach the outlet, and then attach an extension cord, saying: *I made it longer, so I extended it.* Extend the idea of adding on in the sense of making an object longer using another think-aloud as you show 2

$*$ 4 and then 2 $*$ 40. Point to 4 on the number line and then move along the line until you get to 40, saying: *I extended 4 to 40 by multiplying it by 10.*

Lesson 4-2 Making Reasonable Estimates for Products

Standards: 4.OA.3, 4.NBT.3, 4.NBT.4, 4.NBT.5

Warm Up / Mental Math and Fluency: Name subsequent multiples in sequences

Focus:

- Math Message: Consider amounts of foods they ate in one week
- Using Food Survey Data to Make Estimates: Estimate how much of certain foods they eat in one year and review data about average food consumption
- Making Estimates for Multistep Problems: Estimate products of large numbers and calculate and assess the reasonableness of answers

Practice:

- Practicing Multi-digit Addition and Subtraction: Practice addition and subtraction
- Math Boxes 4-2: MJ1 pg. 110
- Home Link 4-2: Use extended multiplication facts to estimate and check the reasonableness of their answers

Assessment: MJ1 pg. 108; Observe students as they complete the journal page. Expect most students to be able to make sense of the problems, articulate a plan for solving the multistep number stories, and assess the reasonableness of their answers based on their estimates.

Differentiation Options:

- **Readiness:** To practice rounding large numbers, students play *Spin-and-Round.*
- **Enrichment:** To explore estimation strategies, students find missing numbers and digits in multiplication number sentences and problems using place-value structure.
- **Extra Practice:** To practice estimation strategies, students work within a budget of $65 to plan a party for 18 guests, choosing party favors and estimating total costs. Remind students to include Marla and her friends in the total count of party goers.
- Activity Cards: 41
- **ELL Support:** Preview the terms *eggs, cups of milk,* and *cups of yogurt* before starting the Math Message. Show pictures of each of these foods and say the names as you touch each picture in turn. Name one and ask students to point to the corresponding picture. Help students develop their everyday language skills when reading *SRB* pg.286 aloud by showing a picture of each of the foods mentioned.

Lesson 4-3 Partitioning Rectangles

Standards: 4.NBT.2, 4.NBT.4, 4.NBT.5, 4.MD.3

Warm Up / Mental Math and Fluency: Write numbers in standard notation

Focus:

- Math Message: Solve a problem about floor tiling
- Using a Partitioning Strategy: Consider various methods for finding area
- Partitioning to Multiply: Students are introduced to a multiplication strategy based on partitioning a rectangle
- Practicing the Partitioning Strategy: Students work with a partner to model and solve multiplication problems by partitioning rectangles

Practice:

- Games - Factor Captor: Apply strategies for finding factors of larger numbers
- Math Boxes 4-3: MJ1 pg. 113, fraction circles
- Home Link 4-3: Represent and solve multiplication problems by partitioning rectangles

Assessment: MJ1 pg. 112; Observe students completing journal page. Expect them to partition rectangles to find the answers in Problems 1 through 4.

Differentiation Options:

- **Readiness:** To prepare for partitioning rectangles into manageable parts, students practice decomposing 2-digit numbers. Model the process using the number 27. Have each student build the number 27 using longs and flats. Continue decomposing numbers like 18, 51, and 73 by following the same procedure until students are comfortable with the decomposition structure.
- **Enrichment:** To apply their multiplication skills, students solve an old puzzle involving houses, cats, whiskers, and fleas. Students discuss different ways to solve the problem, write number models with unknowns, and illustrate the situation.
- **Extra Practice:** For additional practice with multiplication strategies, partners create 2-digit by 1-digit multiplication problems with number cards as they work to find higher products to win points.
- Activity Cards: 42-43
- **ELL Support:** Scaffold for students' understanding of *partition* by displaying the word and underlining the first four letters. Use gestures to reinforce how a part is a piece of a whole while showing a rectangular grid with more than 10 squares. Use the same prompts as you partition a number into expanded form, repeating as needed.

Lesson 4-4 Converting Liquid Measures

Standards: 4.NBT.4, 4.NBT.5, 4.NBT.6, 4.MB.1, 4.MD2

Warm Up / Mental Math and Fluency: Solve extended multiplication facts

Focus:

- Math Message: Consider the units of liters and milliliters
- Exploring Liters and Milliliters: Examine measurement scales for liters and milliliters
- Converting Liters and Milliliters: Use a table and diagrams to convert measurements
- Solving Liquid Measurement Number Stories: Solve stories involving liters and milliliters

Practice:

- Game - Polygon Capture: Identify polygons by their properties
- Math Boxes 4-4: MJ1 page 116, fraction circles or number line
- Home Link 4-4: Convert metric units

Assessment: MJ1 pg. 114; Observe students solving Problems 1 and 2. Although this is their first exposure to liters and milliliters, expect most to convert whole numbers of liters to milliliters when given the relationship 1 L = 1,000 mL. Expect some students to be able to explain that they multiplied the number of liters by 1,000 to find the number of milliliters. For students who struggle, suggest that they show how 1 L = 1,000 mL using a graduated cylinder and a beaker.

Differentiation Options:

- **Readiness:** To explore the relationship between liters and milliliters, students choose the appropriate unit for measuring liquid amounts.
- **Enrichment:** To extend conversion work with liters and milliliters using decimals, students imagine themselves as customers at a store that sells soup in various milliliter and liter containers. They study the menu and combine amounts to complete their purchase requirements in multiple ways.
- **Extra Practice:** To practice converting between liters and milliliters in a real-world situation, students imagine helping a chef find two different ways to purchase bottles of oil that equal the total amount he needs (about 25 L) for a month's worth of recipes.
- Activity Cards: 44
- **ELL Support:** Display labeled measuring tools (liter pitcher, graduated cylinder, beaker) or labeled pictures of the measuring tools used in the lesson. Point to each and say its name. Then name the tool and have students point to the tool or picture. Make the pictures available for student reference during the lesson.

Lesson:4-5 (2-day lesson) Walking Away with a Million Dollars

Standards: 4.NBT.1, 4.NBT.5

Warm Up / Mental Math and Fluency: Write large numbers in expanded form

Focus:

- Math Message: Determine how many $1 bills would cover a book
- Making Sense of Strategies: Find the value of their book if it were made of $5 bills and discuss strategies
- Solving the Open Response Problem: Decide whether students could fit one million dollars in a box of a given size and explain how they know their answers make sense

Focus:

- Setting Expectations: Review the open response problem and discuss what a good response might include. They also review how to discuss others' work respectfully.
- Reengaging in the Problem: Examine others' work using a rubric as a guide or in a class discussion.
- Revising Work: Revise their work from Day 1.

Practice:

- Math Boxes 4-5: MJ1 paage 118
- Home Link 4-5: Determine how many calculators will fit in a box

Assessment: Open Response; Collect and review students' revised work. Expect students to improve their work based on the class discussion. For the content standard, expect most students to accurately multiply with multi-digit numbers.

Differentiation Options:

- **Readiness:** Relating Shaded Grids to the Number Line. Math Masters page 131. Students shade grids to find equivalent names for decimals. Students use both a tenths and hundredths grid to generate equivalent names for tenths.
- **Enrichment:** Rounding Repeating Decimals. To extend their work rounding decimals, students "unround" rounded calculator displays, identify patterns in repeating decimals, extend those patterns, and re-round the resulting decimal numbers
- **Extra Practice**: Spinning to Round. Activity Card 46. Math Masters page 133. Students draw cards to generate a 5-digit number with one digit in the ones place followed by four digits in decimal places. They use a spinner to determine which place value they must round to. Partners check each other's work.
- **Adjusting the Activity:** For students who have difficulty explaining their reasoning in writing, use sentence frames like these to help them get started: "First I _____. Then I _____. Finally I _____." Encourage them to use drawings to show their reasoning. For students who complete the problem early, ask them to determine if a student could carry the box with one million dollars in $100 bills. Each bill weighs 1 gram.
- **ELL Support:** Prior to the lesson, use stacks of pattern blocks or other manipulatives to review the meaning of terms in the open response problem, such as *stack* and *ream*.

Use visuals, simple stories, or examples to review other contextual terms, such as *heroic, deed,* and *reward*. Describe or illustrate different meanings of the term *bill*.

Lesson 4-6 Introducing Partial-Products Multiplication

Standards: 4.NBT.2, 4.NBT.4, 4.NBT.5, 4.MD.3

Warm Up / Mental Math and Fluency: Round large numbers to various places

Focus:

- Math Message: Solve a number story involving area
- Introducing Partial-Products Multiplication: Discuss strategies for multiplying a 3-digit number by a 1-digit number
- Practicing Partial-Products Multiplication: Practice multi-digit multiplication using partial products
- Connecting Multi-digit Multiplication Representations: Match partitioned rectangles to partial products

Practice:

- Metric Measurement Conversions: Practice converting metric units
- Math Boxes 4-6: MJ1 page 123
- Home Link 4-6: Use partial-products multiplication

Assessment: MJ1 pgs. 12-121; Circulate and observe students working on journal pages. Expect them to solve Problems 1 and 2 correctly by partitioning and also to apply partial products to these two problems. Some students may be able to use partial-products multiplication independently on journal page 121. Students will practice this method through various contexts over the next several lessons.

Differentiation Options:

- **Readiness:** To support their understanding of partial products multiplication, students practice decomposing 3- and 4-digit numbers. Have students decompose the number 375 into 100s, 10s, and 1s and use base-10 blocks to model the decomposed number.
- **Enrichment:** To explore an early algorithm for multiplication, partners study an example of an ancient Egyptian method for multiplying.
- **Extra Practice:** To practice multiplication strategies, partners play Part 2 of *Products for Points,* in which they use number cards to create 3- and 4-digit by 1-digit multiplication problems.
- Activity Cards: 45-46
- **ELL Support:** Scaffold students' understanding of the term *partial* by focusing on the base word, *part*. Display a tower of connecting cubes. Count the cubes together with the students. Think aloud: *This is too tall. I am going to take this tower and break it into smaller* parts. Break the tower into two parts. Say: *Now I have two* parts. Count the number of cubes in each part aloud. Each time, emphasize the word *part* with statements like these: *This* part *has 10 cubes. That* part *has 4 cubes. The two* parts *together make 14 cubes.* Repeat as needed.

Lesson 4-7 Metric Units of Mass

Standards: 4.NBT.4, 4.NBT.5, 4.NBT.6, 4.MD.1, 4.MD.2

Warm Up / Mental Math and Fluency: Compare number using < and >

Focus:

- Math Message: Use a measurement scale to answer questions
- Measuring Mass in Metric Units: Use a measurement scale to discuss the relationship between kilograms and grams
- Converting Units of Metric Mass: Solve measurement number stories
- Solving Metric Mass Number Stories: Solve more measurement number stories

Practice:

- Game - Fraction/Decimal Concentration: Find fraction and decimal equivalencies
- Math Boxes 4-7: MJ1 page 126
- Home Link 4-7: Convert kilograms to grams and solve number stories

Assessment: MJ1 pg. 124; Observe students solving Problems 1 and 2. Although this is their first exposure to kilograms and grams, expect them to convert whole numbers of kilograms to grams when given the relationship 1 kg = 1,000 g. Expect some to explain that they multiplied the number of kilograms by 1,000 to find the number of grams.

Differentiation Options:

- **Readiness:** To experience a hands-on comparison of grams and kilograms, students hold and compare familiar objects of a given metric mass.
- **Enrichment:** To extend their understanding of the metric system, students visit the National Institute of Standards and Technology website and identify the base units of the seven measures included in the International System of Units (SI).
- **Extra Practice:** To practice converting kilograms to grams, students complete a chart detailing the masses of marine mammals and their food intake.
- Activity Cards: 47
- **ELL Support:** Help students gain familiarity with the terms *weigh* and *weight* by passing around a heavy object and a light object (such as a hardcover book and a paper clip). Use think-alouds.

Lesson 4-8 Money Number Stories

Standards: 4.NBT.2, 4.NBT.4, 4.NBT.5, 4.MD.1, 4.MD.2

Warm Up / Mental Math and Fluency: Read numbers

Focus:

- Math Message: Solve a multistep number story about money
- Solving Money Conversion Problems: Solve problems involving conversion between monetary units
- Solving Money and Time Number Stories: Solve multistep number stories about time and money

Practice:

- Games - How Much More? Solve number stories involving additive and multiplicative comparisons
- Math Boxes 4-8: MJ1 pg. 127
- Home Link 4-8: Make plans for solving multistep number stories involving money

Assessment: MJ1 pages 128-129; Take note of students' answers to Problems 2 and 4 on journal pages 128 and 129, expecting that they will accurately use a multiplication strategy to find the cost of buying multiple tickets. For those who struggle applying a multiplication strategy, work through one of the problems using the partial-products method and connecting the products to repeated addition. Encourage students who excel at solving the problems to complete the Enrichment activity for this lesson.

Differentiation Options:

- **Readiness:** For experience exchanging money amounts, students play *Dollar Exchange*.
- **Enrichment:** To create multistep number stories involving real-life situations, students use the table on MJ1 page 128 to write problems based on travel times and fares for train and bus trips. They compare solutions with a partner, analyzing strategies and discussing any disagreements or errors.
- **Extra Practice:** For experience computing with money, students solve multistep number stories about purchasing items from an electronics store. They add, subtract, and multiply to find total costs, figure change, and estimate whether they have enough to purchase certain items. They write equations to show each step toward their solutions.
- Activity Cards: 48-49
- **ELL Support:** Role-play the Math Message problem using play money with each of the denominations noted in the problem. Pretend to distribute the amounts in the problem to individual students in the classroom. Encourage Beginning ELLs to write

down the names of the students to whom money was distributed and the amounts they were given to help prepare them to explain their answers.

Lesson 4-9 Partial-Products Multiplication

Standards: 4.NBT.2, 4.NBT.4, 4.NBT.5

Warm Up / Mental Math and Fluency: Solve extended multiplication facts

Focus:

- Math Message: Solve a 2-digit by 2-digit multiplication problem
- Multiplying by a Multiple of Ten: Solve 2-digit by 2-digit multiplication problems in which the multipliers are multiples of 10
- Two-Digit by Two-Digit Multiplication: Use partial products to solve multiplication problems
- Connecting Multi-digit Multiplication Representations: Match partitioned rectangles to partial products

Practice:

- Game - Fraction Top-It: Compare fractions
- Math Boxes 4-9: MJ1 page 132
- Home Link 4-9: Practice using partial products to solve number stories

Assessment: Observe as students match cards. Expect them to correctly match most of the partial-products multiplication cards to rectangular representations.

Differentiation Options:

- **Readiness**: To prepare for 2-digit by 2-digit multiplication, students play an extended-facts version of *Multiplication Top-It* by attaching a 0 to either one or both numbers before finding the product. Observe students playing and listen as they discuss strategies for solving.
- **Enrichment:** To explore a multiplication strategy from the 1800s, students use a Russian peasant method of multiplication to multiply 2-digit numbers.
- **Extra Practice:** To practice multiplication strategies, partners play Part 3 of *Products for Points,* in which they use number cards to create 2-digit by 2-digit multiplication problems.
- Activity Cards: 50-51
- **ELL Support:** Introduce or review the word *match* by showing objects or pictures of objects that are identical, such as socks and earrings, and demonstrating how they are identical. Then introduce the concept of matching objects that go together, such as lowercase and uppercase letters. To help prepare students for matching partial products

and their partitioned rectangle representations, use letter-pairing examples to show that matches do not have to be identical.

Lesson 4-10 Multiplication Wrestling

Standards: 4.NBT.2, 4.NBT.4, 4.NBT.5

Warm Up / Mental Math and Fluency: Solve multiplication facts, extended facts, and other problems

Focus:

- Math Message - Use a strategy to generate the largest possible product
- Sharing Solutions - Share strategies for finding the largest product
- Game - Multiplication Wrestling - Practice multiplying 2-digit numbers by 2-digit numbers

Practice:

- Representing Decimals - Practice writing decimals from different representations
- Math Boxes 4-10: Preview for Unit 5 - MJ1 page 134
- Home Link 4-10 - Practice extended multiplication facts

Assessment: Observe students playing Multiplication Wrestling. Expect most students to be able to accurately decompose each 2-digit number into tens and ones.

Differentiation Options:

- **Readiness:** In preparation for adding partial products in *Multiplication Wrestling,* students review partial-sums addition by finding the sum of multidigit numbers.
- **Enrichment:** To apply their understanding of the Distributive Property of Multiplication over Addition, students use estimation strategies to determine who has the highest score in a *Multiplication Wrestling* competition. Ask students to use the back of the page to explain how they solved Problem 4 and to show their work for Problem 5.
- **Extra Practice:** To investigate common errors that occur while playing *Multiplication Wrestling,* students analyze three *Multiplication Wrestling* situations. They solve the problems on the game record sheet and describe the errors they discover from comparing their strategies with the incorrect computations.
- Activity Cards: 52
- **ELL Support:** To build or activate background knowledge about the sport of wrestling, consider showing a video clip from a wrestling match. Show images of the different styles of wrestling found around the world. Finally, show that in tag-team wrestling you compete with the opponents on the other team while working together with your own partner.

Lesson 4-11 Area Models for Rectangles and Rectilinear Figures

Standards: 4.NBT.4, 4.NBT.5, 4.MD.3, 4.G.2

Warm Up / Mental Math and Fluency: Solve multiplication/division number stories

Focus:

- Math Message - Find the area of a figure
- Finding the Area - Share strategies for finding area when the perimeter and only one side length are known
- Finding the Area of Rectilinear Figures - Find areas by subdividing rectilinear figures

Practice:

- Game - Fraction Match - practice recognizing equivalent fractions
- Math Boxes 4-11 - MJ1 page 136
- Home Link 4-11 - Find the area of rectilinear figures and rectangles with multidigit side lengths

Assessment: MJ1 page 135; Observe students solving the problems. Expect them to accurately find the areas in Problems 1 and 2 using a formula. Some will be able to find the area of the rectilinear figure in Problem 3a.

Differentiation Options:

- **Readiness:** For practice working with the concept of area and the formula for the area of rectangles, students make as many different rectangles as they can with an area of 36 square units.
- **Enrichment:** To further explore concepts of area and perimeter, students solve problems involving the dimensions of a tennis court.
- **Extra Practice:** To practice finding the area and perimeter of more complex figures, students add nine new cards to the *Rugs* and *Fences* game. These cards have rectilinear shapes that students will partition into rectangles before using the formula to find the area or perimeter.
- Activity Cards: 18
- **ELL Support:** Use role playing to introduce the term *adjacent* by associating it with the more familiar term *next to.* Have students point to other things in the classroom that are adjacent to each other.

Lesson 4-12 Multistep Multiplication Number Stories

Standards: 4.OA.3, 4.NBT.3, 4.NBT.4, 4.NBT.5

Warm Up / Mental Math and Fluency: Solve division facts and extended facts

Focus:

- Math Message - Solve a multistep multiplication number story
- Applying Multiplication Strategies - Estimate, solve, and check the reasonableness of both the answers and the estimates to problems
- Solving Multistep Number Stories - Estimate, solve, and use their estimates to assess the reasonableness of the answers to problems

Practice:

- Game - Number Top-It - Compare large numbers
- Math Boxes 4-12 - MJ1 page 139
- Home Link 4-12 - Solve multiplication number stories

Assessment: MJ1 page 137; Observe students' answers to Problem 1. Expect them to write appropriate number models for the number story and to solve them. Some may not be able to correctly assess the reasonableness of their answer if they use front-end estimation.

Differentiation Options:

- **Readiness:** To further understand problem solving, students use the Guide to Solving Number Stories on *SRB* pg. 26 to help solve the following multistep number story: *Lilly wants to adopt a dog from the shelter. The fees are $211. Lily has saved $175, and she can get $3 off for every hour she volunteers at the pet shelter. How many hours does she need to volunteer?* Help students see that solving the number story takes more than one step. Refer students to the Guide and ask them how they would solve the problem.
- **Enrichment:** To further explore strategies for solving multistep multiplication number stories, students write a number story requiring at least three steps, one of which involves multi-digit multiplication. They solve the number story, trade with a partner, and solve each other's problem. Students discuss solutions, analyzing any mistakes or differences of opinion.
- **Extra Practice:** To practice solving multistep multiplication number stories, partners find solutions to problems involving a pedometer reading, yard work, and planting bulbs. Partners plan strategies and write number models, explaining in words how they found each answer and checking to make sure it makes sense.
- Activity Cards: 53
- **ELL Support:** Students may be familiar with the term *step* as steps in a staircase or the steps we take when walking. Help them understand the adjectives *one-step* and *two-step* by connecting them to the sequential terms *first* and *second*. Demonstrate with examples that deal with procedures.

Lesson 4-13 Lattice Multiplication

Standards: 4.NBT.5

Warm Up / Mental Math and Fluency: Write numbers and find values of digits

Focus:

- Math Message - Compare two ways of solving multiplication problems
- Exploring the Lattice Method of Multiplication - Learn about and practice lattice multiplication
- Using the Lattice Method with 2-Digit Multipliers - Practice solving multidigit multiplication problems using the lattice method

Practice:

- Game - Decimal Top-It - Practice making the largest possible decimal numbers
- Math Boxes 4-13 - MJ1 page 142
- Home Link 4-13 - Practice the lattice method of multiplication

Assessment: MJ1 page 141; Observe students using the lattice method to solve Problems 2 and 3. Expect them to be able to apply the method.

Differentiation Options:

- **Readiness:** Beat the Calculator Game -To prepare for lattice multiplication, students practice basic multiplication facts.
- **Enrichment:** To apply their understanding of lattice multiplication, students use Napier's Rods to multiply 2-, 3-, and 4-digit numbers by a 1-digit number.
- **Extra Practice:** To practice the lattice method of multiplication, students solve problems on *MM* page TA39. Fill in the problems for students, and include zeros in some of the factors.
- **ELL Support:** To scaffold students' understanding of the term *lattice,* display visual examples of objects that incorporate lattices, such as fencing. Then show the lattice used for multiplication. As you describe different pieces of both lattices, emphasize terms you will use in the lesson, including *diagonal, right side, top, bottom, outside,* and *inside*. Enunciate the terms clearly, connecting the spoken words with the written words and their counterparts on the lattice. Provide vocabulary cards that students can use to identify each image.

Lesson 4-14 (2-day lesson) Unit 4 Progress Check

Warm Up / Self-Assessment: Complete Self-Assessment

Assessment:

- **Unit 4 Assessment** - These items reflect mastery to expectations to this point
- **Unit 4 Challenge** (Optional) - Students may demonstrate progress beyond expectations
- **Cumulative Assessment** - These items reflect mastery expectations to this point

Look Ahead:

- **Math Boxes** 4-14: Preview for Unit 5- MJ1 page 143
- **Home Link** 4-14 - Students take home the Family Letter that introduces Unit 5

Differentiation Options: Adjusting the Assessment - See TE for adjustments to the assessment.

Unit Plan Title	Operations with Fractions
Suggested Time Frame	19 days including flex days

Stage 1: Identify Desired Results

Overview / Rationale

In this unit, students deepen their understanding of fractions and develop strategies for adding and subtracting fractions and mixed numbers with unlike denominators. They also connect fraction-of thinking to multiplication and generalize a fraction multiplication algorithm. Finally, students are introduced to fraction division.

New Jersey Student Learning Standards for Mathematics

5.NBT.5 Fluently multiply multi-digit whole 5.NBT.5 e numbers using the standard algorithm.

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.

5.NF.4.a Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$.

5.NF.4b Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5.NF.5 Interpret multiplication as scaling (resizing), by:...[See 5.NF.5a and 5.NF.5b for full text of the standard.]

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between

multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.)

GMP3.1 Make mathematical conjectures and arguments.

GMP3.2 Make sense of others' mathematical thinking.

GMP4.1 Model real-world situations using graphs, drawings, tables, symbols, numbers, diagrams, and other representations.

GMP4.2 Use mathematical models to solve problems and answer questions.

Technology Integration
__X__ **8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
- Student Websites - Teacher Websites - SMART board
____ **8.2 Technology Integration, Engineering, Design and Computational Thinking – Programming** All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES
The following social and emotional competencies are integrated in this curriculum document:

Self-Awareness
_____Recognize one's own feelings and thoughts
_____Recognize the impact of one's feelings and thoughts on one's own behavior
_____Recognize one's personal traits, strengths and limitations
_____Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management
__x__Understand and practice strategies for managing one's own emotions, thoughts and behaviors
__x__Recognize the skills needed to establish and achieve personal and educational goals
__x__Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness
__x__Recognize and identify the thoughts, feelings, and perspectives of others
_____Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
_____Demonstrate an understanding of the need for mutual respect when viewpoints differ
_____Demonstrate an awareness of the expectations for social interactions in a variety of setting

Responsible Decision Making
__x__Develop, implement and model effective problem solving and critical thinking skills
_____Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills
_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
_____Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

In this unit plan, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – 21st Century Themes			**Indicate whether these skills are:** ● **E – encouraged** ● **T – taught** ● **A – assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**			CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
X	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing			CRP5. Consider the environmental, social and economic impacts of decisions.
X	Becoming a Critical Consumer			CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
	Career Exploration			CRP11. Use technology to enhance productivity.
	Career Preparation			CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

NJ Student Learning Standards for English Language Arts

RI.4.3 - Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.4 - Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

RI.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.4.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Essential Questions:	**Enduring Understandings:**
● How do I explain how changing the size of the whole affects the size or amount of a fraction?	***Students will understand that…*** ● Common denominators make it easier to add and subtract fractions and mixed numbers ● There are many ways to manipulate fractions to solve a problem.
Knowledge:	**Skills:**

Students will know…	**Students will be able to…**
● Equivalent fraction ● Multiplication rule for equivalent fractions ● Common denominator ● Factor ● Factor pair ● Multiple ● Common denominator ● Quick common denominator (QCD) ● Common denominator ● Quick common denominator (QCD) ● Multiplication rule for equivalent fractions ● Product ● Factor ● Horizontal ● Vertical ● Area model ● Dimensions ● Algorithm ● Represent ● Mathematical model ● Multiplication rule for equivalent fractions ● Quotient ● Dividend ● Divisor	● Fluently multiply multi-digit whole numbers using U.S. traditional multiplication. ● Recognize that a common denominator makes it easier to add and subtract fractions and mixed numbers; use a strategy to identify a common denominator; add and subtract fractions and mixed numbers when one of the following is required, but not both: finding a common denominator, or renaming the sum or starting number to have a smaller or larger fraction part. ● Use models to solve number stories involving addition and subtraction of fractions and mixed numbers that require one, but not both, of the following: finding a common denominator, or renaming the sum or starting number; use benchmark fractions and number sense to make reasonable estimates for fraction and mixed-number sums and differences. ● Find a fraction of a whole number, when the answer is a whole number, by partitioning the whole number into equal parts and taking the appropriate number of parts or by multiplying the whole number by the numerator of the fraction and dividing by the denominator; use paper-folding and other visual representations to visualize partitioning a fraction into equal parts and finding the value of one or more parts; connect fraction-of problems to fraction multiplication. ● Find the area of a rectangle with fractional side lengths by counting the number of unit-fraction tiles that cover the rectangle and relating the count

	to how many tiles cover a unit square; use area models to represent and find fraction products. ● Predict that a product of a whole number and a fraction less than 1 will be less than the whole number and informally explain why this is so; understand that multiplying a fraction by another fraction equal to 1 creates an equivalent fraction. ● Use tools and models to solve real-world problems involving multiplication of fractions by whole numbers or fractions by fractions. ● Use models to solve problems involving division of a unit fraction by a whole number or division of a whole number by a unit fraction when the problems are in context.

Student Resources	
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Add/Subtract Fractions	http://www.funbrain.com/fractop/index.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Equivalent Fractions	http://www.funbrain.com/fract/index.html
Decimal/Fraction Match	http://www.interactivestuff.org/match/maker.phtml?featured=1&id=8
Unlike Fractions	http://www.harcourtschool.com/activity/elab2004/gr5/11.html
Websites	www.abcya.com www.sheppardsoftware.com www.coolmath.com

Teacher Resources	
Games/Lessons	http://littletonpublicschools.net/Default.aspx?tabid=539
Games/Demos	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Demo Lessons/Activity Sheets	http://www.learnalberta.ca/content/me5l/html/math5.html

Add/Subtract Fractions	http://www.funbrain.com/fractop/index.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Equivalent Fractions	http://www.funbrain.com/fract/index.html
Decimal/Fraction Match	http://www.interactivestuff.org/match/maker.phtml?featured=1&id=8
Quizzes/Practice	http://littletonpublicschools.net/Default.aspx?tabid=539
Khan Academy	www.khanacademy.com
Mentor Texts	The Multiplying Menace: The Revenge of Rumpelstiltskin The Multiplying Menace Divides Fractions, Decimals and Percent Fractions in Disguise: A Math Adventure Piece=Part=Portion

Stage 2: Acceptable Evidence

Assessments

Formative:

- Math Message
- Oral Mental Math Fluency
- Math Journal
- Slates
- Lesson Assessment Check-In
- Collins Writing
- Exit Slips
- Home Link
- Teacher Observation
- Games/Activity Cards

Summative:

- Benchmark Assessment
- Quizzes
- Unit Progress Check
- Open Response Assessments
- Student Work Products

Stage 3: Learning Experiences

Lesson 5.1 Using Equivalent Fractions to Find Common Denominators

Students will use equivalent fractions to find common denominators and solve problems.

Standards: 5.NF.1

Warm-Up: Mental Math: Students estimate fraction sums and differences.

Focus: Math Message: Students solve fraction addition problems**.**

Math Message Follow-Up:

- Students review strategies for generating equivalent fractions to find common denominators.
- MJ p. 153 Invite volunteers to share their solutions and strategies for Problem 1 in the Math Message. Expect most students to solve Problem 1 mentally, but some may use fraction circles or a number line.
- Have students work in partnerships to complete journal pages 153 and 155. After using equivalent fractions to identify common denominators, students add, subtract, or compare fractions. They use estimates to check that their answers make sense. Circulate and observe, reminding students that they can think about the benchmarks 0, 12, and 1 to help them estimate. When most students have finished, discuss answers. Keep in mind that writing fractions in simplest form is not an expectation in Grade 5.
- **Differentiation:** Have those who struggle generating equivalent fractions complete the Readiness activity. Since this is the first time students have used equivalent fractions to find common denominators, expect them to have more difficulty completing journal page 155, where they have to identify the equivalent fractions needed to solve each problem.
- MJ pages153-155 Students find and use common denominators to solve fraction addition, subtraction, and comparison problems.
- Invite students to explain why it is difficult to add and subtract fractions with unlike denominators. Ask them to summarize how to find a common denominator using equivalent fractions.

Game: Decimal Top-It Subtraction-SRB pages 289-299. Students practice subtracting decimals

Practice: MJ Math Boxes 5-1. Home Link 5-1

Assessment: Expect most students to be able to generate equivalent fractions by using the multiplication rule for equivalent fractions for Problem 3 on journal page 153.

Differentiation:

- **Readiness:** Review the Multiplication Rule for Equivalent Fractions. MM page166
- **Extra Practice:** Activity Card 57. For additional practice finding common denominators, students generate two fractions by drawing cards and then list equivalent fractions to find a common denominator. They rename each fraction using the common denominator. For an extension, students flip a coin or counter to determine whether to add or subtract the fractions.
- **Enrichment:** Page 167. To extend their work finding equivalent fractions with common denominators, students solve challenging number story problems by converting measurements based on the size of the cup or spoon they are using.
- **ELL Support:** Help student understand the term equivalent as being the same amount but looking different. Display two sets of items like pencils, one set in its original packaging and the other opened and with the packaging removed. Use think-alouds.

Lesson 5.2 More Strategies for Finding Common Denominators

Students will practice strategies for finding common denominators. They use common denominators to add and subtract fractions.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students generate equivalent fractions.

Focus: Math Message: Students read about and discuss factors and multiples.

Math Message Follow-Up:

- Students learn strategies for finding a common denominator for a pair of fractions.
- SRB p. 72-73 Invite several students to share what they learned from their partner in the Math Message, referring to *Student Reference Book,* pages 72 and 73 as needed. Display a class definition and examples for each term, making sure the following points are included in the discussion: factor, factor pair, and multiple. Multiples help us find common denominators.
- **Differentiation:** For students who have difficulty understanding the difference between factors and multiples, use a multiplication table (*Math Journal 2,* inside back cover) for visual emphasis. You may want to have students spend additional time on problems that allow them to think about the relationship between the original denominator(s) and the common denominator. Display problems and use arrows or gestures to emphasize that it is important to note how to get from the original denominator to the common denominator because the same change needs to be applied to the numerator. You may want to have students spend additional time on problems that allow them to think about the relationship between the original denominator(s) and the common denominator. Display problems and use arrows or gestures to emphasize that it is important to note how to get from the original denominator to the common denominator because the same change needs to be applied to the numerator.
    - *Example:* 7/12 + 1/5 =
    - Common Denominator: 60
    - Think: *What do I multiply 12 by to get 60?* So I need to multiply the numerator, 7, by 5 as well. Students should use similar thinking to determine that they need to multiply the numerator and denominator of 1/5 by 12..
- Have students turn to journal page 156 and summarize the strategies for finding common denominators that they have learned. They should record strategies in their own words so they can refer to them as needed. *Sample language:*
    - **Strategy 1:** Make a list of equivalent fractions for each fraction until you've found equivalent fractions with a common denominator.

    - **Strategy 2:** See if one denominator is a multiple of the other. If it is, it is also a common denominator.
    - **Strategy 3:** Multiply the two original denominators. Use their product as a common denominator.
- Have students complete the rest of journal page 156 using any of the strategies discussed. If students have trouble determining whether one denominator is a multiple of the other, suggest that they record factor pairs for the larger denominator and check whether the smaller denominator is listed. When most of the class has completed the page, review solutions.
- Have partners talk about how they would solve the problem 79 – 23. Invite them to share which strategies they could use to find a common denominator, which strategy they would prefer to use, and why.

Practice: MJ p. 158 Math Boxes 5-2, Home Link 5-2

Assessment: Expect most students to be able to apply at least one of the strategies discussed in class to identify a common denominator.

Games: Hidden Treasure. SRB page 311. MM page G26. Students practice plotting and naming points on a coordinate grid.

Differentiation:

- **Readiness: Playing Buzz or Bizz-Buzz.** SRB page 294. Review finding multiples. Observe which students are able to easily identify multiples of the BUZZ number. Discuss what strategies are being used.
- **Extra Practice:** MM page 169. For additional practice finding common denominators, students complete *Math Masters*, page 169. They list eight equivalent fractions for two different fractions, circle any fractions with common denominators, put a box over the common denominator that is the product of the original denominators, and star any denominators that are a multiple of the other denominator. They solve fraction addition and subtraction problems.
- **Enrichment:** Activity Card 58. SRB page 293. MM page G15. To extend their work finding common denominators, students play a version of *Build-It* in which they use number sense to order fractions. Then they find a common denominator to check the accuracy of the order
- **ELL Support:** Use visual aids and think-alouds to help students name and distinguish factors and multiples. Display multiplication expressions and label factors as you state what you will do. Identify "factor" and provide a list of multiplication facts for the same factor.

Lesson 5.3 Addition of Fractions and Mixed Numbers

Students solve problems involving the addition of fractions and mixed numbers.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students rename fractions and mixed numbers by trading wholes for fractional parts.

Focus: Math Message: Students estimate sums of fractions and mixed numbers and solve some problems mentally.

Math Message Follow-Up:

- Students estimate sums of fractions and mixed numbers and explain their estimation strategies
- **MJ p. 160:** Have students share their estimation strategies for Problems 1–3. Expect most to have thought about the size of the addends relative to the benchmarks of 12 and 1 as a way to help estimate. Then have students explain their estimation strategies for Problems 4–6, which involve mixed numbers. Many students may have relied only on the whole-number parts of the addends to make estimates. Be sure to highlight that sometimes the fractional parts of mixed numbers create another whole.
- **MJ p. 160-162: S**tudents solve problems involving the addition of fractions and mixed numbers
- Have students share how they solved Problem 4 on journal page 1
- **Differentiate:** Students who struggle may benefit from using fraction circles to check their work as they create equivalent fractions or rename answers.

Practice: MJ p. 159 Math Boxes 5-3 Home Link 5-3

Differentiation:

- **Readiness: Renaming Fractions Greater Than One as Mixed Numbers.** MM page 171. Discuss the example. Call attention to the connections between the drawing and the number sentence. Have students create their own representations. Have students rename the fractions and mixed numbers.
- **Extra Practice:** Activity Card 59. MM page 172-173. For additional practice adding fractions and mixed numbers, students find sums to get four-in-a-row on a fraction board. Encourage students to discuss and compare strategies as they solve problems. Remind them to determine whether a problem can be solved mentally before calculating on paper. Alert students to the possibility that they may need to identify some answers as equivalent fractions on the fraction board. For example, 4 2/4 could be represented on the fraction board as 4 2/4, 4 1/2, or 18/4**.**

- **Enrichment:** MM page 174. To further explore fraction addition, students solve problems, look for a pattern, and then use the pattern to solve other problems. They discover unit fractions - that the answer to any addition problem with two unit fractions can be expressed as the sum of the denominators over the product of the denominators.
- **ELL Support:** Use visual aids to introduce the meaning of the word "mixed" and to help students transfer their understanding to the term "Mixed numbers." Show pictures or sets of materials, asking students to point to mixed groups. Extend to sets of whole numbers and sets of fractions.

Assessment: Expect most students to be able to solve Problems 1, 2, and 5 on journal page 161, which require either renaming the sum or finding a common denominator, but not both. Some will be able to solve the remaining problems, which require coordinating both skills.

Games: SRB p. 298-299 Decimal Top-It Addition. Students practice adding decimals

Lesson 5.4 Subtraction of Fractions and Mixed Numbers

Students solve problems involving the subtraction of fractions and mixed numbers.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students write decimals using number names.

Focus: Math Message: Students solve and compare two mixed-number subtraction problems.

Math Message Follow-Up:

- **MJ page 163.** Students discuss strategies for solving subtraction problems involving the renaming of fractions and mixed numbers**.**
- Remind students that in the previous lesson they solved addition problems with fractions and mixed numbers. Today's lesson will focus on subtraction with fractions and mixed numbers. Point to the poster the class created in the previous lesson with tips for tackling new problems.
- **MJ page 164.** Students solve problems involving subtraction of fractions and mixed numbers.
- Create another class poster (or add to the poster from Lesson 5-3) with questions to consider when subtracting fractions and mixed numbers. Use the suggestions from Lesson 5-3, adding a subtraction-specific question like this one: *Should I rename the start number as a mixed number with a larger fraction part?*
- Have students work independently or in partnerships to complete journal page 164. Encourage them to use drawings and fraction circle pieces to help them as needed. Remind them to write number models for the number stories before solving and to use their estimates to check that their answers make sense.
- Have students choose a problem that they found difficult and discuss it with a partner. Invite volunteers to share what they learned from talking with their partner.
- **Differentiate:** Encourage those who struggle working with unlike denominators or renaming to continue modeling problems with fraction circle pieces.

Practice: MJ page 165 (Reviewing Decimals) MJ page 166. Math Boxes 5-4. Home Link 5-4

Assessment: Expect most students to be able to use drawings or fraction circle pieces to solve Problems 2, 3, and 5 on journal page 164, which involve renaming the starting number or finding a common denominator, but not both. Some students may be able to solve Problem 4, which involves both mixed numbers with unlike denominators and renaming the starting number with a larger fractional part.

Differentiation:

- **Readiness: Renaming Mixed Numbers.** MM page 176. Students practice renaming mixed numbers as equivalent mixed numbers with a larger fractional part. Emphasize that

the number sentences and the drawing of fraction circles are both ways to represent the process of renaming. Stress that students will eventually do many of the steps mentally.

- **Extra Practice:** Activity Card 60. MM pages 178-179. For additional practice subtracting fractions and mixed numbers, students find differences to get three-in-a-row on a fraction board. Encourage students to discuss and compare strategies as they solve problems. Remind them to determine whether a problem can be solved mentally before calculating on paper. Alert students to the possibility that they may need to identify some answers as equivalent fractions on the fraction board. For example, 1 1/9 could be represented on the fraction board as 1 1/9 or 10/9.
- **Enrichment:** MM page 177. To further explore fraction subtraction, students solve problems with unit fractions, look for a pattern, and apply the pattern to solve other problems.
- **ELL Support:** Use think-alouds, simple sentences, gestures, and pictures to help students understand that "rename" means "to give another name" or "to name again."

Lesson 5.5 Connecting Fraction-Of Problems to Multiplication

Students will solve fraction-of problems and connect these problems to multiplication of fractions by whole numbers.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students write decimals in expanded form.

Focus: Math Message: Students compare 15 of a set of numbers with 35 of the same set of numbers.

Math Message Follow-Up:

- **MJ page 167** Students solve fraction-of problems with non-unit fractions.
- Have volunteers share their strategies for completing the table in Problem 1. Expect strategies to include drawing pictures, using counters, or dividing the *in* numbers by 5. Display both function machines and point out the difference between the rules. Tell students that today they will figure out a strategy for solving problems like 3/5 of 10.
- Ask students to write expressions to model the following problems. They do not need to solve the problems.
- **Differentiate:** To support students who have difficulty seeing the connections between the tables from the Math Message, suggest using counters to find 15 of each *in* number in Problem 1. For each *in* number, refer to the concrete representation of 15 as you ask: *If this is* 15*, what would* 35 *look like?* Use the counters to model 3 groups of 15. Some students may also benefit from drawing a rectangle to represent the whole, partitioning it into the appropriate number of parts, and placing the groups of counters in the sections of the rectangle.
- **MJ p. 167** Students discuss the connection between *of* and *times* and write multiplication number models for fraction-of problems.
  - 3 sets of 4 coins. How many coins in all? $3 * 4$
  - 8 rows of 8 stamps. How many stamps in all? $8 * 8$
  - 6 bags of 12 oranges. How many oranges in all? $6 * 12$
  - Point out that in each problem the word *of* is used. Ask: *What operation did you use to model each problem?* Next have students write an expression to model this problem: 3/4 *of a bag of 8 carrots. How many carrots?* $3/4 * 8$ Point out that the word *of* can be used to indicate multiplication in number stories. When students were solving fraction-of problems, they were really solving fraction multiplication problems. Be sure students understand that they can find $3/4 * 8$ by thinking: *What is* 3/4 *of 8?*
- Have students use this strategy to complete Problem 4 on journal page 167. Then have them work in partnerships to solve Problems 5 and 6. If students have difficulty writing the multiplication number models in Problems 5 and 6, encourage them to first write a simple

fraction-of problem that models the number story, then translate the fraction-of problem into a multiplication number sentence. For example, in Problem 5c, they would first write 4/6 *of 12 is 8*, and then write 4/6 $*$ *12 = 8*.

- **Differentiate:** If students struggle solving Problem 4, suggest that they complete a table for the rule "14 $*$" or "14 of" using the same *in* numbers, and use this table to help them complete the table for the "34 $*$" rule.
- When most students have finished, have them look over their answers to Problems 4–6. Ask: *When you multiply a whole number by a fraction less than 1, is the product greater than or less than the whole number you started with? Does this make sense? Why or why not?*

Practice: MJ pages 167-168. Math Boxes 5-5. Home Link 5-5

Assessment: Expect most students to be able to solve Problem 4 by thinking of 14 of the *in* numbers and multiplying those values by 3. Some may be able to solve the fraction number stories in Problems 5 and 6 and write multiplication number models. Games: Playing Fraction Of

Games: Play Fraction Of. MJ Volume 2 Activity Sheet 17. SRB pages 306–307. MM page G24. Practice multiplying fractions of whole numbers

Differentiation:

- **Readiness: Reviewing Fraction-Of Problems with Unit Fractions.** Use counters to represent and solve problems.
- **Extra Practice:** Activity Card 61. For additional practice with fraction multiplication, students use the *Fraction Of* fraction cards and a die to generate fraction-of problems. They solve the problems and write multiplication number sentences that represent them.
- **Enrichment:** MM page 181. To extend their work with fraction-of problems, students fill in blanks in various "fraction-of" situations and number sentences on *Math Masters*, page 181. Since different numbers are missing in each problem, students will need to reason about which number is the whole and which number is the part. Students explain their thinking for one problem.
- **ELL Support:** Build on students' prior knowledge of the words in and out to help them understand how these words are used in function machines.

Lesson 5.6 Multiplication of Fractions and Whole Numbers

Students will discuss and apply strategies for multiplying fractions by whole numbers.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students round decimals.

Focus: Math Message: Students multiply numbers by 15 and divide the same numbers by 5. They discuss what they notice.

Math Message Follow-Up:

- MJ page 169-170. Students discuss and apply two strategies for multiplying fractions by whole numbers.
- Have students share their answers and strategies for solving Problem 1. Be sure to discuss the second strategy even if no one mentions it. Explain that because of the turn-around rule for multiplication, students can think of multiplication problems as fraction-of problems, even when the fraction is the second factor rather than the first.
- Explain that the strategies work for any problem involving multiplication of a fraction by a whole number, regardless of whether the answer is a whole number or a fraction. Point out that when using division to solve these problems (as in Problem 1b), students should express the remainder as a fraction.
- Have students work in partnerships to complete the rest of journal page 170, using either of the strategies discussed in this lesson to solve the problems.
- **Differentiate:** To support students who struggle doing whole-number multiplication and division, suggest using a calculator to complete the multiplication and division involved in using each fraction/whole-number multiplication strategy. Ask them to record number sentences or the keystrokes they used on the calculator so they can demonstrate their understanding of each strategy.
- **Introduce Fraction/Whole Number Top-It.** SRB page 310. Students practice multiplying fractions by whole numbers.
- Have volunteers share a problem they solved in one round of *Fraction/Whole Number Top-It* and describe how they solved it.

Practice: MJ page 171 (Using a Graph). Math Boxes page 172. Home Link 5-6

Assessment: Expect most students to be able to successfully apply one of the strategies practiced in this lesson to solve Problems 2 and 4, which have whole-number answers. Some will be able to solve Problems 3 and 5, which have fractional answers, and some may be able to demonstrate how to use both strategies to solve the problems.

Differentiation:

- **Readiness: Reviewing Division Strategies.** Students review and discuss division strategies, including how to report remainders as fractions. Display a simple division problem with a whole number answer. Invite students to share answers and strategies. Display a division problem with a whole number answer. Have students share strategies for solving the problem. Display a division problem with a remainder. Have students solve and share strategies. Review how to express the remainder as a fraction.
- **Extra Practice:** Activity Card 63. For additional practice multiplying whole numbers by fractions, students generate problems with number cards and solve them using both of the strategies discussed in this lesson. They discuss answers with a partner and compare the two strategies.
- **Enrichment:** Activity Card 62**.** To extend their work with multiplication of fractions and whole numbers, students generate multiplication problems with number cards. Before solving each problem, they predict whether the product will be greater than or less than each of the factors. Problems include fraction factors both less than 1 and greater than 1
- **ELL Support**: To support students' understanding of the relationship between multiplying by a unit fraction and dividing by the denominator of that fraction, build understanding of the terms same, like, and alike. Show pairs of objects.

Lesson 5.7 Fractions of Fractions

Students will apply and extend their understanding of finding fractions of whole numbers to find fractions of fractions.

Before You Begin: For the Focus activities, each student will need at least seven sheets of paper. The exact size is not important, but students may struggle completing the folding activities if the paper is much smaller than a standard sheet.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students solve fraction of problems.

Focus: Math Message: Students find 12 of a whole number and 1/2 of a fraction.

Math Message Follow-Up:

- Students share their strategies for solving the fraction-of problems and discuss what was difficult about finding a fraction of a fraction.
- Circulate and observe students as they solve the Math Message problems. Expect most students to struggle with Problem 2, but encourage them to persevere by using representations or tools to think it through. After students have had sufficient time to work, invite them to share their answers and strategies for finding 1/2 of 3. Then have them share strategies for finding 1/2 of 3/4.
- MJ page 173-174. Students find fractions of fractions by folding paper
- Distribute several sheets of paper to each student. (*See Before You Begin.*) Tell students that they will fold the paper to solve problems involving finding fractions of fractions. Pose the following problem: *Larry has* 1/2 *of a fruit bar. He wants to give* 1/2 *of what he has to his brother. What part of a whole fruit bar will Larry give to his brother?*
- Tell students they will use a sheet of paper to represent Larry's fruit bar. Have them fold it in half vertically and then unfold it. Demonstrate how to orient their sheets so that the fold line is vertical and ask students to shade in 1/2.
- Have partners compare their answers on journal page 174 and discuss to resolve any discrepancies
- **Differentiate:** When folding paper, some may make the number of folds match the denominator instead of thinking about the number of folds needed to represent the correct number of equal parts.

Practice: MJ page 175. Math Boxes 5-7. Home Link 5-7

Assessment: Expect most students to be able to sketch the results of their paper folding and shading on journal pages 173–174 to represent fraction products. When prompted to think about the total number of parts and the number of shaded parts, most will also be able to interpret the results and record the correct products.

Games: Play Division Top-It. SRB page 325. Students practice dividing multi-digit whole numbers

Differentiation:

- **Readiness: Labeling Fractions on Folded Paper.** Students label sections of folded paper with the fractions they represent.
- **Extra Practice:** Activity Card 64. MM G24. For additional practice finding fractions of fractions, students use the *Fraction-Of* fraction cards and game board (*Math Masters*, page G24) to create fraction-of problems. They solve the problems by folding paper and record their answers on the *Fraction-Of* Record Sheet.
- **Enrichment:** MM page 184. To extend their work finding fractions of fractions, students solve a multistep fraction-of problem on Math Masters, page 184.
- **ELL Support:** Help students understand horizontal and vertical by combining the words with gestures. Have students trace a vertical line or gesture up and down as they repeat the term vertical.

Lesson 5.8 Area Models for Fraction Multiplication

Students use area models to find fraction products.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students compare decimals.

Focus: Math Message: Each student will need one sheet for paper. Fold and shade a sheet of paper to find 2/3 of 2/3. Discuss with a partner and compare your work.

Math Message Follow-Up:

- MJ page 176. Students discuss how the area of rectangles with given dimensions can represent fraction products.
- Invite students to share answers. Tell students that folding and shading paper is one way to find fraction products. Today they will explore a different way to find fraction products using what they know about area.
- Ask students to turn to journal page 176 and examine the diagram in Problem 1. Display the journal page for the discussion. Point out that there are two number lines, one **horizontal** and one **vertical**, and each of the number lines shows the interval from 0 to 1.
- **MJ page 177.** Students draw area models to find fraction products.
- Have students turn to journal page 177 and look at the diagram in Problem 1. Display the journal page for the discussion. Ask: *How could we use this diagram to help us find* 3/4 × 2/6*?*
- Walk through the steps of Problem 1 with the class. Ask guiding questions like the ones below to help students complete Parts a–e and the diagram. Complete your displayed journal page as the class follows along in their journals.
- **Differentiation:** If students struggle determining the areas of the rectangles, ask guiding questions like these: How many parts is the unit square divided into? How many of those parts are shaded? What fraction of a square unit is shaded?
- Have volunteers explain whether they prefer to use paper folding or area models to multiply fractions and why.

Practice: MJ page 178. Math Boxes 5-8. Home Link 5-8

Assessment: Expect most students to shade rectangles with the appropriate dimensions in Problems 2 and 3 on journal page 177 and to use the rectangles to find the fraction products.

Games: Play Multiplication Top-It. SRB page 325. Students practice playing multi-digit whole numbers

Differentiation:

- **Readiness: Labeling Fractions on a Number Line.** MM page 187. To prepare for labeling area models, students label fractions on a number line. Stress the difference between intervals and tick marks on the worksheet.
- **Extra Practice:** Activity Card 65. MM page 186. For additional practice multiplying fractions by fractions, students use area models to solve fraction multiplication problems. Students use the halves, thirds, fourths, and fifths from their fraction cards to determine fraction factors. They create and use area models (*Math Masters*, page 186) to find the product.
- **Enrichment:** MM page 188. To extend their work finding products of fractions, students solve a multistep fraction problem about planning a community park. They examine two park plans on *Math Masters*, page 188 and use number models to help them answer questions. They decide which plan they think the community should choose and explain their choice.
- **ELL Support:** Students may use the terms tick mark and check mark interchangeably. Help them understand the difference by showing and naming both a check mark and a variety of tick marks, such as those found on number lines, rulers, and thermometers.

Lesson 5.9 Understanding an Algorithm for Fraction Multiplication

Students use area models to understand and apply an algorithm for fraction multiplication.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students round decimals.

Focus: Math Message. Students use an area model to represent a fraction multiplication problem. M*ake a copy of* MM *page TA30. Work with a partner to draw an area model for* 3/4 ∗ 2/3.

Math Message Follow-Up:

- **MJ page 179. MM page TA30.** Students predict how many total parts and how many shaded parts will be in area models. They use patterns to derive a fraction multiplication algorithm.
- Display *Math Masters*, page TA30 and have students help you create an area model for 3/4 ∗ 2/3. Note that some students may have represented 3/4 on the vertical number line and ⅔ on the horizontal number line. Point out that this is also a correct model for the problem and that both models show the same product.
- **Differentiate:** If students struggle multiplying fractions using the algorithm, have them use *Math Masters*, page TA30 to complete an area model to find the product. Then ask them to look for and describe the relationships between the numerators of the factors and the product and the denominators of the factors and the product.
- **MJ page 179.** Students practice using a fraction multiplication algorithm
- Explain that students will practice using the algorithm to multiply fractions. Students should still check whether their answers make sense by using strategies such as paper folding, area models, or predicting the size of the product before or after they do the computation.
- Have students complete MJ page 179 individually or in partnerships.
- Have students talk with a partner about how they used the algorithm to multiply the fractions in Problem 7.

Practice: MJ page 180 (Solving Decimal Number Stories). Math Boxes page181. Home Link 5-9

Assessment: Expect that most students will successfully use the algorithm to multiply the fractions in Problems 2–7 on journal page 179. Some students may be able to draw an area model in Problem 8 and explain how it shows that one of their answers is correct.

Differentiation:

- **Readiness: Looking for Patterns in Area Models.** MJ2 page 176-177. To prepare for deriving an algorithm for fraction multiplication, students look for patterns in area models. Have students examine the factors and area models they completed previously on the journal pages and look for patterns.

- **Extra Practice**: Activity Card 66**.** For additional practice using an algorithm to multiply fractions, students draw fraction cards to generate fraction multiplication problems. They explain why the algorithm works. As an extension, students draw area models to represent products.
- **Enrichment:** MM p. 190**.** To extend their understanding of a fraction multiplication algorithm, students show that the algorithm works for fractions greater than 1. They use an area model to support their reasoning.
- **ELL Support:** To support students' understanding of the term algorithm, show examples of visual step-by-step directions, such as illustrated direction for putting together a model car. Extend to following steps for a familiar math algorithm such as U.S. traditional multiplication.

Lesson 5.10 Sharing Breakfast (2-Day Lesson)

Students will solve a fraction number story by interpreting a drawing that models the situation.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students use place-value clues to write decimals.

Focus: Math Message: Students create and explain a representation for a fraction multiplication problem.

Math Message Follow-Up:

- Invite students to share their drawings or paper folding with a partner and discuss how they chose to represent, or show, the multiplication problem. Ask several partnerships to share their representations.
- Distribute *Math Masters*, pages 192 and 193 to each student. Read the problem as a class and review the directions. You may wish to make colored pencils available for students to use for their drawings.
- Explain that a breakfast casserole contains eggs, vegetables, and other ingredients and is baked in an oven. Consider showing a picture of a breakfast casserole. Partners or groups should work together to ensure they understand the directions and interpret the picture correctly.
- Have students turn to *Student Reference Book*, pages 12–14 to read about Ask: *Why do mathematicians use models to solve problems and answer questions?*
- **Differentiate: Academic Language Development**
  - Tell students that instead of saying that the shading shows a fraction, they can use the synonym "represents"
  - If students struggle writing an explanation in Problem 4, suggest using this sentence frame: *In the picture,* _____ *represents* _____. Have students explain it orally. IF students struggle finding the words to describe the picture, consider reviewing the terms column, row, numerator, denominator, part, and whole.

Day 2:

- Review students' work. Use the Reengagement Planning Form (Math Masters, page TA4) and the rubric in the Day 2 Focus activity: Revising Work to plan ways to help students meet expectations for both the content and practice standards. Look for common misconceptions, such as students who misinterpret the story, thinking that Group A left the square labeled "leftover portion" for Group B to eat. Also make sure students are working with correct drawings and number models.

- After this brief discussion, tell students that they are going to look at other students' work and see whether they thought about the problem in the same way. Explain that students will try to figure out how others used models to solve the problem and answer questions.
- Remind students that they can change their minds about how to solve a problem. Refer to your list of discussion guidelines and encourage the class to use sentence frames when discussing other students' work:
  - Could you explain _____?
  - I like how _____.
- Pass back students' work from Day 1. Before students revise anything, ask them to examine their responses and decide how they could be improved. Ask the following questions one at a time. Have partners discuss their responses and give a thumbs-up or thumbs-down based on their own work.
  - *Did you identify the fraction of the whole casserole that Group B took?*
  - *Did you add to the picture or include a drawing to show how you found how much Group B took?*
  - *Did you write a correct number model that represents the story?*
  - *Did you explain how you interpreted the picture to solve the problem?*
- Tell students they now have a chance to revise their work. Have them work with their partners from Day 1. Students who wrote complete and correct explanations on Day 1 can look for ways to improve their work or find a new strategy for solving the problem. Help students see that the explanations presented during the discussion are not the only correct ones. Tell students to add to their earlier work using colored pencils or to use another sheet of paper, instead of erasing their original work.

Practice: Math Boxes page 183. Home Link 5-10

Differentiation: If students struggle getting started, assist with a prompt such as: *Use the picture to figure out how much casserole Group A took. How much casserole was left before Group B took their portion?*

Assessment:
Collect and review students' revised work. Expect them to improve their work based on the class discussion. For the content standard, expect most students to use the drawing to find Group B's portion of the casserole as 3/12 in Problem 1. Use rubric from website or book.

Summarize: Ask students to reflect on their work and revisions. Ask: *What did you do to improve your drawing, number models, and explanations?*

Lesson 5.11 Explaining the Equivalent Fractions Rule

Students will relate the multiplication rule for equivalent fractions to the effect of multiplying by 1

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students generate equivalent fractions.

Focus: Math Message. Students compare the size of a product to the size of one factor without multiplying.

Math Message Follow-Up:

- MJ page 184. Students discuss the results of multiplying by numbers greater than, less than, and equal to 1.
- Complete Problem 1 on journal page 184. Be prepared to explain your thinking. Before students share their answers, ask: *What do you notice about the number sentences in Problem 1?* Have students explain their answers. Expect most to know that multiplying 5 by a fraction less than 1 will result in a product less than 5, but they may need support reasoning through the effects of multiplication by fractions greater than 1.
- Students solve fraction multiplication problems with fractions equal to 1 to explain the equivalent fractions rule.
- Display a name-collection box for 1. (*See below.*) Have students list fractions that could go in it. If students struggle thinking of fraction names, encourage them to think about collections of fraction circle pieces that are equivalent to one red circle. For example, 4 yellow pieces make 1 red circle, and each yellow piece shows 1/4, so another name for 1 is 4/4.
- Tell students they are going to explore the result of multiplying fractions by fractions equivalent to 1. As a reminder, ask a volunteer to describe the fraction multiplication algorithm students learned in Lesson 5-9. Remind the class that finding an equivalent fraction by multiplying the numerator and the denominator by the same number is called the **multiplication rule for equivalent fractions.**
- Have students explain how they knew their fractions in Problem 2 were equivalent. Emphasize the idea that the equivalent fractions rule relies on the Multiplicative Identity Property, the idea that any number times 1 equals itself.
- **Differentiate:** If students struggle explaining in writing how they know that one fraction is equivalent to another, have them first explain orally. Use prompts like these to guide their explanation: You wrote that _____ is equivalent to _____. How do you know that these fractions are equivalent? What did you multiply by? Why did you multiply by 22 and not a fraction like 23? What is special about multiplying by a fraction equal to 1? What do you know about multiplying by 1? Put these ideas together in your explanation.

Games: Play Fraction Top-It Addition. SRB page 309. Students practice adding fractions

Practice: MJ page 185. Math Boxes 5-11. Home Link 5-11

Assessment: Use Problem 2 on journal page 184 to assess students' ability to relate the multiplication rule for equivalent fractions to the Multiplicative Identity Property. Expect most to be able to identify fractions equivalent to 1 in Part A and use the multiplication rule to generate equivalent fractions in Part B. Some may be able to explain why the fractions are equivalent in terms of the Multiplicative Identity Property in Problem 2c.

Differentiation:

- **Readiness: Revisiting the Multiplication Rule for Equivalent Fractions.** MM page 195. Students make and interpret fraction representations.
- **Extra Practice:** Activity Card 67. MM page 197. For more practice explaining the results of multiplying by different factors, students summarize patterns from the lesson. They draw a symbol card and use number cards to form a fraction factor that makes a number sentence true. Students discuss which fraction factors produce products equivalent to the fraction they started with.
- **Enrichment:** MM page 196. To extend their work with fraction equivalence and the Multiplicative Identity Property, students explore and explain a division rule for generating equivalent fractions.
- **ELL Support:** Use the phrase "exactly the same" with visuals of identical objects to help student understand the Multiplicative Identity Property. Accompany the visuals with think-alouds. Show a mixed collection of objects. Indicate one that has an identical match in the set and ask a student to identify the match. Repeat with other objects. Build on experiences with the word "identical", emphasizing that when we multiply by 1, the answer is identical to, or exactly the same as, the other factor.

Lesson 5.12 Fraction Multiplication Number Stories

Students create story contexts for fraction multiplication problems.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students compare the size of a product to the size of one factor without multiplying.

Focus: Math Message: Students think of real-world uses of multiplication.

Math Message Follow-Up:

- **MM page 202.** Students will discuss real-world contexts for whole number and fraction multiplication.
- Invite students to share situations where they use multiplication. Make a list of situations as students suggest them, drawing attention to units that might be used. Point out that recognizing and creating number stories involving multiplication requires students to draw on their understanding of what it means to multiply. Tell students that today they will extend their understanding of multiplication to real-life situations involving fraction multiplication. Have students work in partnerships. Each partnership should pick a number pair and tell a multiplication number story ending in a question. Before solving, students should predict how the product will compare to each of the factors.
- Ask students whether the multiplication situations from the Math Message would make sense with fractions. Encourage them to generalize about the types of multiplication stories that can be told with fractions as opposed to whole numbers. Be sure to discuss these points:
- When multiplying fractions by fractions, it doesn't make sense to think in terms of multiple sets of objects. For example, you might have 4 boxes of 8 crayons, but you wouldn't have 1/4 box of 12 crayon.
- Only some units work with fractional amounts. For example, you can have 3/4 cup of milk, but you can't have ¾ of a student.
- Area and comparison situations still work with fractions. For example, you can have a tile that is 1/2 foot by 14foot. You can also say that something is a fraction of the size of something else.
- Students match number sentences to visual representations and then write fraction multiplication number stories. Once all the cards have been matched, students will pick two pairs of cards, glue or tape them in their journal, and write a number story that can be modeled by each pair of cards. Demonstrate by displaying a matching set of cards and telling a multiplication number story. Distribute *Math Masters*, pages 199–200 to each partnership. Have them cut out the cards and complete journal page 186.
- Invite volunteers to share their favorite number story. Discuss how the story fits the number sentence and representation.

- **Differentiate:** To provide support for generating appropriate number stories, suggest that students replace the multiplication symbol with the word *of*.

Practice: MJ page 187. Math Boxes 5-12. Home Link 5-12

Assessment: Use journal page 186 to assess students' ability to generate real-world contexts involving fraction multiplication. Most students should be able to write a multiplication number story involving a fraction and a whole number. Some students may be able to write a multiplication story involving two fractions. If students struggle, suggest that they think about fractions as measurements in recipes, lengths of rooms or rectangular objects, or distances.

Games: Playing Spend and Save. SRB page 323. MM page G27. Students practice adding and subtracting decimals in a money context.

Differentiation:

- **Readiness: Creating Realistic Number Stories.** Use a think-aloud to demonstrate how to generate a whole-number multiplication number story using 4*5. Have students use their ideas to write a number story.
- **Extra Practice:** Activity Card 68. MM page TA11. For more practice writing fraction multiplication number stories, students draw number cards to generate fraction multiplication problems and write number stories to match. Students trade stories and solve. Then they discuss their strategies.
- **Enrichment:** MM page 201. To extend their work creating story contexts for fraction multiplication problems, students write two different number stories and draw representations using the same numbers. They think about the differences in context for multiplying a fraction by a whole number and multiplying two fractions.
- **ELL Support:** To help prepare students for writing number stories, create a display of words with pictures. Use words with contexts that are appropriate for using an area model. As a nonverbal option for students to show their reasoning, model how to illustrate number stories with a quick sketch sequence, as in a comic strip.

Lesson 5.13 Fraction Division, Part 1

Students use visual models to divide unit fractions by whole numbers.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students find fractions of fractions.

Focus: Math Message: Students solve division problems using fraction representations or drawings.

Math Message Follow-Up:

- Students use visual models and the relationship between multiplication and division to interpret division of unit fractions by whole numbers.
- Have students briefly share their solutions and strategies for Problems 1 and 2. Expect them to use a mental strategy to solve Problem 1 and a number line or fraction circles for Problem 2. After several students share, ask: *What number models could we write to summarize our solutions for Problems 1 and 2?*
- **Differentiate:** To help students make sense of fraction division situations, ask guiding questions like the following:
    - *What are we starting out with in this problem? How can we represent that amount?*
    - *What is happening to that start amount?*
    - *What number model could represent this situation? What operation makes sense?*
    - *How can we show division in our representation of the start amount?*
    - *Remembering the whole, what is one of the equal parts?*
- Point to the number models for Problems 1 and 2. Ask students to identify the **quotient, dividend,** and **divisor** in each number model, reviewing the definitions as needed.
- MJ page 188. Pose several fraction division number stories. Have students write a number model using a letter for the unknown; solve using representations such as fraction circles, number lines, or drawings; and check their answers by thinking about the relative size of the quotient and using multiplication. When most students seem comfortable solving division problems, have them complete journal page 188. Circulate and assist.
- Have partners share the models they used to solve Problems 1 and 2.

Practice: MJ page 189 (Using a Coordinate Grid). MJ page 190. Math Boxes 5-13. Home Link 5-13. Students may benefit from circling one of the equal parts in their drawing to identify the quotient.

Assessment: Expect most students to use a visual model to accurately divide unit fractions by whole numbers in Problems 1 and 2. Some may notice a pattern and be able to divide unit fractions by whole numbers without a visual model. For students who struggle interpreting or solving

fraction division problems, emphasize visual models and ask guiding questions like the ones in the Adjusting the Activity note.

Differentiation:

- **Readiness: Reviewing the Relationship between Division and Multiplication.** This prepares students for using multiplication to check fraction division problems.
- **Extra Practice:** Activity Card 69. For additional practice dividing unit fractions by whole numbers, students draw fraction cards and roll a die to generate fraction division problems. They create a visual representation for each problem and use multiplication to check their answers. Students discuss patterns they notice.
- **Enrichment:** MM page 204. To extend their work with fraction division, students use visual models to solve real-world problems involving non-unit fractions divided by whole numbers.
- **ELL Support:** Introduce vocabulary terms used in the lesson by preparing an anchor chart titled Division that shows a problem with a dividend, divisor, and quotient labeled. Include number sentences with the division sign and fractions. Provide oral practice with the terms of division and have students repeat the terms as you point to examples in various forms. Note the potential for confusion pronouncing the word “dividend” due to the sound of the second i.

Lesson 5.14 Fraction Division, Part 2

Students will use visual models to divide whole numbers by unit fractions.

Standards: 5.NBT.5, 5.NF.1, 5.NF.2, 5.NF.4a, 5.NF.4b, 5.NF.5, 5.NF.6, 5.NF.7

Warm-Up: Mental Math: Students compare the size of a product to the size of one factor without multiplying.

Focus: Math Message: Students use fraction circle pieces to divide a whole number by a fraction.

Math Message Follow-Up:

- Students discuss strategies for solving division problems with fractional divisors.
- Invite students to share their solutions and strategies. Ask: *How did you use your fraction circle pieces to solve this problem?* Encourage students to ask questions to make sure they understand one another's strategies.
- **Differentiate:** If students struggle recognizing the problem as division, ask guiding questions like these: *What did we start with? What happened to that amount? Which operation matches splitting into equal pieces?* For those who struggle interpreting or solving fraction division problems, emphasize visual models and consider implementing the Readiness activity or the Adjusting the Activity note
- Students solve problems in which whole numbers are divided by unit fractions.
- **MJ page 191-192.** Display several division problems in which a whole number is divided by a unit fraction. *Suggestions:*

  $5 \div 1/3$ $4 \div 1/6$ $3 \div 2/8$

- Tell students that it can be helpful to create story contexts to make sense of division problems, and demonstrate with the first problem. Think aloud: *Why would 5 of something be split into* 1/3*s? Flour usually comes in 5-pound bags. Maybe a restaurant has a 5-pound bag of flour and they use* 1/3 *pound of flour each time they make a batch of pancakes. Dividing 5 by* 1/3 *would tell me how many batches the restaurant can make with the 5-pound bag of flour.* Explain that one way to model this problem would be to draw 5 rectangles to represent 5 pounds and split each rectangle into 1/3s. This model could then be used to solve the problem.
- Invite students to tell number stories for the remaining division problems and record them. Have partners work together to model and solve the number stories. Have them write a division number sentence to summarize each solution and a multiplication number sentence to check their answer. Students should also check that the quotient is greater than the dividend in each problem. Ask volunteers to share strategies and solutions. Encourage students to ask each other questions to clarify their thinking.

- Have students discuss the differences between dividing 5 by 1/4 and dividing 1/4 by 5. Help them think about the size of each quotient compared to the dividend and to consider what drawings or models they might use to solve each problem. Encourage students to ask questions to help make sense of one another's thinking.

Games: Play Fraction/Whole Number Top-It. SRB page 310. MM page G14. Students practice multiplying fractions by whole numbers or fractions by fractions

Assessment: Expect most students to be able to use a model to accurately divide whole numbers by unit fractions in Problems 1 and 2 on journal page 191. Some may be able to write an appropriate number story in Problem 3 on journal page 192.

Practice: MJ page 193 Math Boxes. Home Link 5-15

Differentiation:

- **Readiness: Finding the Number of Groups.** To prepare for interpreting division of whole numbers by unit fractions, students solve problems that involve finding the number of equal groups in a total. Emphasize that the quotient is the number of times a smaller number fits into a total, which is one way of thinking about division.
- **Extra Practice:** Activity Card 70**.** For additional practice dividing whole numbers by unit fractions, students draw cards and roll a die to generate fraction division problems. They use multiplication to check their answers and discuss patterns in their number sentences
- **Enrichment:** MM page 206. To extend their work with fraction division, students use visual models and the relationship between multiplication and division to divide fractions by fractions. They check the reasonableness of their answers and look for patterns in the results
- **ELL Support:** To help students understand the number story contexts in the lesson, use real-life objects or pictures of the objects in the number stories. Point to the objects and then the mathematical models.

Lesson 5.15 Unit 5 Progress Check

Administer the Unit 5 Assessment.

Day 1:

- **Unit 5 Self-Assessment:**
  Students complete the Self-Assessment to reflect on their progress in Unit 5
- **Unit 5 Assessment:**
  Students complete the Unit 5 Assessment to demonstrate their progress on the New Jersey Student Learning Standards covered in this unit.
- **Differentiation:**
  All of the content included in the Unit 5 Assessment was recently introduced and will be revisited in subsequent units.
- **Unit 2 Challenge** (Optional):
  Students may demonstrate progress beyond expectations after they complete the Unit 5 Assessment.

Day 2:

- **Open Response Assessment:**
  Students model and solve fraction multiplication and division number stories.
- **Solving the Open Response**:
  The Open Response problem requires students to apply skills and concepts from Unit 5 to model and solve fraction multiplication and division number stories.
- **Differentiate: Adjusting the Assessment**
  If students struggle getting started, suggest that they begin by thinking of ways to represent the number of apples needed to make smoothies for the whole family by using drawings or fraction circles. Encourage students to provide additional models such as a number model, drawing, or number line.
- **Discussing the Problem:** After completing the problem, invite students to share models and solutions with a partner, and then the class. Be sure to discuss both correct and incorrect models.

Looking Ahead:

- **Math Boxes** 5-15: Preview for Unit 6
- **Home Link** 5-15: Students take home the Family Letter that introduces Unit 6.

Unit Plan Title	Investigations in Measurement; Decimal Multiplication and Division
Suggested Time Frame	20 Days including flex days

Stage 1: Desired Results

Overview / Rationale

In this unit, students apply their understanding of place value to multiply and divide decimals by powers of 10. They investigate how patterns in powers of 10 can be used to convert measurements in metric units, learn how line plots can be used to organize and analyze measurement data, and explore a method of finding volumes of figures that are not rectangular prisms. Students also extend whole-number methods to multiply and divide decimals.

New Jersey Student Learning Standards for Mathematics

5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

5.NBT.3 Read, write, and compare decimals to thousandths.

5.NBT.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots.

5.MD.3 Recognize volume as an attribute of solid figures and u 5.MD.3 understand concepts of volume measurement.

5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

GMP6.1 Explain your mathematical thinking clearly and precisely.

GMP6.2 Use an appropriate level of precision for your problem.

GMP6.3 Use clear labels, units, and mathematical language.

GMP6.4 Think about accuracy and efficiency when you count, measure, and calculate.

GMP7.1 Look for mathematical structures such as categories, patterns, and properties.

GMP7.2 Use structures to solve problems and answer question.

Technology Integration
__X__ **8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
- Student Websites - Teacher Websites - SMART board
____ **8.2 Technology Integration, Engineering, Design and Computational Thinking – Programming** All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES
The following social and emotional competencies are integrated in this curriculum document:

Self-Awareness
_____Recognize one's own feelings and thoughts
_____Recognize the impact of one's feelings and thoughts on one's own behavior
_____Recognize one's personal traits, strengths and limitations
_____Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management
__x__Understand and practice strategies for managing one's own emotions, thoughts and behaviors
__x__Recognize the skills needed to establish and achieve personal and educational goals
__x__Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness
__x__Recognize and identify the thoughts, feelings, and perspectives of others
_____Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
_____Demonstrate an understanding of the need for mutual respect when viewpoints differ
_____Demonstrate an awareness of the expectations for social interactions in a variety of setting

Responsible Decision Making
__x__Develop, implement and model effective problem solving and critical thinking skills
_____Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills
_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
_____Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

In this unit plan, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – 21st Century Themes			**Indicate whether these skills are:** ● **E – encouraged** ● **T – taught** ● **A – assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**			CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
X	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing			CRP5. Consider the environmental, social and economic impacts of decisions.
X	Becoming a Critical Consumer			CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
	Career Exploration			CRP11. Use technology to enhance productivity.
	Career Preparation			CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

NJ Student Learning Standards for English Language Arts

RI.4.3 - Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.4 - Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

RI.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.4.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Essential Questions:	**Enduring Understandings:**
● How does the value of a number change as you move the decimal (to the right or left)? ● How do charts, tables, and graphs help you interpret data?	***Students will understand that…*** ● Moving a decimal to the right or left is a quick way to multiply or divide by 10. ● Charts, tables, and graphs can give us clues as to what happens beyond the limits of our tables.
Knowledge:	**Skills:**

Students will know…	**Students will be able to…**
● Exponential notation, exponent, base, power of 10 ● Metric system ● Line plot, data point, data set, scale ● Data point ● Displacement method, calibrate ● Equivalent problem ● Reaction time	● Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 110 of what it represents in the place to its left. ● Use whole-number exponents to denote powers of 10; multiply whole numbers by powers of 10 and explain the number of zeros in the product; multiply or divide a decimal by a power of 10 when no more than one placeholder zero is necessary to write the product or quotient. ● Read and write decimals to thousandths using base-ten numerals, number names, and expanded form; compare two decimals to thousandths based on the meanings of the digits in each place, using >, =, or < to record comparisons. ● Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. ● Add and subtract decimals to hundredths using models or strategies; estimate and find products of decimals when both factors are greater than 1; estimate and find quotients of decimals when the dividend is greater than 1 and the divisor is a whole number.

	● Place fractional data on a line plot when the number line and scale are provided; use information in line plots to solve single-step problems. ● Recognize volume as an attribute of solid figures and understand concepts of volume measurement, including that a unit cube can be used to measure volume and that the volume of a figure in cubic units is equal to the number of unit cubes that would fit inside the figure. ● Relate the multiplication involved in volume formulas to the process of packing with unit cubes; apply volume formulas to solve real-world and mathematical problems; use volume formulas and addition to find volumes of figures composed of rectangular prisms.

Student Resources	
Decimal Switch	http://www.interactivestuff.org/sums4fun/switch.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Decimal/Fraction Match	http://www.interactivestuff.org/match/maker.phtml?featured=1&id=8
	www.abcya.com www.sheppardsoftware.com www.coolmath.com

Teacher Resources	
Games/Lessons Topics	http://littletonpublicschools.net/Default.aspx?tabid=539
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Demo Lessons/Activity Sheets	http://www.learnalberta.ca/content/me5l/html/math5.html

Decimal Switch	http://www.interactivestuff.org/sums4fun/switch.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Decimal/Fraction Match	http://www.interactivestuff.org/match/maker.phtml?featured=1&id=8
Quizzes/Practice	http://littletonpublicschools.net/Default.aspx?tabid=539
Create a Graph	http://nces.ed.gov/nceskids/createagraph/default.aspx
Khan Academy	www.khanacademy.com
Mentor Texts	Perimeter, Area and Volume Fractions, Decimals and Percent Math-terpieces Polly's Pen Pal

Stage 2: Acceptable Evidence

Assessments

Formative:

- Math Message
- Oral Mental Math Fluency
- Math Journal
- Slates
- Lesson Assessment Check-In
- Collins Writing
- Exit Slips
- Home Link
- Teacher Observation
- Games/Activity Cards

Summative:

- Benchmark Assessment
- Quizzes
- Unit Progress Check
- Open Response Assessments
- Student Work Products

Stage 3: Learning Experiences

Lesson 6-1 Multiplying and Dividing Decimals by Powers of 10

Students use a calculator to multiply and divide decimals by powers of 10. They describe and explain patterns in the placement of the decimal point.

Standards 5.NBT.1, 5.NBT.2, 5.NBT.3

Warm-Up: Mental Math: Students read aloud decimals written in numerals.

Focus: Math Message: Students write 3.2 million in standard notation

Math Message Follow-Up:

- Students discuss strategies for writing 3.2 million, or $3.2 * 106$, in standard notation.
- Ask several students to share their answers to the Math Message and explain their reasoning. Display the place-value chart on *Math Masters,* page TA32.
- Expect some students to incorrectly translate 3.2 million as 32,000,000, thinking that since 1 million has 6 zeros, there should be 6 zeros after the 3 and the 2. For students who make this error, emphasize the point that 3.2 million means 3 whole millions and another 210 of a million. Invite volunteers to read their numbers aloud to check whether their number has 3 million or 32 million.
- Students multiply and divide decimals by powers of 10. They look for and explain patterns in the placement of the decimal point.
- Tell students they will use a calculator to multiply and divide decimals by powers of 10 written in exponential notation. Have them look at their calculators as you point out the keys for entering numbers in exponential notation. You may want to refer to *Student Reference Book,* pages 334 and 335 for examples
- MJ pages 196-197 (Multiplying and Dividing Decimals by Powers of 10)
- **Differentiation:** To support students who struggle trying to apply or understand rules for multiplying and dividing by powers of 10, suggest multiplying or dividing by one 10 at a time. For example, for 3.1 x 104:
  - 3.1 x 10 = 31
  - 31 x 10 = 310
  - 310 x 10 = 3,100
  - 3,100 x 10 = 31,000
  - Explain that multiplying by 104 is the same as multiplying by 10 four times.
  - If students struggle when describing how digits shift, have them place each product in a place-value chart (Math Masters, page TA32). Ask questions like these: In what place was the 3 before we multiplied? Where was the decimal point? In what place is the 3 now, after we multiplied? Where is the decimal point now? So how did the digit 3 move

when the start number was multiplied by 10? How did the decimal point move? After students have described shifts for multiplying or dividing by 10, have them compare a start number like 3.1 with the final result of multiplying or dividing by a power of 10, like 31,000.

- Have partners share their explanations from Problem 13. Encourage students to think about the connection between powers of 10 and place-value relationships when describing how digits and the decimal point shift.

Assessment: Expect most students to be able to apply the rules they summarized in Problems 3 and 6 to solve Problems 7–10, which require attaching, at most, one placeholder zero. Some may be able to accurately apply the rules in Problems 11–12, which require attaching two or more placeholder zeros. Some students may also be able to explain patterns in the placement of the decimal point by referring to place-value relationships in Problem 13. If students struggle trying to recognize or apply patterns, suggest multiplying or dividing by one 10 at a time, as described in the Adjusting the Activity note.

Practice: MJ page 195 (Interpreting Dog Food Data). MJ page 198 Math Boxes. Home links 6-1

Differentiation:

- **Readiness: Exchanging Base-10 Blocks to Represent Place-Value Shifts.** MM page TA33. Preparing students to describe patterns when multiplying or dividing by powers of ten.
- **Extra Practice:** Activity Card 71. For additional practice multiplying and dividing decimals by powers of 10, students draw cards to form decimals, roll a die to determine exponents, and flip a coin to create multiplication or division problems. They use a calculator to check their work. Students discuss what patterns they used to solve the problems and explain why those patterns make sense.
- **Enrichment:** MM page 212. To extend their work multiplying by powers of 10, students explore patterns in exponents when numbers are multiplied by more than one power of 10. They use decimal-point patterns to solve problems and compare the result to related problems. They describe what they notice and apply the pattern to rewrite expressions with powers of 10 Allow students to use calculators to check their work.
- **ELL Support:** Introduce students to the term “base” by preparing a pictorial 4-square graphic organizer (MM page TA2).

Lesson 6-2 Playing *Exponent Ball*

Students learn a game to practice multiplying and dividing decimals by powers of 10.
Standards 5.NBT.1, 5.NBT.2, 5.NBT.3.b, 5.OA.2
Warm-Up: Mental Math – Writing decimals that are greater than and less than a given decimal.
Math Message: Students put expressions in order from least to greatest
Focus: Math Message Follow-Up

- Students discuss a strategy for ordering expressions without evaluating them
- Invite several students to explain how they ordered the expressions. Expect many of them to have evaluated each expression and then ordered the results. (Ask if anyone put the expressions in order without evaluating them first. Have students share their reasoning.
- **Game:** Introduce Exponent Ball, SRB page 303-304, Students practice multiplying and dividing decimals by powers of 10. They compare decimals and whole numbers to determine their scores.
- Have students explain how they multiplied and divided by powers of 10 when playing *Exponent Ball.* Remind them to think about why patterns with the decimal point make sense.

Practice: MJ page 199 (Practicing Fraction Division). MJ page 200 Math Boxes. Home link 6-2
Differentiation: Adjusting the Activity

- To support students who struggle comparing numbers or placing a number within a range, suggest that they write the number in a computation grid (*Math Masters*, page TA7). They can then write the lower and higher numbers from a range above and below the number they are trying to place. Make sure they align the decimal points. Remind students to compare digit by digit, starting with the largest (or left-most) places.
- Ask questions like these: *Is 0.0042 greater than the lower number, 0.0001?* Yes. *Is 0.0042 less than the higher number, 0.00099?* No. *Does 0.0042 fall within the range 0.0001–0.00099?* No. Have students try other ranges until they find one that fits

Differentiation:

- **Readiness: Placing Values within a Range of Numbers.** MM page G28, page TA7.
- **Extra Practice:** MM page 214. For additional practice multiplying and dividing by powers of 10, students evaluate expressions representing different animal weights. They compare the weights and explain their reasoning.
- **Enrichment:** Activity Card 72. To extend their experience with multiplying and dividing by powers of 10, students work backward from a range of values to form multiplication and division expressions. They roll a die to select a range, name a number within the range, and translate that number into an expression with a power of 10.
- **ELL Support:** To build or activate background knowledge about the sport of American football, consider showing a video clip from a football game. Discuss the meaning of terms: goal line, yard, yard line, kick, run, and touchdown.

Assessment: Use the *Exponent Ball* record sheet to assess students' ability to multiply and divide decimals by powers of 10. Expect most to make reasonable attempts to use patterns to move the decimal point as they evaluate their expressions. Most students should be able to record correct answers when no more than one placeholder zero is required. Some may be able to keep track of the placement of digits when two or more placeholder zeros are required or clearly explain their results. Support students who struggle by having them multiply or divide by one 10 at a time on a calculator and discuss patterns they notice.

Lesson 6-3 Application: Converting Measurements in the Metric System

Students apply their understanding of multiplication and division by powers of 10 to convert measurements in metric units.

Standards 5.NBT.2, 5.MD.1

Warm-Up: Mental Math: Students multiply and divide whole numbers and decimals by powers of 10

Math Message: Students complete a "What's My Rule?" table to convert meters to centimeters. MJ page 201, problem 1

Focus: Math Message Follow-Up

- Sketch a function machine and table like the one on the journal page and record students' answers as they share them. Ask: *What rule did you use to find the out values, or the number of centimeters?*
- Remind students about the patterns they noticed when multiplying and dividing by powers of 10. Ask them to explain the results in the "What's My Rule?" tables using these patterns

Differentiate: Adjusting the Activity

To support students who struggle making conversions in context, ask guiding questions like these:

- What unit are you starting with?
- What unit do you need to answer the question?
- How are those two units related?
- Have students write an equation connecting the given unit with the desired unit, such as 1 L = 1,000 mL, or fill in a "What's My Rule?" table on Math Masters, page TA34. Encourage students to think about converting 1 of the given unit to the desired unit and then use that rule to convert the number in the problem
- Students solve multi-step real-world problems involving metric conversions.
- Have partners discuss the conversions they made on journal page 202. Encourage them to explain how and why they made each conversion.

Practice: MJ Math Boxes page 203. Home Links 6-3

Assessment: Expect most students to recognize which conversions are needed to solve the number stories on journal page 202 and to be able to multiply and divide by powers of 10 to complete those conversions once they have identified the appropriate rule. Most should be able to solve Problem 1, where guiding questions are provided to help them identify the rule. Some students may be able to solve Problems 2–4, but others may struggle trying to execute or interpret their conversions in context without the guiding questions. To support those who have difficulty with conversions, see the Adjusting the Activity note.

Differentiation:

- **Readiness: Using Unit Conversions to Rename Measurements.** SRB page 328. To help students gain experience working with unit conversions.
- **Extra Practice:** Activity Card 73. SRB page 328. For additional practice converting measurements in the metric system, students draw cards to generate measurements and roll a die to select units. They write number sentences with units to summarize their calculations. As an extension, students create a number story about one of their conversions.
- **Enrichment:** MM page 216. To extend their work converting metric measurements, students convert the distance to the Moon from kilometers to millimeters. They estimate how many stacked pennies it would take to reach the Moon. Students express amounts with powers of 10 and describe the patterns they notice.
- **ELL Support**: Connect to students' knowledge of currency to demonstrate the meaning of the term convert. Display a visual of currency conversion rates and use think-alouds with everyday phrases like change from/to and exchange.

Lesson 6-4 Line Plots

Students create line plots to display measurement data in fractions of a unit. They use operations with fractions to solve problems based on the information in the line plots.

Standards 5.MD.1, 5.MD.2, 5.NF.1, 5.NF.2

Warm-Up: Mental Math: Students find common denominators for fractions.

Math Message: Students measure their pencils. They examine the class data and think about an appropriate scale for a line plot.

Focus: Math Message Follow-Up

- Students make a line plot to display the lengths of their pencils. They use the line plot to solve problems.
- Remind students that in the previous lesson, they solved problems involving measurement conversions. Today they will work with line plots to organize and interpret measurement data. Remind students that a line plot is a type of graph in which data points are represented by Xs or other marks. The Xs are placed above a number line to show how often each value appears in the data set. Ask: What is our data set
- MJ page 206-207. Students create a line plot to represent the heights of all the students in the class. They use the line plot to solve problems.
- Discuss students' answers to Problem 5 on journal page 207 until a consensus is reached.

Games: Playing Decimal Top-It - Addition or Subtraction. SRB p. 298-299. Students practice adding or subtracting decimals.

Practice: MJ page 204 Math Boxes. Home Links 6-4

Assessment: Expect most students to accurately place Xs on the line plot to represent height data on journal page 206 and correctly interpret the plot to answer Problems 1–3 on journal page 207. Some may be able to choose an appropriate scale when labeling the number line and compute with fractions to answer Problems 4–6, but others may struggle. See the Common Misconception note to support students who struggle with labeling the line plot. Students may also benefit from a reminder to rewrite fractions with common denominators before adding.

Differentiation:

- **Readiness: Labeling Number Lines with Fractional Increments.** MM page 218. Preparing students for creating line-plot scales with fractional units.
- **Extra Practice:** MM page 219. For additional practice solving problems using line plot data, students complete *Math Masters,* page 219. They create a line plot showing pounds of pecans sold in fractional units and then answer questions about the pecan orders
- **Enrichment:** Activity Card 74. To extend their work with line plots, students conduct a measurement investigation. They collect measurement data about a topic of their choice and create a line plot that models their data on poster paper. They write several problems that can be solved by examining the line plot.

- **ELL Support:** Use role play to introduce the term nearest, connecting it to near and nearer and contrasting it with far away. Use three students to showcase near and far by standing next to you in a line.

Lesson 6-5 Working with Data in Line Plots

Students use information presented in line plots to solve problems, including problems about redistributing measurement data.

Standards 5.NBT.6, 5.MD.2, 5NF.2

Warm-Up: Mental Math: Students rename mixed numbers and fractions

Math Message: Students consider whether an orangutan is taller or shorter than a fifth grader

Focus: Math Message Follow-Up

- Students even out data to find the typical height of a student in their class. They compare their findings to the height of an orangutan.
- Tell students that today they will continue using line plots to organize measurement data and solve problems. Discuss responses to the Math Message, calling attention to how students used the class-height line plot to answer the question.
- Refer students to journal page 207 from the previous lesson. Ask: *How can we use this information to help us find the typical height of a fifth grader in our class?*

Differentiation:

- Some students may benefit from an alternative demonstration that models the process of evening out data. Use three or more graduated cylinders or measuring cups. You will also need at least one larger calibrated container that can hold the total amount of water in all the cylinders. Pour a different amount of water into each cylinder and challenge students to come up with a way to redistribute the water so that each cylinder has the same amount. For example, fill three graduated cylinders with 2 ounces, 4 ounces, and 6 ounces of water, respectively. Empty each cylinder into the larger container to find the total amount. (2 + 4 + 6 = 12). Ask: If we want to evenly distribute 12 ounces among the 3 cylinders, how much water should we pour in each cylinder? Explain how the number model 12 ÷ 3 = 4 represents the evening out process. Pour 4 ounces of water into each cylinder to confirm the finding.
- Students use line plots to calculate the typical heights of animals and compare them to fifth graders.
- Tell students that they will now examine additional line plots and answer questions about the heights of other animals. Have students study the line plots on journal page 208. Take a few minutes to examine the titles and labels and discuss what the line plots model. Make sure students understand that the scale on each line plot is 1/2 inch, so the unlabeled tick marks between whole numbers represent mixed numbers such as 41 1/2, 42 1/2 , and so on. MJ page 208-209
- Have partners share something interesting or surprising that they learned from working with the animal-height line plots.

Practice: MJ p. 210(Practicing Fraction Multiplication), MJ p. 211 Math Boxes, Home links 6-5

Assessment: Expect most students working with their assigned animal line plot to be able to calculate the height represented by a single stack of Xs placed over a fractional part of the scale. Some may be able to accurately solve Problems 1–5 on journal page 209, but expect some students to struggle keeping track of their calculations. To support these students, consider using the optional Extra Practice activity, which involves working with fewer data points.

Differentiation:

- **Readiness: Interpreting Line Plot Data.** This helps students prepare for using line plots to solve problems. Students interpret the meaning of the Xs that appear on a line plot. Display a line plot labeling whole numbers only. Have students suggest a realistic context and add a title and label.
- **Extra Practice:** Activity Card 75. For additional practice solving problems based on line plots with fractional measurements, students work in teams to solve problems involving animal-height data represented in the line plots on journal page 208
- **Enrichment:** MM page 222-223. To extend their work using line plots to solve problems, students create line plots showing the scores of two competitive divers. They calculate the divers' final scores in two ways: first by using all seven judges' scores and then by following competitive diving rules, where the two highest and two lowest scores are thrown out. Students compare results and consider why using the scoring rule makes sense.
- **ELL Support:** Help students understand the term even by providing contexts featuring the phrase we're even. Give one student 5 objects while you keep 7 objects then give the student one of your objects, saying, "Now we're even!"

Lesson 6-6 Applying Volume Concepts

Students apply their knowledge of volume concepts to calculate the volume of a building.
Standards: 5.MD.3, 5.MD.5.b, 5.MD.5.c
Warm-Up: Mental Math: Students solve fraction of number stories
Math Message: Students evaluate a strategy for finding the volume of Chicago's Willis Tower
Focus: Math Message Follow-Up

- Students estimate the volume of Willis Tower and make posters summarizing their work.
- Have partnerships share their thoughts about the Math Message. Some students may argue that multiplying the area of the base of the building and the height of the building is a reasonable strategy because $V = B \times h$. Others might say that because the building gets narrower as it gets taller, it is not shaped exactly like a rectangular prism. Therefore, using the formula $V = B \times h$ would not be the best way to estimate the volume. Acknowledge that while multiplying the area of the base by the height of the building is one way to get a rough estimate of the volume of Willis Tower, it would be an overestimate.
- Allow time for groups to read each other's posters. Encourage students to think about how other groups' strategies are similar to and different from the strategy that their group used. Students should also note whether other groups got the same total volume that they did. According to the information on **Math Masters, page 226,** Willis Tower has a volume of approximately 53,578,125 cubic feet. Students present their posters and compare the strategies used by different groups.
- Have students share one thing they learned about volume from looking at the other groups' posters.
- **Games: Play Decimal Top-It. SRB 296-297.** Students play a variation of Decimal Top-It in which they calculate their scores using subtraction.

Practice: MJ page 212 (Comparing Strategies for Finding Volume). MJ page 213 Math Boxes, Home links 6-6
Differentiation:

- **Readiness: Reviewing Volume Strategies.** Activity Card 13. Activity prepares students for estimating the volume of a building.
- **Extra Practice: Play Prism Pile-Up**. SRB page 319. For additional practice with volume strategies, partnerships play Prism Pile-Up. If students are missing any Prism Pile-Up cards, replacement cards can be copied from Math Masters, pages G4 and G5 or created from the Activity Sheets of blank cards at the back of Math Journal 2.
- **Enrichment: Solving a Packaging Problem.** Activity Card 76, MM page 227. To extend their work with volume, students find how much packaging material is needed to fill a shipping box. They use mathematical models to solve a similar problem about a classroom object
- **ELL Support:** Students may be familiar with the term volume as used in regard to sound, such as the volume setting on a television. Help students understand volume in a mathematical context by using think-aloud statement that include the everyday terms hold and fill. For example: This container can hold objects. It has a lot of space inside it that I can fill up. It has a large volume. It can hold a lot.

Assessment: Expect most students to be able to describe a correct strategy for finding the volume of Willis Tower. Strategies should include dividing the tower into parts and applying a formula. Some students may be able to describe how they could have calculated the volume more efficiently. If students struggle describing their strategies, encourage them to first tell a partner about the strategy their group used before writing it down.

Lesson 6-7 Measuring Volume by Displacement

Students use displacement to measure the volume of objects.

Standards: 5.MD.3 5.MD.4, 5.MD.5b

Warm-Up: Mental Math: Students find common denominators

Math Message: Students discuss how to find the volume of two objects

Focus: Math Message Follow-Up

- Students create a tool that can be used to measure the volume of objects.
- **MJ page. 214.** Have volunteers share their strategies for finding the volume of the prism. Expect most students to say that they would measure the length, width, and height of the prism and apply a formula. Ask: Could we use the same strategy to find the volume of the orange? Why or why not?
- Tell students that they will learn a new method for measuring the volume of objects called the displacement method.
- **MJ page 215. MM TA6**, Students use displacement to measure volume in milliliters and cubic centimeters.
- Point out that the volume of solid objects is usually measured in cubic units rather than milliliters. Tell students that they are going to complete an activity to determine how many cubic centimeters are equivalent to 1 milliliter. This will allow them to report the volume of the solid objects in cubic units instead of milliliters.
- Invite a volunteer to measure the dimensions of the prism from the Math Message to the nearest centimeter. Then have students calculate the volume of the prism in cubic centimeters. Answers vary. Ask: What will the volume of the prism be in milliliters? Answers vary, but the measurement in milliliters should be the same as the measurement in cubic centimeters. Use a calibrated bottle to verify the volume of the prism in milliliters.

Games: Play Exponent Ball. SRB pages 303-304. Students practice multiplying and dividing decimals by powers of 10

Practice: MJ pages 216 Math Boxes. Home links 6-7

Differentiation

- **Readiness: Reviewing Liters and Milliliters.** To prepare for measure volume using displacement, students review the metric units used to measure liquid volume. Guide a discussion about whether it seems reasonable to determine the volume of a liquid by finding its length, width, and height. Pour the water from the bottle into the measuring cup to show how liquids do not hold their shape, making it difficult to measure length, width, and height. Explain that in the metric system two of the units commonly used to measure liquid volume

are liters and milliliters. Have students examine the measuring cup to determine the volume of water in the cup.

- **Extra Practice:** MM page 229. For additional practice finding volume using displacement, students find volumes using a calibrated bottle. They use their fist to find the approximate volume of their heart. They measure everyday objects to find a collection of items with a combined volume similar to the volume of a human brain.
- **Enrichment:** Activity Card 77. MJ page 215. To extend their understanding of volume and displacement, students solve challenging multi-step volume problems. Provide students with golf balls or other suitable objects with a volume that can be measured using a calibrated bottle
- **ELL Support:** To help students understand the term displace, play Musical Chairs.

Assessment: Expect most students to be able to write explanations on the Exit Slip describing how to read the scale on the calibrated bottle to determine the volume of objects. Some students may be able to write explanations clearly describing the idea that both solid objects and water have volume and that the volume of the displaced water will be equal to the volume of the object. If students struggle describing how to use the calibrated bottle, have them return to a workstation and measure the volume of an object again and then describe what they did.

Lesson 6-8 Estimating Decimal Products and Quotients

Students use estimation and number sense to predict the relative size of decimal products and quotients.

Standards: 5.NBT.7, 5.OA.2

Warm-Up: Mental Math: Students predict the relative size fraction products and explain their thinking.

Math Message: Students make a conjecture about the relative size of a decimal product based on its factors**.**

Focus: Math Message Follow-Up

- Students use estimates to place decimal points in decimal products and quotients.
- Ask several students to share their conjectures and arguments. Expect most to argue that 2.4 $*$ 1.8 is greater than 2.4 because 1.8 is greater than 1. Remind students of the work they did with fraction multiplication in Unit 5
- MJ p. 217, Tell students that in today's lesson, they will use estimation to help them solve decimal multiplication and division problems. Students are accustomed to using estimates to check the reasonableness of their answers. Now they will begin to use estimates to help them find solutions to multiplication and division problems.
- Differentiate: When students make estimates of decimal products and quotients, it may help them to consider the relationship between benchmark decimals, such as 0.25, 0.5, 0.75, and their fraction equivalents. For example, when estimating the product of 0.4 $*$ 13.7, it might help students to think about 0.4 as close to 0.5, or 12. They can then reason that 12 $*$ 14 = 7 to estimate a product

Games: Introduce Dog-Gone Decimal. SRB page 302

- Students practice estimating decimal products.
- Ask students to explain to a partner how they would arrange the cards 7, 5, 9, and 1 and place the decimal points to get a product as close as possible to the target number 10.

Practice: MJ page 218 Math Boxes. Home links 6-8

Differentiation:

- **Readiness: Estimating Whole-Number Products and Quotients.** Emphasize the importance of students using mental computation and considering whether their approach will overestimate or underestimate the quotient. Remind them that they can adjust either the dividend or divisor to create a number sentence they can solve mentally.
- **Extra Practice:** Activity Card 78. MM page 232. For more practice estimating decimal products and quotients, students draw cards to create decimal multiplication and division

problems with products or quotients that fall into certain target ranges. Problems are recorded in the appropriate boxes in the table on MM page 232

- **Enrichment:** MM page 231. To extend their work estimating decimal products and quotients, students write number models to solve division number stories on *Math Masters*, page 231
- **ELL Support**: Help students understand the term reasonable by using think-alouds with the phrase make sense. Display a picture showing both a wintry scene and a person wearing summer attire. Describe the weather and then ask yes or no questions to assess if it makes sense and if it is reasonable. Extend to estimates for computations with whole numbers.

Assessment:
Expect most students to be able to make reasonable estimates for products when both factors are greater than 1 and for quotients when the dividend and divisor are both greater than 1. Some may be able to estimate products and quotients when one or both numbers are less than 1, but expect many students to struggle. Those who are able to make reasonable estimates should be able to use them to accurately place decimal points in decimal products and quotients. GMP1.4 Consider having students who struggle working with estimates complete the optional Readiness activity.

Lesson 6-9 Multiplication of Decimals

Students learn two strategies for solving decimal multiplication problems.

Standards 5.NBT.2, 5.NBT.5, 5.NBT.7

Warm-Up: Mental Math - Students multiply and divide by powers of 10 and explain the placement of the decimal point in the product or quotient.

Math Message: MJ page 219. Students solve a decimal multiplication problem

Focus: Math Message Follow-Up

- Students multiply decimals as if they were whole numbers and use estimates to place decimal points in the products.
- Have students share solutions and explain their strategies. Make sure the following strategies are discussed:
    - Use repeated addition to solve, adding 1.2 eight times.
    - 1.2 + 1.2 + 1.2 + 1.2 + 1.2 + 1.2 + 1.2 + 1.2 = 9.6
    - Multiply the whole-number part of the decimal, 1, by 8 for a product of 8. Next add 0.2 eight times to get 1.6. Then add those two numbers together for a total of 9.6.Point out that the second strategy breaks the problem into more manageable parts and uses a combination of multiplication and addition.
- MJ page 220. Students multiply factors by powers of 10 to make whole numbers, and then divide the product by powers of 10 to "undo" the multiplication.
- Tell students that there are times when making an estimate is not helpful or practical
- Have students complete the problems on journal page 220 (which are identical to the ones on page 219). When they are finished, have students compare answers to confirm they got the same answer using both strategies

Games: Introducing Decimal Domination. SRB page 295.

- Students play Decimal Domination to practice multiplying decimals.
- Ask students to explain which strategy they prefer for multiplying decimals and why

Practice: MJ page 221 Math Boxes. Home links 6-9

Differentiation:

- **Readiness: Practicing Whole-Number Multiplication.** Preparation for solving decimal multiplications by reviewing whole-number multiplication algorithms.
- **Extra Practice:** Activity Card 79. MJ pages 219-220. For further practice calculating decimal products, students draw cards to create decimal multiplication problems. Partners solve the problems using two different methods and then compare products and strategies

- **Enrichment:** MM page 234. To extend their work with decimal multiplication, students solve problems set in a real-world context
- **ELL Support:** Provide listening and oral language practice with the noun and verb forms of the term estimate so that students see that despite the difference in pronunciation, they are being asked to do the same thing when directed to estimate or to make an estimate.

Assessment: Expect most students to be able to solve Problems 1 and 2 on journal page 219 using the estimation strategy. Some may be able to solve Problem 3, which involves one factor that is less than 1. Some may also be able to solve the problems using powers of 10 to shift the decimal point on journal page 220. Do not expect students to use both methods fluently. Over time, they may come to prefer one strategy over another. If students struggle to solve whole-number multiplication problems, have them complete the optional Readiness activity

Lesson 6-10 Open Response: Fundraising (2-Day Lesson)

Students solve a multistep number story using decimals and explain how they know their answers make sense.

Standards 5.NBT.2, 5.NBT.5, 5.NBT.7

Day 1:
Warm-Up: Mental Math: Students solve fraction-of number stories.

Math Message: MJ page 222. Students determine which number is the correct product without calculating to find an exact answer.

Focus: Math Message Follow-Up.

- Students discuss strategies for choosing the answer that makes sense.
- Ask students to share their strategies for solving the Math Message problems. Students might have estimated or used number sense
- As students share strategies, consider listing them on the Class Data Pad or chart paper. Display the list for reference when students solve the open response problem.
- Tell students that mathematicians and others who use mathematics always take time to check whether their answers make sense. Explain that today they will solve a multistep problem and check whether their answers make sense using strategies similar to the ones they used in the Math Message.
- **Differentiation: Adjusting the Activity**
  If students struggle to understand how the values of 0.5 and 2.5 are related to each other and to the series of problems in the Math Message, suggest placing the two numbers on a number line to show which whole numbers they come between
- **ELL Support:**
  - Make sure students understand the context of the problem prior to the lesson by reviewing the meaning of "as much as."
  - The concept of making sense of an answer is at the core of the Math Message and open response problem. *Does it seem right?*
  - Use pictures, examples, role plays, and other strategies to introduce vocabulary.

Solving the Open Response Problem.

- **MM page 236-237.** Students calculate the amount of money donated by two classes and explain how they know their answers make sense.
- **Differentiation: Adjusting the Activity**
  For students who have trouble starting their explanation for why their answers make sense, consider providing a sentence frame, such as: "My answer makes sense because _____."

- Ask: *Why is it important to check whether your answers make sense?* Remind students they will have a more in-depth conversation about the problem on Day 2.
- Getting Ready for Day 2: Review students' work. Use the Re-engagement Planning Form (Math Masters, page TA4) and the rubric in the Day 2 Focus activity: Revising Work to plan ways to help students meet expectations for both the content and practice standards. Watch for students' work that shows an attempt to check whether an answer makes sense by merely re-calculating the answer, as well as for interesting estimation strategies.

Day 2:

Setting Expectations:

- Students discuss what a good answer to the open response problem should include and review how to talk about their own and other students' work respectfully.
- Briefly review the open response problem from Day 1. Ask: *What were you asked to do? What do you think a good response would include?*
- After this brief discussion, tell students that they are going to look at other students' work and see whether they thought about the problem in the same way. Refer to **GMP1.4** on the Standards for Mathematical Practice Poster. Explain that students will try to figure out how other students checked whether their answers make sense.
- Students discuss how others checked whether their answers to the open response problem made sense.

Reengaging in the Problem:

Students re-engage in the problem by analyzing and critiquing other students' work in pairs and in a whole-group discussion. Have students discuss with partners before sharing with the whole group. Guide this discussion based on the decisions you made in Getting Ready for Day 2.

Revising Work:

- Students revise their work.
- Have students reflect on their work and revisions. Ask: *What did you do to better explain why your answers make sense?*

Assessment: Collect and review students' revised work. Expect most student to correctly multiply whole numbers to find the amount of money Class A raised. Most students will be able to multiply with decimals to find the amount of money Class B raised. You can use the rubric on page 616 to evaluate students' revised work.

Practice: MJ page 223 Math Boxes. Home links 6-10

Lesson 6-11 Division of Decimals by Whole Numbers

Students discuss how estimation can be used to place the decimal point when dividing decimals by whole numbers.

Standards 5.NBT.6, 5.NBT.7

Warm-Up: Mental Math - Students write and round decimals

Math Message: Students solve a number story about dividing an amount of money

Focus: Math Message Follow-Up

- Students divide decimals as if they were whole numbers and use estimation to place the decimal point.
- Ask students to suggest a number model for the Math Message problem.

  $84.12 / 4 = *s*$ Then invite volunteers to share their solutions and strategies
- Have students explain to a partner how they solved one of the problems on journal page 225.

Games: Play Spending and Save. SRB page 323. Students practice adding and subtracting decimals

Practice: MJ page 226 Math Boxes. Home links 6-11

Differentiation

- **Readiness: Playing Division Top-It (larger numbers).** SRB page 325. Preparing students for using whole-number division to solve decimal division problems. You may wish to review partial-quotients division before students begin the game. Have students explain to their partner how they wrote their remainder as a fraction.
- **Extra Practice:** Activity Card 80. For additional practice dividing decimals by whole numbers, students use number cards to generate division problems. They divide the decimals as if they were whole numbers and use estimates to place the decimal points in the answers. They explain their strategies to a partner.
- **Enrichment:** MM page 239. To extend their work with division of decimals, students learn an alternative method of dividing decimals called column division. If students are unable to make sense of the example on *Math Masters,* page 239, encourage them to use the *Student Reference Book* page referenced in the icon, which provides another example of a decimal division problem solved with column division.
- **ELL Support:** Students may be unfamiliar with the phrase *split the cost*. Role-play going to the store with a student and buying some things. Phrases to say: *Here is the cost. Here is my money. I don't have enough. Do you have money? Can you share the cost with me? Can we each pay the same amount? Can we split the cost?* Use play money for a visual.

Assessment: Expect most students to be able to make useful estimates for Problems 1–6 on journal pages 224 and 225. Most should also be able to solve Problems 1, 3, and 4, which do not require rounding the quotient. Some students may be able to solve Problems 2, 5, and 6, which do require rounding the quotient. If students struggle making estimates, remind them to use nearby whole numbers that they can work with mentally. If students struggle doing the division, provide extra practice with partial-quotients division with whole numbers.

Lesson 6-12 Division of Decimals by Decimals

Students create equivalent problems to help them solve division problems involving decimal dividends and divisors.

Standards 5.NBT.6, 5.NBT.7

Warm-Up: Mental Math - Students multiply and divide whole numbers and decimals by powers of 10.

Math Message: Students solve division problems and look for patterns

Focus: Math Message Follow-Up

- Students discuss patterns in the Math Message problems. They write equivalent problems to solve simple decimal division problems.
- Have volunteers share their number sentences and display them in the order they are presented in the Math Message. Ask students to share what patterns they notice
- Remind the class that every fraction can be interpreted as a division problem and vice versa
- Differentiate: If students struggle visualizing the number of tenths or hundredths in 2, have them shade two tenths grids on *Math Masters,* page TA21 to represent 20 tenths or two hundredths grids on *Math Masters,* page TA22 to represent 200 hundredths. Similar models can be used to illustrate why $3 \div 0.2$ is equivalent to $30 \div 2 = 15$. For example, students can shade sets of two columns in alternating colors on three tenths grids to show that there are 15 groups of 2 tenths in 3, just as there are 15 groups of 2 in 30.
- MJ page 227. Students use the equivalent-problem strategy to solve more difficult problems
- Have partners share their strategies for writing equivalent problems on the journal page.

Practice: MJ page 228 Math Boxes. Home Links 6-12

Assessment: Expect most students to be able to write an equivalent problem and find a correct quotient for Problem 1 on journal page 227, which requires multiplying the dividend and divisor by 10 to generate an equivalent problem. Some may be able to solve Problem 2, which requires multiplying the dividend and divisor by 100 to generate an equivalent problem. If students struggle writing equivalent problems, encourage them to first multiply both the dividend and divisor by 10. If the divisor is still a decimal number, suggest multiplying by 10 again. If students struggle solving the equivalent problems, encourage them to look back at their work from Lesson 6-11

Differentiation

- **Readiness: Reviewing Prerequisite Skills for Decimal Division.** MM page 241. Students review connections between fractions and division, the multiplication rule for generating equivalent fractions, and the effects of multiplying decimals by 10 and 100.
- **Extra Practice: Dividing Decimals by Decimals.** Activity Card 81. Students use number cards to generate decimal division problems and they solve the problems.

- **Enrichment: Finding a More Precise Answer.** MM page 242. Students consider whether and answer rounded to the nearest whole number provides an appropriate level of precision for a given context. They are introduced to a method for obtaining a more precise answer.
- **ELL Support:** Help students construct the meaning of equivalent using their experiences with money. Give one student five $1 bills and another one $5 bill. Role-play selling an item with a price of $5.00. Use think-alouds: *Who has enough money to buy this? Who has $5.00?* When students realize they have the same amount, say they have *equivalent amounts.*

Lesson 6-13 Application: Estimating Your Reaction Time

Students collect reaction-time data and create a line plot. They compute with decimals to identify typical reaction times and to estimate a total class reaction time.

Standards 5.NBT.3.b,5.NBT.7, 5.MD.2

Warm-Up: Mental Math: Students compare decimals

Math Message: Students prepare for the Grab-It Gauge Experiment

Focus: Math Message Follow-Up

- Students perform the experiment. They identify their typical reaction times and make a line plot of typical reaction times.
- MJ pages 230-231. Tell students that in this lesson they will conduct an experiment to test their reaction time, or how quickly they react to a stimulus, which is something that causes a response. Students will use decimal computation to interpret their results.
- Students estimate a total class reaction time, perform an experiment, and compare the actual time to their estimates.
- Point out that the line plot shows individual reaction times to a stimulus. Tell students that they are going to perform another experiment to find how long it takes for a hand squeeze to travel around the entire class.
- Have students reflect on how they used decimal addition, multiplication, and division to interpret their individual data and estimate the class reaction time

Games: Playing Fraction/Whole Number Top-It. SRB page 310. Students practice multiplying whole numbers and fractions.

Practice: MJ page 229 Math Boxes. Home Links 6-13

Differentiation:

- **Readiness: Thinking About Decimals as Data Points.** MM page 245. Students order decimal times and create a line plot which they use to answer questions about data. Guide

students through the problems, providing background and support. Point out the reasoning they have been applying is the same they used with fractional data in earlier lessons.

- **Extra Practice:** MJ 230-231**.** For more practice interpreting data and computing with decimals, students perform the Grab-It Gauge experiment with their left hand. They compare the results to the right-hand data from the lesson. GMP5.2 Students compare and order decimals to find a middle value. They also add and divide decimals to even out their results.
- **Enrichment:** Activity Card 82. To extend their work computing with decimals to interpret data, students time how long it takes group members to complete a task 5 times. They even out individual results to find typical times and make a line plot. They estimate how long it would take the whole group to complete the task in sequence and then complete the task as a group. They discuss why there might be differences between estimates and actual group times.
- **ELL Support:** Use students' experiences with cause and effect to support their understanding of the terms react and reactions. Use the example of a ball at rest. Use think-alouds emphasizing action and reaction. Encourage students to complete simple sentence frames about action and reaction.

Assessment: Expect most students to be able to order their individual times from fastest to slowest in Problem 1 on journal page 230. If students struggle trying to order their data, suggest listing the times vertically and aligning the digits to make it easy to compare the numbers. Expect most students to add decimals correctly when finding their own typical reaction time or when making a prediction about the class experiment on journal page 231, if their strategies required addition. Some may be able to multiply decimals without using a calculator. If students struggle when adding the decimals, have them work with just a few pieces of data at a time.

Lesson 6-14 Assessment: Unit 6 Progress Check

Administer Unit Assessment.

Day 1:

- **Warm-Up:** Students complete the Self-Assessment to reflect on their progress in Unit 6

- **Unit 6 Assessment:** Students complete the Unit 6 Assessment to demonstrate their progress on the New Jersey Student Learning Standards covered in this unit.

- **Differentiation: Adjusting the Assessment** View TE page 640 to see specific adjustments for each question on the assessment. All instruction and most practice is complete for the content that is marked with an asterisk (*) on page TE 638.

- **Unit 6 Challenge** (Optional): Students may demonstrate progress beyond expectations after they complete the Unit 6 Assessment.

Day 2:

- **Cumulative Assessment:** These items reflect mastery expectations to this point.

- **Looking Ahead:**
  - **Math Boxes** 6.14: Preview for Unit 7
  - **Home Link** 6.14: Students take home the Family Letter that introduces Unit 7.

Unit Plan Title	Multiplication of Mixed Numbers; Geometry; Graphs
Suggested Time Frame	19 Days including flex days

Stage 1: Identify Desired Results

Overview / Rationale

In this unit students learn two methods for multiplying mixed numbers. They use these methods to find the areas of rectangles with fractional side lengths and to solve problems involving fractional data in line plots. Students also review attributes of 2-dimensional figures and classify shapes in a hierarchy based on properties. Finally, students graph points on coordinate grids to visualize numerical patterns and represent real-world problems.

New Jersey Student Learning Standards for Mathematics

5.OA.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

5.NF.4.b Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade).

5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots.

5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.

5.G.4 Classify two-dimensional figures in a hierarchy based on properties.

GMP2.1 Create mathematical representations using numbers, words, pictures, symbols, gestures, tables, graphs, and concrete objects.

GMP2.2 Make sense of the representations you and others use.

GMP2.3 Make connections between representations**.**

GMP8.1 Create and justify rules, shortcuts, and generalizations.

Technology Integration
__X__**8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
- Student Websites - Teacher Websites - SMART board
____**8.2 Technology Integration, Engineering, Design and Computational Thinking – Programming** All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES
The following social and emotional competencies are integrated in this curriculum document:

Self-Awareness
_____Recognize one's own feelings and thoughts
_____Recognize the impact of one's feelings and thoughts on one's own behavior
_____Recognize one's personal traits, strengths and limitations
_____Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management
__x__Understand and practice strategies for managing one's own emotions, thoughts and behaviors
__x__Recognize the skills needed to establish and achieve personal and educational goals
__x__Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness
__x__Recognize and identify the thoughts, feelings, and perspectives of others
_____Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
_____Demonstrate an understanding of the need for mutual respect when viewpoints differ
_____Demonstrate an awareness of the expectations for social interactions in a variety of setting

Responsible Decision Making
__x__Develop, implement and model effective problem solving and critical thinking skills
_____Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills
_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
_____Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

In this unit plan, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – 21st Century Themes			**Indicate whether these skills are:** ● **E – encouraged** ● **T – taught** ● **A – assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**			CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
X	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing			CRP5. Consider the environmental, social and economic impacts of decisions.
X	Becoming a Critical Consumer			CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
	Career Exploration			CRP11. Use technology to enhance productivity.
	Career Preparation			CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

NJ Student Learning Standards for English Language Arts

RI.4.3 - Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.4 - Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

RI.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.4.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Essential Questions:	**Enduring Understandings:**
● How are models used to show how fractional parts are combined or separated? ● What patterns and relationships in numbers help you think about the problem?	***Students will understand that…*** ● There are many ways to model and manipulate fractions to arrive at the correct answer. ● Patterns and relationships between numbers help us determine reasonable answers.
Knowledge:	**Skills:**

Students will know…	**Students will be able to…**
● Partial-products multiplication ● Partial products ● Tiling ● Unit fraction ● Common denominator ● Tick mark ● Attribute ● Property ● Hierarchy ● Category ● Subcategory ● Isosceles triangle ● Equilateral triangle ● Quadrilateral ● Parallel ● Adjacent ● Trapezoid ● Kite ● Parallelogram ● Rectangle ● Rhombus ● Square ● Polygon ● Hierarchy ● Natural measure ● Standard unit ● Cubit ● Great span ● Joint	● Generate a pattern using a given rule; form ordered pairs from corresponding terms in a table; graph ordered pairs on a coordinate plane. ● Add and subtract fractions and mixed numbers with unlike denominators. ● Multiply fractions by whole numbers and by fractions; use an area model, or rewrite factors as fractions and use an algorithm, to multiply a mixed number by a whole number or by a fraction. ● Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths or by multiplying the side lengths; understand that both methods should produce the same area measurement; represent fraction products as fractional areas. ● Divide unit fractions by whole numbers and whole numbers by unit fractions. ● To create line plots using fractional data; use data on line plots to solve single-step and multistep problems involving addition and subtraction. ● To understand that attributes can be used to define categories and subcategories of shapes; recognize when one category is a subcategory of another.

• Precision • Sequence • Rule • Term • Relationship • Corresponding terms • Corresponds • Increase • Decrease • Corresponding terms • Formula	• Understand the basic structure of a hierarchy; classify two-dimensional figures in a correct category according to a hierarchy, although not necessarily the most specific category.

Student Resources	
All Operations Fractions	http://www.funbrain.com/fractop/index.html
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Websites	www.abcya.com www.sheppardsoftware.com www.coolmath.com

Teacher Resources	
Games/Lessons Topics	http://littletonpublicschools.net/Default.aspx?tabid=539
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Demo Lessons/Activity Sheets	http://www.learnalberta.ca/content/me5l/html/Math5.html?launch=true
All Operations Fractions	http://www.funbrain.com/fractop/index.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Quizzes/Practice	http://littletonpublicschools.net/Default.aspx?tabid=539
Khan Academy	www.khanacademy.com

Mentor Texts	Shape Up: Fun With Triangles and Other Polygons Mummy Math The Greedy Triangle What's Your Angle Pythagoras? A Math Adventure If You Were a Quadrilateral Lemonade for Sale

Stage 2: Acceptable Evidence

Assessments

Formative:	**Summative:**
● Math Message ● Oral Mental Math Fluency ● Math Journal ● Slates ● Lesson Assessment Check-In ● Collins Writing ● Exit Slips ● Home Link ● Teacher Observation ● Games/Activity Cards	● Benchmark Assessment ● Quizzes ● Unit Progress Check ● Open Response Assessments ● Student Work Products

Stage 3: Learning Experiences

Lesson 7-1 Multiplication of Mixed Numbers, Part 1

Students use area models and partial products to multiply mixed numbers.

Standards: 5.NF.1, 5.NF.4.a, 5.NF.4.b, 5.NF.5.a, 5.NF.6, 5.OA.2

Warm-Up: Mental Math: Students add fractions with unlike denominators

Math Message: Students create an area model for a mixed-number multiplication problem

Focus: Math Message Follow-Up

- Invite students to share their thoughts about the whole-number area model. Help them explain how they could use the model to find the product of 28 and 6. The area of the left side of the model is $20 * 6$, or 120, and the area of the right side is $8 * 6$, or 48. The area of the entire rectangle is 120 + 48, or 168, so the product of 28 and 6 is 168. Remind students that this method of breaking apart factors to multiply them is called **partial-products multiplication.**
- **Differentiate:** If students struggle to interpret area models, consider sketching tiled rectangles to represent problems. For example, to show the meaning of $4\ 2/3 * 7$, you could draw a rectangle with 7 rows and 4 2/3 columns. Connect the tiled drawing to the open area model, which is a similar representation, but is not fully partitioned. Point out that there are 7 rows of 4 tiles, or 28 full tiles, in one section of the tiled rectangle and 7 rows of 2/3 tile, or 4 2/3 tiles, in another section. Therefore, the total number of tiles is 28 + 4 2/3, or 32 2/3, tiles. Emphasize how the lines dividing area models merely split the area into sections, so that the total area is the combined area of the sections
- If students struggle to interpret area models, consider sketching tiled rectangles to represent problems. For example, to show the meaning of $423 * 7$, you could draw a rectangle with 7 rows and 423 columns. Connect the tiled drawing to the open area model, which is a similar representation, but is not fully partitioned. Point out that there are 7 rows of 4 tiles, or 28 full tiles, in one section of the tiled rectangle and 7 rows of 23 tile, or 423 tiles, in another section. Therefore, the total number of tiles is 28 + 423, or 3223, tiles. Emphasize how the lines dividing area models merely split the area into sections, so that the total area is the combined area of the sections
- Students multiply mixed numbers by whole numbers, fractions, and mixed numbers
- Invite partners to discuss how they multiplied on journal page 234. Ask whether students noticed any patterns in their lists of partial products. For example, some might have noticed that there are two partial products when mixed numbers are multiplied by whole numbers or fractions, and four partial products when they are multiplied by mixed numbers. Encourage students to relate patterns back to area models

Assessment: Expect most students to be able to draw and use area models to multiply a mixed number by a whole number or a fraction in Problems 1 and 2 on journal page 233. GMP2.1, GMP2.2 Some may be able to multiply a mixed number by a mixed number in Problem 3, but many may struggle finding a common denominator for adding all of the partial products. Consider reminding students how to find a quick common denominator to help them add the partial products.

Practice:

- MJ page 235 Creating a Hiking Trail Line Plot.
- MJ page 236 Math Boxes.
- Home links 7-1

Differentiation:

- **Readiness: Reviewing Area Models.** MM page 251. To prepare for representing mixed-number multiplication with area models, students review area models for whole-number multiplication problems on MM page 251. Make sure students understand that the open area model is a simplified version of the tiled model, or array.
- **Extra Practice: Activity Card 83 -** For additional practice multiplying mixed numbers, students roll a die and draw number cards to generate problems. They draw area models, list partial products, and solve the problems. Then students discuss patterns that they notice in the partial products used for each problem
- **Enrichment: MM p. 252 -** To extend their work with multiplying mixed numbers, students study partial products in worked examples and look for patterns. They write a rule for finding partial products *without* an area model and then test their rule by multiplying a mixed number by a whole number. Students check their work using an area model
- **ELL Support:** Use the terms break apart or break up to help students understand the term partial. Show items such as connecting cubes that can be broken apart but easily put back together. Utilize think alouds.

Lesson 7-2 Multiplication of Mixed Numbers, Part 2

Students multiply mixed numbers by renaming factors as fractions and using a fraction multiplication algorithm.

Standards: 5.NF.3, 5.NF.4.a, 5.NF.4.b, 5.NF.5.a, 5.NF.5.b, 5.NF.6

Warm-Up: Mental Math: Students compare the size of factors to the size of the product

Math Message: Students rename mixed numbers and fractions

Focus: Math Message Follow-Up

- Students discuss strategies for renaming mixed number and fractions.
- MJ page 237. Have students share their answers to Problems 1–6 on the journal page. Ask them to explain their strategies for renaming mixed numbers as fractions for one or two of the problems.
- **Differentiate:** If students struggle translating between mixed numbers and fractions, encourage them to draw pictures or use fraction circle pieces until they notice patterns. Ask questions like these to help students make sense of the process: When renaming a mixed number as a fraction: *What type of piece do we have?* (halves, thirds, fourths, and so on) *How many total pieces do we have when we trade wholes for pieces?* When renaming a fraction as a mixed number: *How many pieces are in each whole? How many wholes can we make? What fraction is left over?* Direct students to pay close attention to denominators to determine the number of equal parts in each whole.
- MJ page 238. Students multiply mixed numbers by renaming them as fractions and using a fraction multiplication algorithm.
- Students multiply mixed numbers by renaming them as fractions and using a fraction multiplication algorithm.

Games: Spoon Scramble. SRB page 324. Students practice multiplying fractions and multiplying and dividing by powers of 10.

Assessment: Expect most students to be able to rename factors as fractions and multiply using an algorithm in Problems 1, 3 and 5, which have only one mixed-number factor. Some students may be able to solve Problems 2 and 4, which have two mixed-number factors. If students struggle to rename mixed numbers as fractions, encourage them to refer to the Math Message examples on journal page 237.

Practice: MJ page 239 Math Boxes. Home links 7-2

Differentiation:

- **Readiness: Reviewing an Algorithm for Fraction Multiplication.** MM page TA30. To build readiness for multiplying fractions greater than 1, students review a fraction multiplication algorithm. Have students multiply the fractions and confirm their product by sketching an area model on MM page TA30. Ask students to explain how the area model represent the product they found using the fraction multiplication algorithm. Emphasize that the numerator of the product matches the number of shaded parts and the denominator of the product matches the total number of parts in a unit square.
- **Extra Practice:** Activity Card 84. For additional practice multiplying mixed numbers, partners use number cards to generate problems. One partner draws an area model and lists partial products to solve, while the other renames the mixed numbers as fractions and multiplies using a fraction multiplication algorithm. Students compare results until they agree on a product. They discuss advantages and disadvantages of each strategy
- **Enrichment:** MM p. 254. To extend their work with mixed-number multiplication, students solve a series of contextualized problems on *Math Masters*, page 254. Given the heights of the winning high jump and winning pole vault from the 2012 Olympic Games, they multiply each height by different numbers to adjust for the force of gravity on Earth's moon and different planets. They explain their results.
- **ELL Support:** Help students understand the term rename by modeling how to rename a folder on a computer.

Lesson 7-3 Rectangles with Fractional Side Lengths

Students multiply mixed numbers to find the areas of rectangles with fractional side lengths. They confirm areas by tiling with squares of unit fraction side lengths.

Standards: 5.NF.4.b, 5.NF.6

Warm-Up: Mental Math: Students convert among measurement units.

Math Message: MJ page 240. Students find the area of a rectangle with fractional side lengths.

Focus: Math Message Follow-Up

- Students confirm the area of a rectangle by tiling it with unit squares of the appropriate unit fraction side lengths.
- Discuss students' strategies for solving the Math Message
- Remind students that the formula $A = l \times w$ states that the area of any rectangle can be found by multiplying its length by its width. Also remind them that previously they found the area of rectangles with fractional side lengths by tiling, or covering the area without gaps or overlaps, and counting smaller squares. Tell students that today they will use their understanding of fraction and mixed-number multiplication to show that the area found by tiling is the same as the area found by applying the area formula.
- Students solve real-world area problems. Have students complete journal pages 240 and 241. Allow students to find areas using whichever method they prefer. If students wish to sketch models, provide copies of Math Masters, page TA35.
- **Invite students to share their preferred method for finding the area of rectangles with fractional side lengths. Have students explain how they used their method to solve one of the journal problems.**

Games: Play Exponent Ball. SRB pages 303-304. Students practice multiplying and dividing decimals by powers of 10.

Assessment:
Expect most students to find the area of rectangles with fractional side lengths in Problems 2a, 4d, and 5c, either by multiplying side lengths or using tiling strategies. Most students should make reasonable attempts to answer questions about dimensions and tiles, but expect some to confuse the fractional dimensions of tiles with tiles described as fractions of a unit square. (*See the Common Misconception note.*) Encourage those who struggle to sketch models, or complete the optional Readiness activity with them.

Practice: MJ page 242 Math Boxes. Home links 7-3

Differentiation:

- **Readiness: Examining Squares with Unit Fraction Side Lengths.** MM page 257. To prepare for comparing area found with a formula to area found by tiling, students revisit squares with unit fraction side lengths. Emphasize the difference between naming the side length of smaller squares and naming smaller squares as the fraction of a unit square. Have students discuss patterns that they notice. Remind students that the count of smaller squares is not equal to the area in square units because each small square overs only part of a unit square.
- **Extra Practice:** Activity Card 85**.** For additional practice finding the area of rectangles with fractional side lengths, students roll dice to generate the dimensions of a bathroom floor. They find the floor's area by multiplying side lengths, discuss how they could tile the floor, and find the total number of tiles needed to cover the floor. Students discuss patterns that they notice and how to use the number of tiles to confirm the area.
- **Enrichment:** MM page 256. To extend their work finding the area of rectangles with fractional side lengths, students solve a series of problems about the resolution of a laptop screen. They find the area of a screen with a fractional side length and describe the area in terms of pixels.
- **ELL Support:** Display the word tile and pictures of tiles. Use think-aloud statements to illustrate different uses of the term.

Lesson 7-4 Using Common Denominators for Fraction Division

Students solve fraction division problems by renaming dividends and divisors with a common denominator.

Standards: 5.NF.5.b, 5.NF.7.a, 5.NF.7.b ,5.NF.7.c

Warm-Up: Mental Math: Students translate between whole numbers and fractions

Math Message: MJ page 243. Students use a model to solve a fraction division problem

Focus: Math Message Follow-Up

- Students use common denominators to divide fractions and justify a shortcut by solving problems in two different ways.
- Invite students to discuss solutions. Expect that most drew lines dividing each circle into thirds and counted to find that there were 12 thirds. Remind students that 4 ÷ 1/3 is another way of asking, "How many 1/3s are in 4 wholes?"

Differentiate: If students struggle to interpret fraction division problems, ask guiding questions such as the following:

- For whole numbers divided by unit fractions: How many _____ are in _____? For example, for 4 ÷ 1/3, ask, "How many 1/3s are in 4?"
- For unit fractions divided by whole numbers: If you start with _____ and split it into _____ equal parts, what is one of those parts worth? For example, for 12 ÷ 3, ask: If you start with 12 and split it into 3 equal parts, what is one of those parts worth?
- Students solve division problems with whole numbers and unit fractions.
- Have students complete journal pages 243 and 244. Encourage them to make sense of problems with fraction circles or drawings and to check their answers with multiplication.
- Have partners share their number stories from Problems 5 and 6 and explain how to use the common denominator shortcut to solve them.

Games: Play Doggone Decimal. SRB page 302. Students practice estimating decimal products

Assessment: Expect most students to use fraction circle pieces, drawings, or the common denominator shortcut to compute fraction quotients in Problems 1–4 on page 243. Also expect most to be able to solve the number stories in Problems 1–4 on page 244, although it may be challenging for some to determine appropriate number models. Some students will be able to write appropriate number stories in Problems 5 and 6. Encourage students who struggle writing fraction division number stories to look at the other problems on the page for example

Practice: MJ page 245 Math Boxes. Home links 7-4

Differentiation:

- **Readiness: Using Visual Models for Fraction Division.** MM page 259. To prepare for common denominator division, students review how to use visual models to solve fraction division problems. Make sure students can explain how each divisor, dividend, and quotient is represented. Discuss how multiplication can be used to check an answer.
- **Extra Practice:** Activity Card 86. For more practice using common denominators to divide, students roll dice to generate fraction division problems. They solve the problems using common denominators and check their answers with multiplication, fraction circles, or drawings. As an extension, students create a number story for one of the problems they solved.
- **Enrichment:** MM page 260. To extend their work with fraction division, students use the common denominator method to divide fractions by fractions. Students make sense of a worked example and make an argument about whether or not the method will always work. They think about how many times the divisor is in the dividend to check the reasonableness of their answers.
- **ELL Support:** Help students understand the term common in common denominator by building on their understanding of same. Display a set of objects, like cubes of different colors and sizes. Isolate those that share a common attribute, such as the color red. Use think-alouds.

Lesson 7-5 A Hierarchy of Triangles

Students classify triangles in a hierarchy based on properties.

Standards: 5.G.3, 5.G.4

Warm-Up: Mental Math: Students multiply and divide by numbers of 10

Math Message: MM page 262. Students sort triangles

Focus: Math Message Follow-Up

- Students discuss overlapping and non-overlapping sorts and organize themselves into a hierarchy.
- Students discuss overlapping and non-overlapping sorts and organize themselves into a hierarchy.
- Tell students that the small marks on the sides of the triangles are called **tick marks,** or hash marks. Explain that if two sides are the same length, they have the same number of tick marks. Be sure students understand that a side with two tick marks is not necessarily longer than a side with one tick mark; the number of marks is arbitrary. Note that some of the triangles have tick marks and some do not. Explain that the marks are not necessary when you can clearly see that the sides are not equal in length. Have students share how they sorted the triangles. Make a list of the different ways students sorted
- Students define a triangle hierarchy and use it to classify their triangle cards
- Tell the class they are going to use their triangle cards to create a hierarchy of triangles. Have students set aside any two cards to use later in the activity. Explain that just as "Students in my class" was the top category in the hierarchy of students in the class, "Triangles" will be the top category in the hierarchy of triangles. Have students write "Triangles" on the top left of journal page 246 and place all their triangle cards (except the two they set aside) next to this category. Ask: *What properties do all triangles share?*
- Have students explain to a partner why an equilateral triangle could go in any category on the triangle hierarchy.

Games: Fraction Top-It (Addition). SRB page 309. Students practice adding fractions

Assessment: Expect most students to correctly classify the triangles in the hierarchy. Some students may be able to fill in each blank in Problem 4 with a subcategory of the underlined category and clearly describe the pattern in Problem 5.If students struggle classifying the triangles, have them write descriptions of each category within the hierarchy as suggested in the Adjusting the Activity note. If they struggle filling in the blanks in Problem 4, have students fill in the blank with any other category from the hierarchy and then check whether the statement is still true.

Practice: MJ page 248 Math Boxes. Home links 7-5

Differentiation:

- **Readiness: Playing What's My Attribute Rule?** SRB page 326. To prepare for classifying shapes in a hierarchy, students play What's My Attribute Rule? MM page G31.
- **Extra Practice:** Activity Card 87. MM page 262 and 264. For additional practice with hierarchies, students roll a die to generate properties defining subcategories in a hierarchy. They use their hierarchies to sort a set of triangle cards. You may want to review the definitions of *acute angle, obtuse angle*, and *line of symmetry* before students begin the activity.
- **Enrichment:** MM page 263. To extend their work with hierarchies, students explore how to use Venn diagrams to show the relationships described in a hierarchy. They draw a Venn diagram to match a different triangle hierarchy. In a Venn diagram, subcategories are shown inside their parent categories rather than below them. Encourage students to share what they like about each representation
- **ELL Support:** Hel students understand the term *overlap* by displaying two stick-on notes that are close to each other, but not touching. Place your finger between the notes, using a think-aloud statement like: *There is space between these two stick-on notes.* Then overlap the notes and say*: This stick-on note is over this one. These two stick-on notes are overlapping. There is no space between the two notes. One goes over the other. They overlap.*

Lesson 7-6 A Hierarchy of Quadrilaterals

Students classify quadrilaterals in a hierarchy based on properties.

Standards: 5.G.3, 5.G.4

Warm-Up: Mental Math - Students use estimates to place the decimal point in decimal products.

Math Message: MJ page 250. MM page 266. Students match quadrilaterals to definitions

Focus: Math Message Follow-Up

- Students use quadrilateral definitions to fill in test properties in hierarchy
- Have volunteers share the examples they chose for each type of quadrilateral. Students should give a thumbs-up if they agree and thumbs-down if they disagree with the examples that others share. Discuss and resolve any disagreements. If necessary, review and clarify the meanings of parallel (always the same distance apart) and adjacent (next to each other). If students have difficulty identifying whether two sides are parallel, suggest that they use a straightedge to extend the sides to make it clearer that the sides are always the same distance apart.
- MJ page 250-251. Students use the quadrilateral hierarchy to classify their quadrilateral cards.
- Use the Quadrilateral Hierarchy Poster to demonstrate how to classify quadrilaterals in the hierarchy. Explain that for each quadrilateral card students should start at the top of the hierarchy and test the quadrilateral using the test properties at each intersection. They should leave each card next to the lowest category into which it will fit. Remind students that if they reach a "test" that a quadrilateral does not pass, they should check to see if there is a different branch the quadrilateral could follow. For example, if a quadrilateral does not pass the test for a trapezoid, they should try testing it as a kite.

Differentiate: Adjusting the Activity

If students have trouble keeping track of the various properties of each quadrilateral, suggest that they make a list of the properties of each shape before trying to classify it. For example, before starting to classify Quadrilateral A, they may note that the shape has 2 pairs of parallel sides, 4 equal-length sides, and no right angles. Some students may benefit from having a checklist like the following:

- Does it have:
    - *1 pair of parallel sides?*
    - *2 pairs of equal-length adjacent sides?*
    - *2 pairs of parallel sides?*
    - *4 equal-length sides?*
    - *4 right angles?*

- They can complete the checklist before starting to classify any particular shape, and then use the checklist for reference as they move down the hierarchy. Have students share answers to Problem 2b on journal page 250. Students should give thumbs-up if they agree and thumbs-down if they disagree. Ask a volunteer to describe a pattern that can be used to form true statements about categories and subcategories

Assessment: Use the Quadrilateral Hierarchy Poster to demonstrate how to classify quadrilaterals in the hierarchy. Explain that for each quadrilateral card students should start at the top of the hierarchy and test the quadrilateral using the test properties at each intersection. They should leave each card next to the lowest category into which it will fit. Remind students that if they reach a "test" that a quadrilateral does not pass, they should check to see if there is a different branch the quadrilateral could follow. For example, if a quadrilateral does not pass the test for a trapezoid, they should try testing it as a kite.

Practice: MJ page 249 (Solving Bulletin Board Area Problems). MJ page 252 Math Boxes. Home links 7-6

Differentiation:

- **Readiness: Reviewing Attributes.** MM page 266. To prepare for classifying shapes according to their attributes, students identify and draw shapes with specified attributes.
- **Extra Practice:** Activity Card 86. MM page 266. For additional practice classifying figures in a hierarchy, students classify quadrilateral cards on the hierarchy and keep track of the number of categories and subcategories they pass through. They discuss which figures and paths allow them to pass through the most subcategories**.**
- **Enrichment:** MJ page 251. MM page 267. To extend their work with hierarchies, students draw quadrilaterals with specified attributes. The attributes are different from those discussed in the lesson, so these problems may be challenging. Students classify the quadrilaterals on the hierarchy. If students need a hint for Problem 2, tell them that a square has four lines of symmetry: two that go through the sides and two that go through the corners.
- **ELL Support:** Use the terms sort and group to build understanding of the term classify. Display a set of mixed objects and use a think-aloud to sort the objects into two different groups according to an attribute, such as color.

Lesson 7-7 Playing Property Pandemonium

Students learn a game to practice naming and classifying quadrilaterals based on properties.

Standards 5.G.3., 5 G.4

Warm-Up: Mental Math: Students use estimates to place the decimal point in decimal quotients.

Math Message: Students list multiple names for a geometric figure.

Focus: Math Message Follow-Up

- **MJ page 251.** Students discuss how the quadrilateral hierarchy can be used to find multiple names for figure**s.**
- Have students share their answers to the Math Message
- Review the idea that a shape in a subcategory has all the attributes of shapes that are in the categories above it. For example, rectangles are a subcategory of parallelograms, so every rectangle has all the attributes, or properties, of a parallelogram. That means every rectangle is also a parallelogram. The same relationship exists between rectangles and trapezoids and between rectangles and quadrilaterals.
- Remind students how to classify the rectangle in the hierarchy, starting at the top and moving down. Point out that all of the names students listed for the shape lie on the path taken from the top of the hierarchy to get to the lowest possible subcategory for the shape

Differentiate:

- If students have difficulty with the idea that figures can have multiple names, connect back to the activities in Lesson 7-5 in which they classified themselves in a hierarchy. Point out that the students in the last group could have been called “Students in my class,” “Students in my class with a sibling,” and “Students in my class with a sibling who is a brother,” depending on how specific students wanted to be. Similarly, a rectangle can be called a quadrilateral, trapezoid, parallelogram, or rectangle, depending on how specific a name is needed.

Games: Introducing Property Pandemonium. SRB page 320

- Students practice naming and classifying quadrilaterals
- Ask a student to share the property, quadrilateral, and drawing from one round of the game. Have volunteers give as many other names for the quadrilateral as they can and justify their answers.

Assessment: Expect that most students will be able to generate at least one additional name for their quadrilaterals when referencing the quadrilateral hierarchy. Some students may be able to consistently find all the possible names using the quadrilateral hierarchy, and some may strategically draw shapes with fewer names. If students struggle generating names for their quadrilaterals, have them point to the first name they wrote for the quadrilateral (the one from the Quadrilateral Card) in the hierarchy, then see if they can find another name by tracing a path upward.

Practice: MJ page 253 Multiplying Mixed Numbers. MJ page 254 Math Boxes. Home links 7-7

Differentiation:

- **Readiness: Finding Multiple Names for Objects.** MJ page 250. To prepare for finding multiple names for geometric figures, students discuss different names for everyday objects. Refer to the definition on the top of journal page 250. Point out that a trapezoid is a quadrilateral with at least one pair of parallel sides, so we can also just call it a quadrilateral.
- **Extra Practice:** MM page 270. For additional practice drawing and naming geometric figures, students draw figures with a given number of names and list properties of those figures
- **Enrichment:** Activity Card 89. MM page 269. To extend their work with hierarchies, students create a hierarchy for a topic of their choice. They write or draw examples that would fit into categories and subcategories without writing names for the categories. They trade papers with a partner and the partner tries to determine the category names
- **ELL Support:** To support understanding of terms that will be used while playing Property Pandemonium, such as pair, parallel, right angles, and equal length, provide students with vocabulary cards that include each term and corresponding illustrations.

Lesson 7-8 Open Response: A Hierarchy of Polygons (2-Day Lesson)

Students create a new hierarchy with given polygons.

Standards 5.G.3, 5.G.4

Day 1:

Warm-Up: Mental Math

Students find a fraction factor in a multiplication problem, given a second factor and the product.

Math Message: Students name common geometric attributes of different shapes

Creating Hierarchies:

- **Math Message Follow-Up** Students create two hierarchies with polygons
- **MJ page 255.** Ask students to share the attributes of the shapes on the journal page. Consider listing the attributes that students share on the Class Data Pad or chart paper.

Solving the Open Response Problem.

SRB page 22. MM page 272-273. Distribute Math Masters pages 272 and 273. Read and review the directions as a class. Have students cut out the polygon cards. Remind them that they will use the polygon cards to create a hierarchy, but they should not glue the cards to the page. Instead, they will draw the polygons on the hierarchy. Students can work with a partner on the task, but they should record their own solutions

Differentiate: Adjusting the Activity

- To help students get started making a hierarchy, have them put all of the shapes at the top of the page in the polygons category. Then have them identify a property that some, but not all, of the polygons have, and move the polygons with that property down to a subcategory. To help them label the subcategory, give them the prompt, "These are polygons with _____."
- If students have difficulty finding a place for eight of the polygons when creating the hierarchy for the open response problem, remind them that even if polygons do not fit in a subcategory, all of them fit in the top polygons category. For example, if students create a subcategory about parallel sides, they will find that only six of the polygons have parallel sides. They can place two other polygons in the top category, for a total of eight polygons.

- To help students get started making a hierarchy, have them put all of the shapes at the top of the page in the polygons category. Then have them identify a property that some, but not all, of the polygons have, and move the polygons with that property down to a subcategory. To help them label the subcategory, give them the prompt, "These are polygons with _____."

- If students have difficulty finding a place for eight of the polygons when creating the hierarchy for the open response problem, remind them that even if polygons do not fit in a subcategory, all of them fit in the top polygons category. For example, if students create a subcategory about parallel sides, they will find that only six of the polygons have parallel sides. They can place two other polygons in the top category, for a total of eight polygons.

Getting Ready for Day 2: Review students' work. Use the Re-engagement Planning Form (*Math Masters,* page TA4) and the rubric in the Day 2 Focus activity: *Revising Work* to plan ways to help students meet expectations for both the content and practice standards. Look for complete and correct hierarchies, as well as work that uses unclear language or that categorizes the polygons but does not use the structure of a hierarchy.

<u>Day 2</u>:
Setting Expectations: Students discuss what makes a hierarchy correct and complete. They also discuss how to respectfully talk about their own and other students' work.

- Briefly review the open response problem from Day 1.
- After this brief discussion, tell students that they are going to look at other students' work and see whether they thought about the problem in the same way. Refer to on the Standards for Mathematical Practice Poster. Explain that students will analyze and discuss other students' hierarchies to see how they chose to classify the polygons.
- Students discuss the properties and structure of others' hierarchies.

Reengaging in the Problem: Students reengage in the problem by analyzing and critiquing other students' work in pairs and in a whole-group discussion. Have students discuss with partners before sharing with the whole group

Revising Work:

- **MM. page 272-273.** Students revise their work from Day 1.
- Have students reflect on their work and revisions. Ask: *How did you make sure your hierarchy was mathematically correct? Did you revise your hierarchy? If so, how?*

Assessment: Collect and review students' revised work. Expect students to improve their work based on the class discussion. For the content standard, expect most students to correctly classify the polygons in a hierarchy with subcategories that are more specific than the categories above them.

Practice: MJ page 256 Math Boxes. Home links 7-8

Lesson 7-9 Collecting and Using Fractional Data

Students organize and represent fractional data on line plots. They use operations on fractions to solve problems.

Standards 5.MD.2, 5.NF.1, 5.NF.2, 5.NF.2

Warm-Up: Mental Math: Students multiply fraction by fractions

Math Message: Students read about and discuss natural measures

Focus: Math Message Follow-Up

- **MJ page 258. SRB page 212.** Have several students share which natural measure they would use to measure the width of their journals
- Differentiate: To help students who struggle trying to accurately measure to the nearest fraction of an inch, scaffold their thinking by asking questions like these:
- How many whole inches are there? Record the number as the whole-number part of the mixed number.
- To what level of precision are we measuring: the nearest half, fourth, eighth, or sixteenth of an inch? Record the answer as the denominator part of the mixed number.
- Which tick marks on the tape measure represent the level of precision we are measuring to? Count up along those tick marks from the last whole inch to the end of the object you are measuring. Record the count as your numerator.
- **MJ page 258-259.** Students create line plots and use them to answer questions.

Assessment:

- Expect most students to be able to create line plots using fractional data and to find differences in fractional data in Problem 7. Some may correctly solve Problems 6 and 8, which involve evening out and multiplying fractions. If students struggle creating line plots, consider having them transfer the class data onto a piece of paper so that they can cross out each measurement after representing it on the line plot. If students struggle solving Problem 7, have them represent the problem with fraction circles or on a number line.
- Ask students to discuss any trends that they noticed in each data set after creating the line plots.

Games: Play Property Pandemonium. SRB page 320. Students practice naming and classifying quadrilaterals

Practice: MJ page 257 Math Boxes. Home links 7-9

Differentiation:

- **Readiness: Exploring Equivalent Fractions on a Ruler.** MM page 275. To build readiness for gathering fractional measurement data, students review the marking on a ruler. Be sure to clarify that the "inch" shown is zoomed in so each increment can be seen clearly, making this "inch" much larger than a real inch. Have students label each tick mark with sixteenths. Remind them that although they are not writing the whole-number part for eah measurement, it is important to remember that it is there. Have students label each 1/8 tick mark above the 1/16 labels. Continue with fourths and halves so that all possible names are given for each tick mark. Then have students measure a few items to the nearest inch, half inch, quarter inch, eighth inch, and sixteenth inch.
- **Extra Practice:** MM page 276. For additional practice organizing fractional data on line plots and solving problems with fractional data, students place mixed numbers with unlike denominators on a line plot and answer questions about the data.
- **Enrichment:** Activity Card 90. MM page 277. To extend their work with appropriate levels of precision for fractional measurements, students measure 6 objects using a different level of precision than a partner. They plot their measurement data, compare it to their partner's, and discuss how different levels of precision affect the appearance of the line plot.
- **ELL Support:** In this lesson students work with the word span, which begins with the consonant cluster *sp*. ELLs may find it difficult to pronounce this sound in the initial position if it does not occur in that position in their home language. Point out the correct pronunciation and articulate it carefully. List other words that begin with the *sp* sound.

Lesson 7-10 Identifying and Visualizing Patterns

Students use rules to generate sequences, identify relationships between corresponding terms, and graph points on a coordinate grid to visualize patterns and relationships.

Standards 5.G.1, 5.G.2, 5.OA.3

Warm-Up: Mental Math - Students identify rules for patterns and continue them

Math Message - Students identify rules used to generate patterns and to relate columns in a table

Focus: Math Message Follow-Up

- **MJ page 260-261.** Students form ordered pairs using corresponding terms of two sequences and graph them. They discuss how the graphs show patterns and relationships.
- Have students share their answers for Part A of the Math Message. Ask: How do you know that is the rule? Have students share and explain their answers to Part b.
- Tell students that the lists of numbers in Parts A and B are called sequences. Sequences often have an underlying rule that is used to generate the numbers in the sequence. The numbers in a sequence are sometimes called the terms of the sequence. For example, 1, 2, 3, 4, 5, and so on are the terms of the sequence from Part a.
- **Differentiate: Adjusting the Activity**
  If students have difficulty keeping track of the three rules involved in each problem, have them circle the *in* column and rule in one color, the *out* column and rule in a second color, and one row of the table and the *in/out* relationship rule in a third color. Students can then refer to, for example, the red rule, the blue rule, and the green rule.
- Have students examine the graphs they drew on journal pages 260–261. Ask: *What is similar about all the graphs? What are some differences among the graphs?*
- Have students describe how the graphs (in Problems 3 and 4 on journal page 261) show whether the *in* numbers or the *out* numbers are increasing faster.

Assessment: Expect that most students will be able to use the rules to fill in the columns in Problems 2–4 and write a rule for Problem 3b on journal pages 260–261. Some students may struggle identifying the rules in Problems 2b and 4b because they are division rules rather than multiplication rules. Most students should also be able to form ordered pairs and accurately graph the points in each problem. Some students may be able to explain why the rule makes sense in Problem 2c. If students struggle using the rules to fill in the columns or to identify the relationships, have them practice these skills separately as described in the optional Readiness activity.

Practice:

- MJ page 262 (Multiplying & Dividing Fractions).
- Math Boxes page 263.
- Home links 7-10

Differentiation:

- **Readiness: Identifying and Describing Rules.** To prepare for using rules to analyze relationships, students determine rules for sequences and for in/out tables.
- **Extra Practice:** Activity Card 91. MM page 280. For additional practice analyzing patterns and relationships, students roll a die to determine rules, use the rules to generate sequences, and describe the apparent relationship between corresponding terms. They graph ordered pairs consisting of corresponding terms
- **Enrichment:** MM page 279. To extend their work analyzing patterns and relationships, students use corresponding pieces of data to form ordered pairs. They graph the points to represent the data set and discuss whether the relationship between the *x*- and *y*-coordinates can be described with a rule. Before beginning, you may want to point out that the axes are not shown on the graph because the graph shows a part of the coordinate grid that is far away from the axes. Students can imagine the axes being far off to the left and below.
- **ELL Support:** Scaffold student understanding of patterns. Show examples and non-examples of simple patterns, using materials such as pattern blocks or strings of numbers.

Lesson 7-11 Rules, Tables, and Graphs, Part 1

Students analyze patterns and rules in tables of values, create graphs to represent the data, and answer questions using rules, tables, and graphs.

Standards 5.G.1, 5.G.2, 5.MD.1, 5.OA.3

Warm-Up: Mental Math - Students identify a rule that relates corresponding terms of two patterns

Math Message: Students calculate how far an airplane travels in 1 minute given the distance it traveled in one hour.

Focus:

- **Math Message Follow-Up**
- **MJ page 264-265.** Students examine patterns in a table of values. They use the data to create a graph and answer questions.
- Have students share how they solved the Math Message. Expect them to understand that because there are 60 minutes in 1 hour, they can restate the problem as "An airplane traveled 480 miles in 60 minutes." To find out how many miles the plane traveled in 1 minute, divide 480 by 60. The plane traveled 8 miles in 1 minute
- Explain that lines are always represented with arrows at both ends to indicate that they continue. Some students may comment that in real life a plane cannot fly indefinitely; it will eventually run out of fuel. Others may point out that a flight could not begin at less than 0 seconds. Acknowledge these points, but explain that when we use a mathematical model to represent and solve real-world problems, we can pay attention to the parts of the model—in this case, the parts of the line—that make sense in the given situation.
- Have students work in partnerships to complete Problems 3–7 on journal pages 264 and 265. Then discuss as a class.
- **Differentiate: Adjusting the Activity**
  Some students may benefit from using a transparency sheet to help them plot points. Demonstrate placing one edge of the transparency along the grid line corresponding to the *x*-coordinate. Slide the sheet so the other edge is in line with the *y*-coordinate. Plot the point at the sheet's upper right-hand corner. Students can also use the transparency to find an unknown coordinate when a line has already been drawn by placing one edge along the grid line of the known coordinate, placing the corner on the line, and following the other edge to where it intersects the axis.
- MJ page 266-267. Students complete tables of values based on a rule, create a graph, and answer questions
- Ask: *Would you use the table, the graph, or the rule to find out how many words Frank could type in 12 minutes?* Have students discuss their thoughts with a partner. Share as a class if time permit

Assessment: Expect most students to accurately complete the table, graph the data, and answer the questions on journal pages 266 and 267. If students struggle applying rules, have them draw a function machine and use it to complete the tables. Refer to the optional Readiness activity to support students who struggle when creating or interpreting the graph. Students may benefit from using a transparency, as suggested in the Adjusting the Activity note.

Practice MJ p. 268 Math Boxes, Home Links 7-11

Differentiation:

- **Readiness: Interpreting Coordinate Grid Scales.** MM page 284. To prepare for working with axes with different scales, students are introduced to a coordinate grid with different scales. Remind students that the axes on a coordinate grid are number lines. Make sure students see that because the x-axis on this grid is labeled by 10s, the five divisions between each 10 represent jumps by 2s. Discuss how the y-axis is labeled and what the divisions represent.
- **Extra Practice:** MM page 282. For additional practice working with rules, tables, and coordinate grids, students examine a graph and create a table that represents points on the given line. GMP2.1, GMP2.2 They write a rule to describe the relationship between the corresponding terms in the table.
- **Enrichment:** Activity Card 92. MM page 283. To extend their work with rules, tables, and graphs, students draw two number cards to determine how many miles per minute they can fly. Students create a table of values, ordered pairs, and a graph to represent their speed. They compare their graph to a partner's and find a rule that describes how fast they can fly.
- **ELL Support:** Use role play involving class rules or traffic signs, such as stop signs and no parking signs, to explain the meaning of rules as guidelines to be followed at all times. Make the connection to the rules in in/out tables.

Lesson 7-12 Rules, Tables, and Graphs, Part 1

Students use rules, tables, and graphs to compare real-world relationships and solve problems.

Standards 5.G.1, 5.G.2, 5.OA.3

Warm-Up: Mental Math: Students estimate the products of decimal multiplication problems.

Math Message: Students write a rule to describe a real-world situation. They use it to complete a table and write ordered pairs.

Focus: Math Message Follow-Up

- **MJ page 270.** Students will create graphs to represent data from two different rules. They use the graphs to answer questions.
- **MJ pages 266 and 270.** Remind students that in a table they can look for three different rules. Ask: When you wrote a rule to describe Karla's earnings in the Math Message, were you describing a rule for the x column, a rule for the y column, or a rule about the relationship between the corresponding x- and y- terms? Have students share their answers to the Math Message.
- **MJ pages 270-271.** Students complete tables and graphs to represent and answer questions about the results of a footrace.
- Tell students that they will now use rules, tables, and graphs to analyze a footrace problem. Read the directions for Problem 2 on journal page 270 as a class and ask students to look carefully at the tables.
- After the start of the race, how many yards does Eli gain on Lupita each second? Explain. If their speeds stay the same, how many seconds would Eli and Lupita have to run for Eli to be 10 yards ahead of Lupita? Explain.
- Ask students to describe to a partner how the graphs helped them visualize what happened in the race. Call attention to how this description matches the "story" represented by the tables.

Differentiate: Adjusting the Activity

To help students visualize how the line graph models the race results, have two students portray Eli and Lupita and act out the race in slow motion. To challenge students, pose additional questions and have students explain how they used the table, the rule, or the graph to find the answer.

Games: Playing Spoon Scramble. SRB page 324. Students practice multiplying fractions and multiplying and dividing by powers of 10

Assessment: Expect most students to accurately complete Problems 3–5 on journal page 271. Students may need to be reminded to label each line in Problem 4, since they are graphing two sets of data on the same grid. If students struggle graphing on a coordinate grid, consider providing additional practice by having them play Hidden Treasure. If they struggle to solve Problem 5, ask guiding questions like these: How far has Eli run after 7 seconds? How far has Lupita run after 7 seconds? Who is ahead? How do you know?

Practice: MJ page 269 Math Boxes. Home links 7-12

Differentiation:

- **Readiness: Modeling a Turtle Race.** MM page 288. For experience with mathematical representations of real-world contexts, students act out a race modeled by the tables and graph on MM page 288. Discuss how the column headings in the tables correspond to each axis on the grid. Set up a 15-foot racecourse in our classroom with each foot marked. Choose two students as turtle racers. Call out the values in the table, second by second, as the "turtles" move along the course. As the turtles advance, have students use their fingers or the points of two pencils to trace the turtles' position s on the graph.
- **Extra Practice:** MM page 286. For additional practice working with rules, tables, and coordinate grids, students complete two tables about gas mileage and choose an appropriate rule for each table. They write ordered pairs, create a graph, and then answer questions about the data.
- **Enrichment:** Activity 93. MM page 287. To extend their understanding of constructing graphs from data, students represent race results with multiple graphs. Students conduct two different types of races along a 5-meter course. They graph the results for each participant, then compare and discuss the resulting graphs.
- **ELL Support:** Help students understand the term head start using visuals and role play. Assess student understanding of the term by asking who would like to have a head start.

Lesson 7-13 Old Faithful's Next Eruption

Students identify relationships between patterns. They graph ordered pairs from corresponding terms of patterns and use the graph to analyze a real-world phenomenon.

Warm-Up: Mental Math: Students make estimates for decimal division problems

Math Message: Students use rules to complete two tables and discuss the similarities and differences between them.

Focus: Math Message Follow-Up

- Students explore a rule relating columns in an in/out table that involve more than one operation.
- Have students share how they filled in the tables in the Math Message problem and what they noticed about the two tables. Be sure to discuss the following points:
- Both tables follow the same pattern in the in columns, + 1, and the same pattern in the out columns, + 2. The in columns on both tables are identical because they both begin with 1 and follow the same pattern. The values in the out column of Table 2 are 100 more than the values in the out column of Table 1.
- **MJ page 272.** Students generate terms by applying a rule. They write terms as ordered pairs and graph them.
- Have students use their graphs or the formula on journal page 272 to determine whether the wait time for Old Faithful's next eruption increases or decreases as the length of the eruption increases. Ask them to explain how they know.

Games: Play Decimal Domination: SRB page 295. Students practice multiplying decimals

Assessment: Expect most students to be able to apply the rule to complete the table and to form and graph ordered pairs on a coordinate grid in Problems 1–3 on journal page 272. Most students should also be able to interpret coordinate values to solve Problem 4. If students struggle to complete Problem 4, consider breaking the question down into smaller parts by asking questions like: *If the length of the previous eruption was 4 minutes, what is the wait time to the next one? How many hours and minutes are equal to 70 minutes? What time will it be 70 minutes, or 1 hour and 10 minutes, after 8:30?*

Practice: MJ page 273 Math Boxes. Home Links 7-13

Differentiation:

- **Readiness: Testing and Using Rules.** To prepare for finding a rule with more than one operation, students examine pairs of numbers to find a rule that relates them. Remind students that a rule is a way to relate every in value in a sequence with its out value. What

works in one row may not work in another, so it is important to test the rule with several sets of values. Display one pair of terms and have students propose rules that relate the numbers. Record their suggestions. Display a second pair of terms and ask students to determine which original rule is the best fit. Encourage students to explain their thinking.

- **Extra Practice:** MM page 291. For practice identifying relationships between corresponding terms of two patterns, students complete tables using given rules. They write formulas relating the corresponding terms of the patterns and use the formulas to answer questions about various real-world situations.
- **Enrichment:** Activity Card 94. MM page 290. To extend their work identifying relationships between patterns, generating terms, and forming ordered pairs, students work backward to identify a relationship between two corresponding terms, use the relationship to complete a table, and identify a pattern in the table's *out* column
- **ELL Support:** Help students understand the meaning of the term *corresponds* by restating it using the everyday term *goes with*. Display a set of dominoes and show a number card that corresponds to dots on a selected domino. Using different dominoes, ask student to find the number and that corresponds to, or goes with, the set of dots on a given domino.

Lesson 7-14 Assessment: Unit7 Progress Check

Administer Unit Assessment.

Day 1:

- **Warm-Up:** Students complete the Self-Assessment to reflect on their progress in Unit 7.

- **Unit 7 Assessment:** Students complete the Unit 2 Assessment to demonstrate mastery as expected to this point on the NJ Student Learning Standards covered in this unit.

- **Differentiation: Adjusting the Activity -** View TE page 748 to see specific adjustments for each question on the assessment. All instruction and most practice is complete for the content that is marked with an asterisk (*) on page TE 746-747.

- **Unit 7 Challenge** (Optional): Students may demonstrate progress beyond expectations after they complete the Unit 7 Assessment.

Day 2:

- **Open Response Assessment:** Students add shapes to a hierarchy of quadrilaterals, name three of the shapes with multiple names, and explain how to use the hierarchy to name the shapes.

- **Differentiate: Adjusting the Activity**
  - If students have trouble getting started, point to figure G (parallelogram) and ask: *What test properties does it have? What is the lowest subcategory in the hierarchy in which it has the test properties? Use the hierarchy to give other names for the figure?*
  - Some students may forget that they can follow multiple paths upward from the lowest subcategory for figures A and L. If students need support, ask: *Which path or paths in the hierarchy can you use to find names for a square?*

- **Discussing the Problem:** After completing the task, display figures H and A. Begin by asking for a few volunteers to explain how they can find the names for figure H using the hierarchy. Ask: Why isn't figure H also a parallelogram? What is another way to tell that figure A is a parallelogram? How does the hierarchy help you name the figures?

- **Evaluating Students' Responses:** Expect most students to play the five quadrilaterals in the correct positions in the hierarchy and provide correct answers for at least two of problems 1-3. You can use the rubric on page 750 to evaluate students' work.

Looking Ahead:

- **Math Boxes** 7.14: Preview for Unit 8
- **Home Link** 7.14: Students take home the Family Letter that introduces Unit 8.

Unit Plan Title	Applications of Measurement, Computation, & Graphing
Suggested Time Frame	19 Days including flex days

Stage 1: Desired Results

Overview / Rationale

In this unit students learn two methods for multiplying mixed numbers. They use these methods to find the areas of rectangles with fractional side lengths and to solve problems involving fractional data in line plots. Students also review attributes of 2-dimensional figures and classify shapes in a hierarchy based on properties. Finally, students graph points on coordinate grids to visualize numerical patterns and represent real-world problems.

New Jersey Student Learning Standards for Mathematics

5.OA.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

5.NF.4.b Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade).

5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots.

5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.

5.G.4 Classify two-dimensional figures in a hierarchy based on properties.

GMP2.1 Create mathematical representations using numbers, words, pictures, symbols, gestures, tables, graphs, and concrete objects.

GMP2.2 Make sense of the representations you and others use.

GMP2.3 Make connections between representations**.**

GMP8.1 Create and justify rules, shortcuts, and generalizations.

Technology Integration
__X__ **8.1 Educational Technology:** All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
- Student Websites - Teacher Websites - SMART board
____ **8.2 Technology Integration, Engineering, Design and Computational Thinking – Programming** All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

INTEGRATED SOCIAL AND EMOTIONAL LEARNING COMPETENCIES
The following social and emotional competencies are integrated in this curriculum document:

Self-Awareness
_____Recognize one's own feelings and thoughts
_____Recognize the impact of one's feelings and thoughts on one's own behavior
_____Recognize one's personal traits, strengths and limitations
_____Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management
__x__Understand and practice strategies for managing one's own emotions, thoughts and behaviors
__x__Recognize the skills needed to establish and achieve personal and educational goals
__x__Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness
__x__Recognize and identify the thoughts, feelings, and perspectives of others
_____Demonstrate an awareness of the differences among individuals, groups, and others' cultural backgrounds
_____Demonstrate an understanding of the need for mutual respect when viewpoints differ
_____Demonstrate an awareness of the expectations for social interactions in a variety of setting

Responsible Decision Making
__x__Develop, implement and model effective problem solving and critical thinking skills
_____Identify the consequences associated with one's action in order to make constructive choices
_____Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills
_____Establish and maintain healthy relationships
__x__Utilize positive communication and social skills to interact effectively with others
_____Identify ways to resist inappropriate social pressure
_____Demonstrate the ability to present and resolve interpersonal conflicts in constructive ways
_____Identify who, when, where, or how to seek help for oneself or others when needed

In this unit plan, the following 21st Century Life and Careers skills are addressed:				
Check ALL that apply – 21st Century Themes			**Indicate whether these skills are:** ● **E – encouraged** ● **T – taught** ● **A – assessed** **Career Ready Practices**	
9.1	**Personal Financial Literacy**			CRP1. Act as a responsible and contributing citizen and employee.
	Income and Careers		ETA	CRP2. Apply appropriate academic and technical skills.
X	Money Management			CRP3. Attend to personal health and financial well-being.
	Credit and Debt Management		ETA	CRP4. Communicate clearly and effectively and with reason.
	Planning, Saving, and Investing			CRP5. Consider the environmental, social and economic impacts of decisions.
X	Becoming a Critical Consumer			CRP6. Demonstrate creativity and innovation.
	Civic Financial Responsibility			CRP7. Employ valid and reliable research strategies.
	Insuring and Protecting		ET	CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
9.2	**Career Awareness, Exploration, and Preparation**			CRP9. Model integrity, ethical leadership and effective management.
X	Career Awareness			CRP10. Plan education and career paths aligned to personal goals.
	Career Exploration			CRP11. Use technology to enhance productivity.
	Career Preparation			CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

NJ Student Learning Standards for English Language Arts

RI.4.3 - Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.4 - Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

RI.4.7 - Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.4.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

Essential Questions:	**Enduring Understandings:**
● How are models used to show how fractional parts are combined or separated? ● What patterns and relationships in numbers help you think about the problem?	***Students will understand that…*** ● There are many ways to model and manipulate fractions to arrive at the correct answer. ● Patterns and relationships between numbers help us determine reasonable answers.
Knowledge:	**Skills:**

Students will know…	**Students will be able to…**
● Partial-products multiplication ● Partial products ● Tiling ● Unit fraction ● Common denominator ● Tick mark ● Attribute ● Property ● Hierarchy ● Category ● Subcategory ● Isosceles triangle ● Equilateral triangle ● Quadrilateral ● Parallel ● Adjacent ● Trapezoid ● Kite ● Parallelogram ● Rectangle ● Rhombus ● Square ● Polygon ● Hierarchy ● Natural measure ● Standard unit ● Cubit ● Great span ● Joint ● Precision ● Sequence ● Rule ● Term	● Generate a pattern using a given rule; form ordered pairs from corresponding terms in a table; graph ordered pairs on a coordinate plane. ● Add and subtract fractions and mixed numbers with unlike denominators. ● Multiply fractions by whole numbers and by fractions; use an area model, or rewrite factors as fractions and use an algorithm, to multiply a mixed number by a whole number or by a fraction. ● Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths or by multiplying the side lengths; understand that both methods should produce the same area measurement; represent fraction products as fractional areas. ● Divide unit fractions by whole numbers and whole numbers by unit fractions. ● To create line plots using fractional data; use data on line plots to solve single-step and multistep problems involving addition and subtraction. ● To understand that attributes can be used to define categories and subcategories of shapes; recognize when one category is a subcategory of another.

• Relationship • Corresponding terms • Corresponds • Increase • Decrease • Corresponding terms • Formula	• Understand the basic structure of a hierarchy; classify two-dimensional figures in a correct category according to a hierarchy, although not necessarily the most specific category.

Student Resources	
All Operations Fractions	http://www.funbrain.com/fractop/index.html
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Websites	www.abcya.com www.sheppardsoftware.com www.coolmath.com

Teacher Resources	
Games/Lessons Topics	http://littletonpublicschools.net/Default.aspx?tabid=539
Games/Demos Topics	http://www.topmarks.co.uk/Interactive.aspx?cat=24
Demo Lessons/Activity Sheets	http://www.learnalberta.ca/content/me5l/html/Math5.html?launch=true
All Operations Fractions	http://www.funbrain.com/fractop/index.html
Mr. Nussbaum	http://mrnussbaum.com/fifth-grade-math/
Quizzes/Practice	http://littletonpublicschools.net/Default.aspx?tabid=539
Khan Academy	www.khanacademy.com
Mentor Texts	Shape Up: Fun With Triangles and Other Polygons Mummy Math The Greedy Triangle What's Your Angle Pythagoras? A Math Adventure If You Were a Quadrilateral Lemonade for Sale

Stage 2: Acceptable Evidence

Assessments

Formative:	**Summative:**
● Math Message ● Oral Mental Math Fluency ● Math Journal ● Slates ● Lesson Assessment Check-In ● Collins Writing ● Exit Slips ● Home Link ● Teacher Observation ● Games/Activity Cards	● Benchmark Assessment ● Quizzes ● Unit Progress Check ● Open Response Assessments ● Student Work Products

Stage 3: Learning Experiences

Lesson 8-1 Planning an Athletic Field

Students make unit conversions to find areas of sports playing surfaces in square feet. They use their findings to plan an athletic center.

Standards: 5.NBT.4, 5.NBT.7, 5.NF.4, 5.NF.5, 5.NF.6, 5.MD.1, 5.G.1, 5.G.2,

Before You Begin: Consider doing the optional Readiness activity with students who need additional practice making unit conversions. You may find it useful to allow extra time, either on the same day or on a second day if time permits, for students to complete the Planning a 4-Acre Athletic Center activity.

Warm-Up: Mental Math: Students make unit conversions.

Focus: Math Message - Students convert measurements to find the area of an Olympic beach volleyball court in square feet.

Focus: Math Message Follow-Up

- Have students share the strategies they used to solve the Math Message problem. Students should recognize that they need to convert the dimensions of the court to a single unit.
- Tell students that in today's lesson they will use measurement conversions to calculate areas of playing surfaces for various sports. They will then use those areas to create a plan for a large athletic center.
- Remind students that in the Math Message their first step to solve the problem was to convert the dimensions to a single unit. Call their attention to the third column of the table and tell them that they will convert the dimensions of all the playing surfaces to feet. The areas of the playing surfaces in the fourth column will be reported in square feet. Allow them to use a calculator if needed. It is acceptable for students to report their answers as mixed numbers or as decimals.
- Have students share what they know about the term ***acre.*** Some may have heard it used as a unit for measuring land area. Explain that an acre was originally defined as the amount of land that could be plowed in one day. Now an acre is a standard unit that is defined as an area equal to 4,840 square yards. Display this measurement for students, and tell them that an acre is roughly the same area as a football field, excluding end zones. Discuss the idea that an acre of land can be any shape—wide and short, narrow and tall, or irregularly shaped.
- Direct students' attention to Problem 1 on journal page 276. Have them work with a partner to convert 4,840 square yards to square feet.
- Read Problem 2 on journal page 276 as a class. Explain that an athletic center is a building that has many kinds of sports playing surfaces. Consider showing a photo of a gym or athletic center in your area. Have students work in partnerships or small groups to create a

plan for a 4-acre athletic center on journal page 277 using the playing surface dimensions on journal page 275.

- Invite students to share their plans with the class. Have volunteers explain how they chose which playing surfaces to include, how they arranged them, and how many different playing surfaces they were able to fit in the allotted space.

Practice:

- MJ pages 275-278
- Math Boxes 8-1 and 8-3
- Home Link 8-1

Games: Play Exponent Ball. SRB pages 303-304. Students practice multiplying and dividing by decimals and powers of 10.

Assessment:

Expect most students to make conversions and calculate areas on journal page 275 for the karate, soccer, and swimming playing surfaces, which require no more than one conversion. Most students should be able to multiply fractional side lengths to find area—as required for judo, football, and wrestling playing surfaces—but some students may have difficulty converting inches to a fraction of a foot or converting a fraction of a yard to feet. If students struggle with conversions involving fractions, have them complete the optional Readiness activity. Expect most students to struggle finding areas when multiple conversions are required or when they must convert across systems, as for ice hockey.

Differentiation:

- **Readiness: Converting Among U.S. Customary Lengths.** Remind students that changing the unit in which a measurement is expressed is called converting the unit.
- **Extra Practice: Converting Ground Areas from Square Feet to Acres.** For more practice with unit conversions, students convert the ground area, or footprint, of large buildings from square feet to acres. They calculate the number of square feet in a square mile and compare the result to acres.
- **Enrichment: Converting Between Measurement Systems.** To extend their work with measurement conversions, students explore conversions between metric and U.S. customary units.
- **ELL Support:** Use visuals to introduce the terms athletic center and plan, building on students' use of models to represent real-world objects. Display models and corresponding real-world objects, such as a toy shoe from a board game to a real shoe.

Lesson 8-2 Applying the Rectangle Method for Area

Students apply their understanding of rectangular areas to find areas of non-rectangular shapes.
Standards: 5.NF.1, 5.NF.4.b
Warm-Up: Mental Math - Students use estimate to place decimal points in products.
Focus: Math Message - Students find the area of a rectangle and discuss how they could find the area of a triangle.
Math Message Follow-Up:

- Ask students to discuss how they solved Problem 1a.
- If students are not able to visualize how the triangle in the Math Message is half the area of the rectangle, encourage them to cut a rectangle out of paper, cut the rectangle into two pieces along the diagonal, and then put one of the two pieces on top of the other to show that they are the same size.
- Refer students to *Student Reference Book,* pages 228 and 229 and have them read about the rectangle method for finding area. Explain that this method is of value because it is a way to use something known (how to find the area of a rectangle) to find something unknown (the area of other geometric figures). After reading the pages, ask a volunteer to describe in his or her own words how the rectangle method works.
- Have partners explain the rectangle method in their own words on journal page 279. Then have them complete journal page 280. Circulate and assist. If your class discussed Figure C, encourage students to attempt the "Try This" problems.

Practice: MJ 8-2, Home Link 8-2
Assessment: Expect students to struggle when trying to visualize and draw rectangles around the figures on journal page 280. Visualizing and drawing rectangles around the triangles in Problems 1 and 3 should be the easiest for students. Expect most students to be able to use a multiplication strategy to find the area of rectangles with fractional and mixed-number side lengths once they have drawn the rectangles. Watch for students who forget to halve the area of the rectangle when finding the area of the triangle. Encourage those who make this mistake to label areas they have found on each figure and to count squares and partial squares to check that their answers make sense. Do not expect students to formalize formulas for finding the areas of non-rectangular figures.
Differentiation:

- **Readiness: Finding Areas of Rectangles with Fractional Side Lengths.** MM page TA3. To build readiness for finding areas of nonrectangular figures using the rectangle method, students practice finding areas of rectangles with fractional side lengths. Have students draw rectangles with given dimensions and then use those dimensions to find the areas. Students can count grid squares to check their answers. Check to be sue students are drawing fractional side lengths accurately and multiplying mixed numbers correctly.
- **Extra Practice:** For further practice using the rectangle method, students roll dice to form a whole number and a mixed number. They draw rectangles using the rolled numbers as dimensions and draw a triangle or trapezoid within the rectangle. They find the area of their partner's figure.
- **Enrichment:** To extend their work with using the rectangle method to find area, students draw rectangles around composite shapes to determine the area.
- **ELL Support:** Use think-alouds to help students understand the meaning of the prefix non, meaning "not." Show a problem on the board that makes sense. Show another that does not make sense – that is *nonsense*.

Lesson 8-3 Planning an Aquarium

*Students apply length, area, and volume concepts to plan a home aquarium.***:**

Before You Begin: For the Choosing a Fish Tank activity, consider displaying a 1-gallon milk container. You may find it useful to allow students extra time to complete the Planning an Aquarium activity. For the Practice activities, if additional sets of *Property Pandemonium* cards are needed, make copies of *Math Masters,* page G32. For the optional Readiness activity, tape 2 or 3 empty boxes together to form a composite figure that resembles a multi-room house. Keep the boxes open at the top. For the optional Extra Practice activity, students will need to measure a common classroom object, such as a chair, desk, or bookcase.

Warm-Up: Mental Math - Students use estimates to place decimal points in quotients.

Focus: Math Message: Students choose a fish tank based on volume guidelines.

Math Message Follow-Up:

- Have students share their responses to the Math Message. Expect them to recognize that both fish tanks have a volume greater than 230 cubic inches, so either tank would be suitable under the guideline. Some may choose Fish Tank 2, reasoning that its greater volume would give the goldfish more room to swim.
- Tell students that today they will use what they know about length, area, and volume to plan an aquarium. First, they will learn some important guidelines for selecting fish tanks and fish.
- Have students work in partnerships to complete Problem 3 on journal page 283. Discuss students' responses. Emphasize that even though both fish tanks meet the volume guideline, Fish Tank 1 provides a healthier environment for the fish because it also meets the surface area guideline.
- Tell students that they will now use what they know about area and volume and what they have learned about fish tank guidelines to plan an aquarium. Distribute calculators and have students turn to journal pages 284–286. Look over each page together and make sure students understand the various components of the task. Students will have to choose a fish tank, calculate its volume and the area of its base, and use that information to determine the number and size of fish they can order for the aquarium. Be sure to call attention to the bulleted points at the top of journal page 285 and tell students that these are the fish tank guidelines they just learned. Have students work in partnerships to complete the journal pages. Circulate and assist.
- When most students have finished, pose questions about the activity. Encourage students to clearly explain their thinking and use appropriate units.

Games: Property Pandemonium. SRB page 320. Students practice drawing, naming, and classifying quadrilaterals.

Practice: MJ Math Boxes 8-3. Home Link 8-3

Assessment: Expect most students to be able to correctly calculate the area of the base and the volume of the tank they chose in Problems 2 and 3 on journal page 284. Students who struggle finding area may benefit from drawing the base on a separate sheet of paper and labeling the dimensions. Have those who need additional practice finding volume play *Prism Pile-Up.* (*See Lesson 1-12.*) Some students may be able to work backward to calculate the total inches of fish that could live in the tank, order an appropriate selection of fish on journal page 286, and explain their thinking on journal page 285.

Differentiation:

- **Readiness: Reviewing Length, Area, and Volume.** To review measurement concepts, students find the length, area, and volume of a composite figure. Tape together 2 or 3 empty boxes to form a composite figure and ask students to imagine that it represents a house for a hamster. Have volunteers measure and display the dimensions of the figure to the nearest ½ inch. Pose questions to review the concepts of area and volume.
- **Extra Practice:** For additional practice applying measurement concepts, students measure a classroom object to help them solve problems about length, area, and volume. Students are encouraged to create drawings to help them model and solve problems.
- **Enrichment:** To extend their understanding of volume concepts, students design a fish tank that meets specific volume and area guidelines. They explain why their fish tank is large enough to support their choice of fish.
- **ELL Support:** Use role play and think-alouds to help students understand the term guideline as an instruction telling how something should be done.

Lesson 8-4 Treasure Hunt (2-day lesson)

Students use representations to solve a problem about the volume of a rectangular prism.

Standards: 5.MD.3, 5.MD.5.b

Day 1: Open Response

Warm-Up: Mental Math: Students write numbers using expressions with powers of 10.

Focus:

- **Math Message:** Students consider whether a change in the shape of a juice box affects the volume of the juice inside.

- **Discussing the Juice Box – Math Message Follow-Up:**
  - Students discuss why the volume of the juice stayed constant when the shape of the box changed.
  - Have students share their answers to the Math Message with a partner before sharing their answers for Problem 1 with the class. Consider demonstrating the scenario from the Math Message with a partially-filled juice box so that students can see whether their hypotheses about the juice box and juice were correct.

- **Solving the Open Response Problem.**
  - Students make sense of representations of a rectangular prism to solve a volume problem.
  - Distribute *Math Masters,* pages 307 and 308 and make calculators available. As a class, read the problem and review the directions. Partners should work together to ensure that they understand the story and the directions. Point out that, in this problem, the room remains a rectangular prism even though the length changes. Some students might misread the problem and think that the width also decreases every 10 minutes. Explain that the 4-foot width stays the same; only the 6-foot length decreases every 10 minutes. When the length decreases, it causes the volume of the room to decrease which causes the height of the water to rise. Consider having students draw a picture or series of pictures to show what is happening to the room.
  - **ELL Support:** Help students understand the contexts used throughout the lesson by previewing key ideas and vocabulary. Use pictures to describe the meaning of treasure hunt, lost treasure, trap door, and adventure story.
  - **Differentiate: Adjusting the Activity** – If students struggle getting started, encourage them to set up a table (TE page 787) to help organize their work. They may also benefit from drawing a picture for each 10-minute increment.

- **Summarize:** Ask – *How did representations help you solve the problem?* Remind students that they will have a more in-depth conversation about the problem during the reengagement discussion.

Getting Ready for Day 2.

- Review students' work and plan discussion for re-engagement by showing a student's work and asking students to consider: *What does this representation show? What does this student's explanation tell you? Do you agree with everything the student said? Did the student leave out any steps? Is there anything you would like to ask this student about how he or she solved the problem?*
- Show a different representation from another student and have students consider the following: *How did the student use number models? What would you ask this student? How could this explanation be improved? How could this student's drawings be improved?*

<u>Day 2: Reengagement</u>

Setting Expectations: Briefly review the open response problem from Day 1. Ask students to clarify what they were asked to do and identify what a good response would include.

Reengaging in the Problem: Students analyze and critique other students' work in pairs and in a whole-group discussion. Have students discuss with partners before sharing with the whole group. Guide this discussion based on the decisions you made in **Getting Ready for Day 2**.

Revising Work: Tell students they now have a chance to revise their work. Students who wrote complete and correct explanations on Day 1 can try to find a different way to check their work. Help students see that the explanations presented during the discussion are not the only correct ones. Tell students to add to their earlier work using colored pencils or to use another sheet of paper, instead of erasing their original work.

Summarize: Ask students to reflect on their work and revisions. Ask: *What did you do to improve your representations and explanations?*

Assessment: Collect and review students' revised work. Expect students to improve their work based on the class discussion. For the content standards, expect most students to recognize that the volume of the water will not change as the walls of the room move, to apply the volume formula to find the missing dimensions, and to correctly state how much time will pass before Miriam is lifted to the trap door. You can use the rubric.

Practice: MJ Math Boxes 8-4. Home Link 8-4

Lesson 8-5 Spending $1,000,000

Students devise a plan for spending $1,000,000 to open and operate an animal shelter for one year.

Standards: 5.NBT.4, 5.NBT.5, 5.MD.1

Warm-Up: Mental Math: Students estimate and choose the correct product for decimal multiplication problems.

Focus: Math Message: Students list supplies for an animal shelter.

Math Message Follow-Up:

- Have students share the list of supplies they brainstormed in the Math Message. Compile and display the lists, grouping items into categories as they are shared. If no one mentions them, prompt students to consider less obvious supplies, such as a computer, a printer, paper, phones, and so on. In addition, discuss how shelters need to plan for expenses like employee salaries, rent or building costs, water, heat, electricity, phone service, and Internet. Once several items have been named, invite students to help label the categories you have grouped items into. Include categories such as food supplies, animal accessories, housing, cleaning supplies, medical supplies, and furniture. (*See below for sample lists.*)
- Tell students that in today's lesson they will imagine that the class has received $1,000,000 to open and operate an animal shelter for stray cats and dogs for one year. Read the bottom of journal page 290 as a class. Discuss how students might use the given information when planning their spending. For example, students might first subtract a year's worth of building costs and then use the remaining money to create the rest of the budget.
- Point out that finding the prices for *all* of the supplies and expenses students listed would require a considerable amount of time and research. Explain that to save time the class will work together to create a spending plan. Each partnership or small group will be responsible for one or two categories. When each category has a budget, the class will compile the results and work together to make any adjustments.
- Direct students' attention to journal pages 291 and 292. Give students a moment to make sense of each table. Explain that accounting is the process of recording how money is acquired and spent. Have students record the major categories decided on by the class in the left-hand column of the table on journal page 291. Tell them they will return to the Major Categories Accounting Sheet later in the lesson to fill in the costs for each category.
- Assign categories to partnerships or small groups. Since most building costs are given in the problem description, be sure to pair building costs with another category so that every group has to do some research. Distribute relevant price resources or explain guidelines for Internet use. (*See Before You Begin.*) Tell students that they may not find all the information they need right away. Encourage them to keep looking or to make estimates based on partial information if necessary.

- Give groups time to complete the Itemized Accounting Sheet and record their category totals. Note that there is an additional accounting sheet provided on journal page 293 if students need additional rows for items, or for use for revisions later in the lesson. Students may need to think about unit conversions, such as how many months are in a year, to determine the quantity of items needed and to calculate approximate total costs.

Practice: MJ 8-5, Home Link 8-5

Assessment: Expect most students to successfully round money amounts to the nearest whole dollar and to accurately multiply whole numbers to compute approximate total costs for various items. Some students may make strategic decisions to round to dollar amounts they can multiply mentally instead of rounding to the nearest dollar. Guide students who struggle with computation to round to benchmarks and powers of 10 to check the reasonableness of their answers.

Differentiation:

- **Readiness: Reviewing Estimation Strategies.** To prepare for using estimation to solve a complex budgeting problem, students review strategies for estimating total amouns of money. Tell students that in real-world situations estimates can often provide enough information to move forward in solving a problem.
- **Extra Practice:** For additional practice working with decimals to solve a problem using real-world data, students find a combination of different animals whose combined weight will be within a given limit for an elevator. Students also find the total number of elevator trips needed to transport all of the animals. Students explain their reasoning.
- **Enrichment:** To extend their work creating a budget, students use fractions to represent spending priorities for starting and operating an animal shelter, based on the major category allocations determined in the Focus part of the lesson. Once they have represented the spending in each category as a fraction of $1,000,000, they determine how much money would be spent in each category if the total budget changed to $750,000.
- **ELL Support:** Prepare students to contribute to the list of needed pet shelter items by providing visual aids for them to point to, such as pictures of various pet supplies and accessories from store advertisements. Encourage student to write the names of the items on the pictures. Maintain a display of words with pictures for students to refer to as they work in small groups or partnerships.

Lesson 8-6 Earning $1,000,000

Students calculate how long it would take to earn $1,000,000 at different hourly wages.

Standards: 5.NBT.4, 5.NBT.7, 5.NF.4, 5.NF.5, 5.NF.6, 5.MD.1, 5.G.1, 5.G.2,

Warm-Up: Mental Math: Students estimate and choose the correct quotient for decimal division problems.

Focus: Math Message: Students solve real-world problem about hourly earnings.

Math Message Follow-Up:

- Students discuss how hourly wages can be used to calculate earnings, and they identify unit conversions for workdays, workweeks, and work years.
- Invite students to share their solutions and strategies.
- Remind students of the previous lesson, in which they planned how to spend $1,000,000. Tell students that today they will figure out how long it would take to earn $1,000,000 doing different jobs.
- Explain that for many jobs, wages, or the amount of money earned, are reported as a number of dollars earned per hour worked. In order to find how long it takes to earn $1,000,000, students will need to consider how many hours a person typically works in a day, week, month, or year. Share the following information: There are 8 hours in a typical workday and 5 days in a typical workweek. There are 52 weeks in a year, but many jobs allow workers to take vacation time. For this lesson, students will assume that there are 50 workweeks in a year.
- Divide students into small groups or partnerships. Assign each group one hourly wage. Explain that groups will calculate how long it would take to earn $1,000,000 at their assigned wage. Groups should record their work on journal page 295. They should express their answer in two ways: as a total number of hours (for example, 48,123 hours) and as a number of work years, workweeks, workdays, and hours, using the largest possible whole number for each unit (for example, 34 years, 21 weeks, 4 days, and 6 hours). Explain that the sum of the mixed units should equal the total number of hours. Provide calculators, but encourage students to record number models to keep track of their calculations. Remind them to think carefully about how to interpret any remainders. Have groups that finish early check their answers using a different strategy.

Practice: Math Boxes 8-6, Home Link 8-6

Assessment: Expect most students to successfully determine what calculations and conversions are required to find the total number of work hours needed to earn $1,000,000 at a given wage. Some students may lose track of units when converting a total number of hours to workdays,

workweeks, and work years, or vice versa. Remind them to clearly label the units for each value in number models and write out the unit equivalents, connecting the units they have to the units they need. Most students should be able to execute the intermediate steps accurately by multiplying multidigit numbers by hand. Some may be able to extend their understanding of partial-quotients division to divide numbers with more than 4 digits or to divide by 3-digit divisors, but expect most students to use calculators to divide larger numbers.

Differentiation:

- **Readiness: Representing Measures in Multiple Units.** To prepare for solving a complex problem involving multiple units, students practice converting individual measurements to mixed units. Explain that people often report measures of time using mixed units, such as 2 years and 3 months rather than using fractions of larger units such as 2 3/12 years.
- **Extra Practice:** For more practice converting units to solve real-world problems, students convert annual salaries to hourly wages and explain their reasoning. They also explore why different professions might be desirable and compare the amount of time it would take for people in two different jobs to earn $1,000,000. Allow students to use calculators as needed.
- **Enrichment:** To extend their work with unit conversions in real-world contexts, students consider different ways to report the volume of water dispensed at a water fountain. They consider why a fountain manufacturer might display a count of plastic bottles saved as opposed to the volume of water dispensed in specific units. Allow students to use calculators as needed.
- **ELL Support:** Refer to a calendar while discussing the terms week, workweek, weeks in a year, and work hours. Restate wages as amount of money earned. Use gestures to indicate a calendar week while reciting the days of the week. Highlight Monday through Friday, saying: This is my workweek. I come to school from Monday to Friday. I work from Monday to Friday. Write the number of work hours on each of the 5 days, and think-aloud statements to describe work hours and hourly wages.

Lesson 8-7 Paying Off the National Debt

Students calculate how long it would take to pay off the national debt at different pay scales.

Standards: 5.NBT.2, 5.NBT.5, 5.NBT.6, 5.NBT.7, 5.NF.7, 5.NF.7a, 5.NF.7b 5.MD.1

Warm-Up: Mental Math - Students solve fraction division problems.

Focus:
Math Message: Students estimate the number of hours a typical person works in his or her lifetime.

Exploring National Debt: Math Message Follow-Up:

- Ask several students to share their solutions. Expect that most students will have subtracted 21 from 65 and then multiplied 44 years by 2000 hours to find that a typical person works 88,000 hours in his or her lifetime. Remind students this is an estimate.
- Explain that debt is the amount of money a person, an organization, or a government owes another person, organization, or government. The total amount that the U.S. government owes is called the national debt. When the government borrows more money, the national debt grows. When the government pays back some of the money that is owed, the national debt gets smaller.

Differentiate: Common Misconception
Some students may misinterpret the problem and attempt to multiply the national debt by their assigned hourly wage. To help these students make sense of the numbers in context, pose a similar problem with smaller numbers.

Differentiate: Adjusting the Activity
Some students may be overwhelmed by the magnitude of the numbers involved in this activity. To make the task more manageable, suggest that students think about powers of 10 and patterns with zeros to generate estimates or reason through calculations.

Assessment:
Expect most students to be able to use their understanding of multiplication and division to determine what calculations need to be made and to use their understanding of powers of 10 to roughly estimate the number of hours and people needed to pay off the national debt.

Discussing Implications:
When most groups have a solution, invite them to share their results. Record student finding in a table (TE page 810). Students should share observations. Ask: *How is earning enough to pay off the national debt different from earning $1,000,000?*

Summarize: Invite students to reflect on what they learned from working with the national debt. Have students share information or ideas that they found surprising.

Practice: Math Boxes 8-7. Home Link 8-7

Differentiation:

- **Readiness: Working with Large Numbers.** To prepare for solving a complex problem involving billions and trillions, students discuss strategies for computing with large numbers. Encourage students to think about powers of 10. Have students solve the problem and emphasize that students may need to try several calculations before they find a solution that makes sense.
- **Extra Practice: Estimating Space-Travel Times.** MM page 318. Students solve a series of estimation problems involving distances in space.
- **Enrichment: Comparing National Debts.** Activity card 100. To extend their work computing with large numbers, students find the national debt of several countries and compare the size of each country's debt to the U.S. national debt.
- **ELL Support:** Use role play with play money and think-alouds to support student understanding of the terms debt, owe, pay, and borrow.

Lesson 8-8 A Footstep Problem

Students convert measurement units and perform operations with multidigit whole numbers and decimals to solve time and distance problems.

Standards: 5.NBT.2, 5.NBT.5, 5.NBT.6, 5.NBT.7, 5.MD.1

Warm-Up: Mental Math: Students evaluate statements about quadrilateral properties.

Focus: Math Message: Students discuss how to find the length of 10 footsteps.

Math Message Follow-Up:

- *Why might you want to know the length of 10 steps?* Have students share their strategies for finding the length of 10 steps. Discuss factors that could influence the measurement, such as how a step is defined, whether a person is walking with small or large strides, and the unit of measurement used. Tell students that in today's lesson the class will find the approximate length of 10 steps to the nearest foot and will use that information to solve a problem involving a long distance.
- Tell students that to solve the problem in today's lesson they will need to know the approximate length of just *one* step.
- Have students turn to journal page 300 and record the length of one step for Problem 1. Then ask a volunteer to read the footstep problem at the top of the page aloud. Have students fill in the destination you chose. (*See Before You Begin*.) Once students understand the context of the footstep problem, help them complete Problems 2–4 on the journal page as discussed below. If needed, direct students to the *Student Reference Book* to find the information to complete Problem 2.
- Distribute road maps to each small group or partnership. Have students use the map scale to find the number of miles to the destination and record the answer in Problem 3. (Alternatively, display a map and have a volunteer use the map scale and report the distance to the class.)
- For Problem 4, ask a volunteer to walk around the classroom for 1 minute at a normal walking pace. Have some of the observing students use a stopwatch or the class clock to keep track of the time while the others silently count the walker's steps. Have students record the number of steps per minute in Problem 4. Depending on the amount of time you have, consider having several students walk for 1 minute, recording the walking data, and finding the typical number of steps taken in 1 minute.
- Explain that students will complete the footstep problem in small groups. Give students a few minutes to look over the remaining problems on journal pages 300 and 301 to help them make sense of the challenge.

- Acknowledge that the footstep problem is challenging. Encourage students to keep trying, even if they run into difficulties. Remind them that they know many strategies to accurately and efficiently calculate with whole numbers and decimals.
- Circulate and assist as students complete the journal pages. Consider having students create posters to illustrate their solutions. When appropriate, ask students how they are dealing with remainders when they divide. Help students see that because they are not finding exact answers, it is reasonable to round to the nearest whole number.

Practice: MJ. Math Boxes 8-8, Home Link 8-8

Assessment: Expect most students to be able to accurately convert measurement units and to multiply and divide multidigit numbers and decimals to find a reasonable answer for Problem 5 on journal page 300. If students struggle trying to make sense of the problem, refer to the Adjusting the Activity note on page 815. If students have difficulty calculating accurately, provide calculators to allow them to focus on what to convert and what calculations are needed. Some students may also be able to solve Problem 6 on journal page 301, but expect that many will struggle to reason through the multiple steps of the problem. Students who are ready for a challenge can solve Problem 7.

Differentiation:

- **Readiness: Solving Cheetah Problems.** To prepare for solving multi-step problems and converting measurement units, students solve a series of problems similar to the lesson problem but with smaller numbers. Pose problems and discuss solution strategies while reviewing algorithms as needed.
- **Extra Practice:** For additional practice converting measurement units and performing operations with multidigit numbers, students make sense of how another student converted ages. Math Masters page 321.
- **Enrichment:** To continue their work with multistep problems, students solve an extension of the footstep problem. They use number cards to randomly generate how long they will stop as they walk to a given destination. They incorporate this new information to determine an approximate arrival day and time. Before doing the calculations, they make a prediction about which partner will arrive first. Activity Card 101. Math Masters page 320.
- **ELL Support:** Use visuals and think-alouds to help students understand the term destinations by connecting it to the terms start and end.

Lesson 8-9 Finding Your Heartrate

Students collect heart-rate data. They apply their knowledge of multiplication and unit conversions to find the number of times their hearts beat in different units of time.
Standards: 5.NBT.4, 5.NBT.7, 5.NF.4, 5.NF.5, 5.NF.6, 5.MD.1, 5.G.1, 5.G.2,
Warm-Up: Mental Math: Students use estimates to place a decimal point in factors.
Focus: Math Message: Students read about the heart and take their pulses.
Math Message Follow-Up:

- Circulate and observe as students complete the Math Message. Help students find their pulses, as needed. If some have difficulty accurately counting their heartbeats, suggest that they not look at their partners or at the stopwatch or clock as they count. When students have completed the Math Message, invite several volunteers to share the number of heartbeats they counted in 15 seconds. Expect answers to vary within the range of about 17 to 28 heartbeats per 15 seconds.
- Point out that it was useful to think of 1 minute as 60 seconds. This is an example of a unit conversion. Remind students that in Lesson 8-6 they used unit conversions to figure out how much money people would earn in different amounts of time.
- Have students complete Problem 3a and then examine the table in Problem 3b.

Practice: Math Boxes 8-9, Home Link 8-9
Assessment: Expect that most students will be able to correctly complete the time conversions in Problem 3a on journal page 304 and to use the conversions to solve Problem 3b. Some students may be able to clearly explain how the conversions were helpful when completing the table. If students struggle to apply the conversions to the problem, have them look for patterns in a table as discussed in the Adjusting the Activity note.

Differentiation:

- **Readiness: Applying Unit Conversions to Solve Problems.** To prepare for applying unit conversions to solve problems involving heart rates, students solve unit conversion problems in a more familiar context. Pose the problem from TE page 819 and ask suggested questions.
- **Extra Practice:** For additional practice with multiplication and unit conversions, students find the number of times different animals' hearts beat in 1 hour, 1 day, and 1 year. They compare the heart rates of the different animals. Math Masters page 323.
- **Enrichment:** To extend their work with modeling data and looking for patterns, students investigate how exercise affects their breathing rates. They record breathing-rate data in a table and compare it to the table of heart-rate data they gathered in the lesson. They can make a poster to present their findings. Activity Card 102.
- **ELL Support:** Help students understand the body-part terms used in this lesson by labeling a picture of a person with the terms wrist, thumb, index finger, heart, jaw, neck, and ear. Use think-alouds to model how to take a pulse, and then use prompts to help students take their own pulses. Show visuals, such as a video clip of a heart beating, to explain the term throb. Accompany with statements like: *This is a heart beating. You can feel your heart making your arteries throb.*

Lesson 8-10 Finding Your Cardiac Output

Students graph their heart-rate data and use the graphs to analyze the data. They multiply and divide to calculate and compare their cardiac outputs before and after exercise.

Standards: 5.NBT.7, 5.NF.5, 5.NF.6, 5.MD.1, 5.G.1, 5.G.2

Warm-Up: Mental Math - Students use estimates to place a decimal point in dividends, divisors, and quotients.

Focus: Math Message: Students graph their heart-rate data on a coordinate grid.

Math Message Follow-Up:

- Circulate and observe as students complete the Math Message. Be sure they are using the number of beats in 15 seconds as the *y*-coordinates. If students struggle to plot the *y*-coordinates, draw their attention to the scale on each axis. Encourage them to think about which grid line the coordinate would be closest to and use their best estimate for the placement.
- Tell students that the graphs they created are called **heart-rate profiles.** Heart-rate profiles show how heart rates change as exercise becomes more strenuous.
- Tell students they will calculate their target heart rate and figure out whether they reached their target heart rate while doing jumping jacks in the previous lesson. Have students work in partnerships to solve Problem 3 on journal page 308.
- When most partnerships are finished, have students raise their hands to indicate whether they reached their target heart rates as they did jumping jacks. Ask students who did not reach their target heart rates.
- Tell students that they will continue using their heart-rate data as they calculate how much blood their hearts pump in different amounts of time.
- As a class, read the information at the top of journal page 309 about **cardiac output,** or the amount of blood pumped through the heart in one minute. Then have students work in partnerships to complete the page. They will multiply and divide whole numbers and decimals to find their cardiac output before and right after exercise. Problem 4 also provides practice using unit conversions to solve problems. Students may not immediately know how to solve all of the problems. Encourage them to talk through the problems with their partners before deciding how to solve each problem.

Practice: Math Boxes 8-10, Home Link 8-10

Assessment: Expect that most students will be able to accurately multiply whole numbers and decimals to solve Problems 1–3 on journal page 309. Some students may struggle when completing the unit conversions in Problems 4a and 4c, but most will be able to use their answers to Problems

4a and 4c to solve the real-world problems in Problems 4b and 4d. If students struggle trying to accurately multiply whole numbers and decimals to solve the problems, suggest that they use computation grids (*Math Masters,* page TA7) to organize their work and make estimates to check their work. You may also consider allowing students to use calculators to keep the focus on problem solving.

Games: Spoon Scramble. SRB. p. 324. Students practice multiplying fractions and multiplying and dividing by powers of 10.

Differentiation:

- **Readiness: Making Multistep Unit Conversions.** SRB page 328. To prepare to solve multistep problems involving unit conversions, students review how to use the information in the SRB that require intermediate steps.
- **Extra Practice:** For additional practice creating and interpreting graphs, students predict how different kinds of exercise will affect their heart rates. They collect data, use it to create a heart-rate profile, and compare it to their graphs of the jumping-jack data. Activity Card 103. Math Masters pages 326-327.
- **Enrichment:** To extend their work with decimal computation and unit conversions, students compare the amount of time it takes a heart to pump 1 pint of blood to the amount of time it takes to donate 1 pint of blood and discuss reasons for the difference in times. Encourage students to work with a partner to discuss how to solve the problems and explain their strategies. Allow students to use calculators to keep the focus on problem solving. Math Masters page 325.
- **ELL Support:** Help students understand that a target is a goal, or something you aim for, by showing sports-related pictures such as a soccer net, finish line, goal post, or basketball hoop. Relate this to aiming for your target heart rate when exercising.

Lesson 8-11 Pendulums, Part 1

Students apply their knowledge of place value and coordinate grids to investigate the effect of pendulum length on pendulum swing time.

Standards: 5.NBT.4, 5.NBT.2, 5.G.1, 5.G.2

Warm-Up: Mental Math: Students answer questions about properties of quadrilaterals.

Focus: Math Message - Students read about pendulums and make a conjecture about the effect of length on swing time.

Math Message Follow-Up:

- Briefly discuss the information about pendulums on journal page 311. Ask students whether they have ever seen pendulums other than on clocks. Some students may have seen large pendulums at science museums that illustrate the rotation of the Earth. These pendulums are called *Foucault pendulums*. Others may have used metronomes to keep time while playing music. A metronome is another example of a pendulum.
- *****See Website for detailed information about setting up a pendulum.***
- Explain that students will work in small groups to collect the rest of the data and complete the table on journal page 312. Point out that for the longest pendulums students will not be able to hang the pendulums from the end of the table without the bobs hitting the floor. For these, two students should carefully stand on chairs. One student will hold the string at the appropriate length mark. The other will hold the bob so that the string is parallel to the floor and release it. Tell students that they should be very careful to make sure the bob does not hit other students when it is released. You may want to point out a specific location where students can safely swing these pendulums.
- As groups finish, check that their data seem reasonable. Times for 1 swing should increase from about 0.5 second for a 5 cm pendulum to about 3 seconds for a 200 cm pendulum. If a group's data seem unreasonable, discuss possible reasons. Have students use the data to write ordered pairs and complete the graph on journal page 313.
- When students have finished making their graphs, have them store the pendulums for use in Lesson 8-12.

Practice: Math Boxes 8-11, Home Link 8-11

Assessment: Expect that most students will be able to mentally divide the length of 10 swings by 10 to get the length of 1 swing on journal page 312. Most students should also be able to accurately graph the data on journal page 313. If students struggle dividing by 10, have them use a calculator to divide a few whole numbers and decimals by 10 to help them recall and explain the pattern. If students struggle when graphing the data, have them find and label each coordinate on the appropriate axis before plotting the point, as suggested in the Adjusting the Activity note.

Differentiation:

- **Readiness: Plotting Points with Decimal Coordinates.** MM page 329. To prepare for plotting points with decimal coordinates, students review how to place decimals on number lines and then extend that skill to plotting points. Have students place decimals on the number line beginning with 3.0 and 1.5 and then move to numbers that are not labeled such as 0.8 and 1.4. Have students explain how they knew where to place numbers that were not labeled on the number line. Display the coordinate grid and have students explan how to plot points.
- **Extra Practice:** For more practice drawing and interpreting graphs, students use their pendulum-length graphs to make predictions about swing times, test their predictions, and update their graphs. They discuss whether their predictions were correct and why there might be a difference between their predictions and their results. Activity Card 104.
- **Enrichment:** To extend their work with pendulums, students read about how a pendulum clock works. They use a graph to determine how many times a string pendulum will swing in 1 minute. Math Masters page 330.
- **ELL Support:** To introduce the term pendulums and build background knowledge about them, show visuals of various types of pendulums. Use video clips of a pendulum swinging, explaining the terms swing and back and forth.

Lesson 8-12 Pendulums, Part 2

Students use graphs to investigate the effect of arc size on a pendulum's swing time.

Standards: 5.NBT.2, 5.NBT.4, 5.G.1, 5.G.2

Warm-Up: Mental Math - Students write large numbers as expressions involving decimals and powers of 10.

Focus: Math Message - Students answer questions about their swing-time data.

Math Message Follow-Up:

- Have students share their answers to Problems 1 and 2 on journal page 316 and explain how they used the graph to make their predictions.
- Invite students to share their answers to Problem 3, guiding the discussion to cover the following points:
- The swing time for a 300 cm pendulum can't be predicted directly from this graph because the *x*-axis does not extend to 300.
- Students could draw a bigger graph on which both axes are long enough, but it's hard to tell for sure how the graph would look for bigger *x*-values because the points don't lie on a straight line. So there is no way to make an accurate prediction.
- Review the idea that while mathematical models are useful, students must be careful when they interpret them. Not every model can be used to answer every question, and students should think carefully about each situation before drawing conclusions.
- Tell students that in today's lesson they will investigate how arc size affects the swing time of a pendulum.
- Explain that the curved path that a pendulum follows as it swings is called the arc of the pendulum. When the bob is held so that the string is parallel to the ground, the pendulum swing will have a larger arc. When the bob is held lower, the arc will be smaller.
- Divide the class into small groups and provide each group with a string pendulum, a stopwatch, and a ruler or meter stick. Read Problem 5 with the class. Then have groups create a 50 cm pendulum and use it to complete the second column of the table on journal page 317.
- Next, have students read Problem 6 on journal page 316 and use their results to complete the third column of the table. Remind them to round the times to the nearest tenth of a second. As groups finish, have them complete Problem 7 to analyze their results.

Practice: Math Boxes 8-12, Home Link 8-12

Assessment: Expect that most students will be able to accurately graph the data on journal page 317 and interpret coordinate values in context in Problem 10. Some students may be able to use the

graphs and tables to compare the data sets and describe trends in Problems 11 and 12. If students struggle to graph the data, have them look for patterns in the coordinates. Note that all the *y*-coordinates are the same or close to the same, and sketch a horizontal line to help students with the *y*-coordinates while they focus on the *x*-coordinates. If students struggle to solve Problem 10, have them begin by determining which coordinate they know and which coordinate they need to find out.

Differentiation:

- **Readiness: Reviewing How to Interpret Graphs.** Math Journal pages 20-61. To prepare for using graphs to interpret data, students review how to use graphs to look for relationships among coordinates.
- **Extra Practice:** For additional practice collecting data and creating graphs, students conduct an experiment to test the effects of bob weight on the swing time of a pendulum. They make a conjecture, collect and graph the data, and discuss the results. Math Masters page 332.
- **Enrichment:** To extend their work with collecting and graphing data, students research other experiments that Galileo conducted with pendulums. They collect and display their own data and discuss whether their results match Galileo's. They make a poster to present their findings. If students have trouble getting started, suggest that they investigate how pendulum length or bob weight affects how long it takes a pendulum to stop swinging. Activity Card 105.
- **ELL Support:** Use labeled visuals and actions to reintroduce and discuss the terms pendulum swing, string, bob, and arc. Demonstrate different arc sizes, accompanied by think-aloud statements.

Lesson 8-13 Assessment: Unit8 Progress Check

Administer Unit Assessment.

Day 1:

- **Warm-Up: Unit 8 Assessment -** Students complete the Unit 8 Self-Assessment to reflect on their progress in Unit 8.

- **Assess: Unit 8 Assessment –** Students complete the Unit 8 Assessment to demonstrate their progress on the New Jersey Student Learning Standards covered in this unit.

- **Differentiation:** All instruction in Fifth Grade Everyday Mathematics is complete. If you have concerns about students' progress on this content, see the online differentiation options for support.

- **Unit 8 Challenge** (Optional): Students may demonstrate progress beyond expectations after they complete the Unit 8 Assessment.

Day 2:

- **Cumulative Assessment:** These items reflect mastery expectations of Grade 5 content.

- **Differentiate: Adjusting the Activity**
  View suggesting on TE page 848 for specific items to scaffold and how to do it.

Looking Ahead:

- **Math Boxes** 8-13
- **Home Link** 8-13: Students take home the End-of-Year Family Letter which suggests home-b activities for the break.

ACCOMMODATIONS AND MODIFICATIONS

Below please find a list of suggestions for accommodations and modifications to meet the diverse needs of our students. Teachers should consider this a resource and understand that they are not limited to the recommendations included below.

An **accommodation** *changes* HOW *a student learns*; the change needed does not alter the grade-level standard. A **modification** *changes* WHAT *a student learns*; the change alters the grade-level expectation.

Special Education and 504 Plans

All modifications and accommodations must be specific to each individual child's IEP (Individualized Educational Plan) or 504 Plan.

- Pre-teach or preview vocabulary
- Repeat or reword directions
- Have students repeat directions
- Use of small group instruction
- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments
- Repetition and time for additional practice
- Model skills/techniques to be mastered
- Extended time to complete task/assignment/work
- Provide a copy of class notes
- Strategic seating (with a purpose - eg. less distraction)
- Flexible seating
- Repetition and additional practice
- Use of manipulatives
- Use of assistive technology (as appropriate)
- Assign a peer buddy
- Emphasize key words or critical information by highlighting
- Use of graphic organizers
- Scaffold with prompts for sentence starters
- Check for understanding with more frequency
- Provide oral reminders and check student work during independent practice
- Chunk the assignment - broken up into smaller units, work submitted in phases
- Encourage student to proofread assignments and tests
- Provide regular home/school communication
- Teacher checks student planner
- Provide student with clear expectations in writing and grading criteria for assignments (rubrics)

Testing Accommodations:
Students should receive all testing accommodations for Benchmark assessments that they receive for State testing.

- Setting: Alternate setting for assessments, small groups, screens to block distractions
- Presentation: large print, test readers, use of audio, fewer questions on each page
- Response: answer verbally, use large block answer sheet, speech-to-text dictation, accept short answers
- Allow for retakes
- Provide study guides
- Use of reference aids such as glossary, multiplication tables, calculator
- Choice of test format (multiple-choice, essay, true-false)
- Alternate ways to evaluate (projects or oral presentations instead of written tests)
- Open-book or open-note tests

English Language Learners:
All modifications and accommodations should be specific to each individual child's LEP level as determined by the WIDA screening or ACCESS, utilizing the WIDA Can Do Descriptors.

- Pre-teach or preview vocabulary
- Repeat or reword directions
- Have students repeat directions
- Use of small group instruction
- Scaffold language based on their Can Do Descriptors
- Alter materials and requirements according to Can Do Descriptors
- Adjust number of paragraphs or length of writing according to their Can Do Descriptor
- TPR (Total Physical Response-Sheltered Instruction strategy) Demonstrate concepts through multi sensory forms such as with body language, intonation
- Pair visual prompts with verbal presentations
- Repetition and additional practice
- Model skills and techniques to be mastered
- Native Language translation (peer, assistive technology, bilingual dictionary)
- Emphasize key words or critical information by highlighting
- Use of graphic organizers
- Scaffold with prompts for sentence starters
- Check for understanding with more frequency
- Use of self-assessment rubrics
- Increase one-on-one conferencing; frequent check ins
- Use study guide to organize materials
- Make vocabulary words available in a student created vocabulary notebook, vocabulary bank, Word Wall, or vocabulary ring
- Extended time
- Select text complexity and tiered vocabulary according to Can Do Descriptors
- Projects completed individually or with partners
- Use online dictionary that includes images for words: http://visual.merriamwebster.com/.
- Use online translator to assist students with pronunciation: http://www.reverso.net/text_translation.aspx?lang=EN.

Students at Risk of Failure:

- Use of self-assessment rubrics for check-in
- Pair visual prompts with verbal presentations
- Ask students to restate information and/or directions
- Opportunity for repetition and additional practice
- Model skills/techniques to be mastered
- Extended time
- Provide copy of class notes
- Strategic seating with a purpose
- Provide students opportunity to make corrections and/or explain their answers
- Support organizational skills
- Check daily planner
- Encourage student to proofread work
- Assign a peer buddy
- Build on students' strengths based on Multiple Intelligences: Linguistic (verbal); Logical (reasoning); Musical/Rhythmic; Intrapersonal Intelligence (understanding of self); Visual Spatial Intelligence; Interpersonal Intelligence (the ability to interact with others effectively); Kinesthetic (bodily); Naturalist Intelligence; and Learning Styles: Visual; Auditory; Tactile; Kinesthetic; Verbal

High Achieving:

Extension Activities

- Allow for student choice from a menu of differentiated outcomes; choices grouped by complexity of thinking skills; variety of options enable students to work in the mode that most interests them
- Allow students to pursue independent projects based on their individual interests
- Provide enrichment activities that include more complex material
- Allow opportunities for peer collaboration and team-teaching
- Set individual goals
- Conduct research and provide presentation of appropriate topics
- Provide students opportunity to design surveys to generate and analyze data to be used in discussion
- Allow students to move through the assignment at their own pace (as appropriate)

Strategies to Differentiate to Meet the Needs of a Diverse Learning Population

- Vocabulary Sorts-students engage with the vocabulary word by sorting into groups of similar/different rather than memorizing definitions
- Provide "Realia" (real life objects to relate to the five senses) and ask questions relating to the senses
- Role Play-students create or participate in role playing situations or Reader's Theater
- Moving Circle-an inside and outside circle partner and discuss, circles moves to new partner (Refer to Kagan Differentiated Strategies)
- Brainstorm Carousel-Large Post Its around the room, group moves in a carousel to music. Group discusses topic and responses on paper. Groups rotate twice to see comments of others. (Refer to Kagan Differentiated Strategies)

- Gallery Walk-Objects, books, or student work is displayed. Students examine artifacts and rotate.
- Chunking-chunk reading, tests, questions, homework, etc to focus on particular elements.
- Think Pair Share Write
- Think Talk Write
- Think Pair Share
- Note-taking -can be done through words, pictures, phrases, and sentences depending on level
- KWL (Know, Want to Know, Learned)/KWHL(Know, What to Know, How Will I Learn, learned)/KWLS (Know, Want to Know, Learned, Still Want to Know) /KWLQ (Know, What to Know, Learned, Questions I Still Have) Charts
- Corners Cooperative Learning Strategy: http://cooperativelearningstrategies.pbworks.com/w/page/28234420/Corners.
- Circle Map strategy- place the main topic in a small circle and add student ideas in a bigger circle around the topic. Students may use their native language with peers to brainstorm.
- Flexible grouping -as a whole class, a small group, or with a partner, temporary groups are created: http://www.teachhub.com/flexible-grouping-differentiated-instruction-strategy.
- Jigsaw Activities -cooperative learning in a group, each group member is responsible for becoming an "expert" on one section of the assigned material and then "teaching" it to the other members of the team: http://www.adlit.org/strategies/22371/.

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An Affirmative Action Equal Opportunity Employer

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