GATEWAY ONE: Focus and Coherence

Focus

Indicator 1b -- Instructional material spends the majority of class time on the major cluster of each grade.

Ed Reports Review	BIL Counter Evidence
Indicator 1b -- The instructional materials reviewed for Big Ideas: Modeling in Real Life Grade 4 do not meet expectations for spending a majority of instructional time on major work of the grade. To determine the focus on major work, three perspectives were examined: the number of chapters devoted to major work, the number of lessons devoted to major work, and the number of days devoted to major work. A day-level analysis is most representative of the instructional materials because the number of days is not consistent within chapters and lessons. As a result, approximately 56% of the instructional materials focus on the major work of the grade.	In the BIL Grade 4 program, the percent of lessons devoted to major work and the percent of days devoted to major work are at least 65%. The attached spreadsheet on page 7 shows specific calculations to support the 65%. However, in addition to the calculations shown there, it is vital to realize that the major topics presented in earlier chapters are revisited and woven throughout the remainder of the grade in the supporting and additional topics. For example, students apply the major work of Chapters 3, 4, 5, 7, and 9 when learning the supporting and additional work in Chapters 6, 11, 12, and 13: Think and Grow • Lesson 6.5, page 286 • ***Lesson 11.1, page 496*** • Lesson 11.3, page 508 • Lesson 11.5, page 520 • Lesson 12.1, page 564 • Lesson 12.2, page 570 • Lesson 12.4, page 582 • Lesson 13.4, page 612 Think and Grow: Modeling Real Life • Lesson 11.1, page 498 • Lesson 11.3, page 510 • Lesson 11.7, page 534 • Lesson 12.1, page 566 • Lesson 12.2, page 572 • ***Lesson 12.4, page 584*** • Lesson 13.4, page 614 Show and Grow • Lesson 6.5 #4, page 286

Coherence

Indicator 1e -- Materials are consistent with the progressions in the Standards i. Materials develop according to the grade-by-grade progressions in the Standards. If there is content from prior or future grades, that content is clearly identified and related to grade-level work ii. Materials give all students extensive work with grade-level problems iii. Materials relate grade level concepts explicitly to prior knowledge from earlier grades.

Ed Reports Review	BIL Counter Evidence
Indicator 1e -- The instructional materials for Big Ideas: Modeling in Real Life Grade 4 partially meet expectations for the materials being consistent with the progressions in the Standards. Overall, the materials address the standards for this grade level and provide all students with extensive work on grade-level problems. The materials make connections to content in future grades, but they do not meet the full depth of grade-level standards because off-grade level content is present, and they do not explicitly connect prior knowledge to lesson content. ...In Big Ideas: Modeling in Real Life Grade 4, there are multiple examples where the content extends beyond the grade-level standards, which takes away from the focus of the grade-level mathematics.	In the Teaching Edition, Laurie's Notes often connect prior knowledge to the lesson content. For example: • Chapter 2 Laurie's Overview, page T-31C • Lesson 2.2 Preparing to Teach, page T-39 • Lesson 3.4 Preparing to Teach, page T-87 • ***Lesson 3.6 Getting Started, page T-100*** • Chapter 5 Laurie's Overview, page T-197C • Ch 6 Laurie's Overview, page T-259D • Lesson 11.1, Preparing to Teach, page T-495

Boldfaced italic type indicates pages where additional explanation is annotated on the supporting pages of this document.

Indicator 1e -- Chapter 4, Lessons 6-8 extend beyond Grade 4 (4.NBT.5) when the standard algorithm for multiplication is used, including regrouping (5.NBT.5). For example, in Lesson 8, students are provided an example problem: "A store receives a shipment of 5 boxes of pretzels. Each box is 50 centimeters high and has 24 bags of pretzels. How many ounces of pretzels does the store receive in the shipment?" Step 1 of the problem is written as a standard algorithm. Additionally, there are two regrouping boxes for students to put the regrouped tens. This example serves as a model to students for the remainder of the lesson. In the Dynamic Classroom, these problems are modeled using only the standard algorithm.	4.NBT.5: Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. 5.NBT.5: Fluently multiply multi-digit whole numbers using the standard algorithm. The key to 4.NBT.5 is using various strategies. Strategies for multiplication include place value, area models, Distributive Property, partial products, and regrouping. As curriculum developers, we believe that exposing students to the vertical algorithm while they develop a deep conceptual understanding provides an important foundation for its formal use in later grades. In Grade 4 the vertical algorithm is introduced as a method of recording their work with place value and the Distributive Property. In the Teaching Edition, there is a constant emphasis on the conceptual understanding and not rushing students to using the algorithm. For example: • ***Chapter 4, Laurie's Overview, pages T-141C*** and T-141D • 4.6 Preparing to Teach, page T-173 • ***4.6 Getting Started, page T-174*** • 4.6 Scaffolding Instruction, page T-175 • 4.6 Closure, page T-176 The key to 5.NBT.5 is fluency. We introduce the algorithm in Grade 4, to provide students an opportunity to become familiar with it before fluency with multi-digit numbers is expected in Grade 5.
Indicator 1e -- Chapter 5, Lessons 6-8 extend beyond Grade 4 content when students use the standard algorithm for division (6.NS.2). For example, in Lesson 7, the example problem "Find 3,129 ÷ 4=______." The examples use the standard algorithm and then students engage in six practice problems. In this chapter, 3 of the 9 lessons focus on the standard algorithm, which takes away the focus on the grade-level standards.	4.NBT.6: Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. 6.NBT.6: Fluently divide multi-digit numbers using the standard algorithm. The key to 4.NBT.6 is using various strategies. Strategies for division include place value, models, and partial quotients. As curriculum developers, we believe that exposing students to the vertical algorithm while they develop a deep conceptual understanding provides an important foundation for its formal use in later grades. In Grade 4 the algorithm is introduced as a method of recording their work with place value and partial quotients. In the Teaching Edition, there is a constant emphasis on the conceptual understanding and not rushing students to using the algorithm. For example: • Chapter 5, Laurie's Overview, page T-197D • 5.5, Preparing to teach, page T-223 • ***5.6, Getting Started, page T-230*** • 5.6, Scaffolding Instruction, page T-231 • 5.7, Scaffolding Instruction, page T-237 The key to 6.NBT.6 is fluency. We introduce the algorithm in Grade 4, to provide students an opportunity to become familiar with it, and they use it again in Grade 5, before fluency with multi-digit numbers is expected in Grade 6.
Indicator 1e -- In Chapter 9, Lesson 4, students multiply a whole number by a mixed number, extending beyond the Grade 4 standard, 4.NF.4 ("Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.") Example problems include: "2 x 1 1/2 + ______"; "2 x 3 5/6 = ___"; "4 x 3 6/10 = ___".	4.NF.4: "Apply and extend previous understandings of multiplication to multiply a fraction by a whole number." 5.NF.6: "Solve real-world problems involving multiplication of fractions and mixed numbers." Students learned to write a mixed number as a fraction in Chapter 8. In Lesson 9.3, students multiply fractions and whole numbers. Asking students to multiply mixed numbers and whole numbers in Lesson 9.4 is a natural progression in a coherent curriculum that incorporates previously-learned material into later topics within a grade. This also helps bridge the gap to Grade 5, where the standards require students to solve real-world problems with this skill.

Boldfaced italic type indicates pages where additional explanation is annotated on the supporting pages of this document.

<table>
<tr><td colspan="2">GATEWAY TWO: Rigor and Mathematical Practices</td></tr>
<tr><td colspan="2">Rigor and Balance</td></tr>
<tr><td colspan="2">Indicator 2a -- Attention to conceptual understanding: Materials develop conceptual understanding of key mathematical concepts, especially where called for in specific content standards or cluster headings.</td></tr>
<tr><td>Ed Reports Review</td><td>BIL Counter Evidence</td></tr>
<tr><td>Indicator 2a -- The instructional materials for Big Ideas: Modeling for Real Life Grade 4 partially meet expectations that the materials develop conceptual understanding of key mathematical concepts, especially where called for in specific standards or cluster headings. The instructional materials do not always provide students opportunities to independently demonstrate conceptual understanding throughout the grade-level.

Each lesson begins with an Explore and Grow and Think and Grow section where students develop conceptual understanding of key mathematical concepts through teacher-led activities. Explore and Grow contains one to three problems where students model math and discuss their understanding through guided questions from the teacher. Think and Grow reinforces and extends the learning of the Explore and Grow section.

The instructional materials provide limited opportunities for students to demonstrate conceptual understanding independently throughout the grade-level. The Apply and Grow, and Homework and Practice sections do not engage students in conceptual understanding.</td><td>Conceptual problems are intentionally included throughout the program. Each lesson begins with an Explore and Grow section where students develop conceptual understanding. In every lesson, each Think and Grow example is directly followed by a set of Show and Grow exercises that provide students immediate opportunity to independently practice the concept. These are always followed by Apply and Grow exercises which always include at least one conceptual problem. Also, every Homework & Practice set always contains at least one conceptual problem. For example:

Apply and Grow: Practice
• 1.3 #22, page 17
• 5.3 #13, page 213
• 9.2 #13, page 417
• 11.7 #14, page 533
• 13.3 #8, page 607

Homework & Practice
• 1.4 #15, page 26
• 3.6 #10, page 104
• 6.2 #13, page 272
• 10.2 #20, page 456
• 12.1 #7, page 568</td></tr>
<tr><td colspan="2">Indicator 2c -- Attention to Applications: Materials are designed so that teachers and students spend sufficient time working with engaging applications of the mathematics, without losing focus on the major work of each grade.</td></tr>
<tr><td>Ed Reports Review</td><td>BIL Counter Evidence</td></tr>
<tr><td>Indicator 2c -- The instructional materials for Big Ideas: Modeling for Real Life Grade 4 partially meet expectations that the materials are designed so that teachers and students spend sufficient time working with engaging applications of the mathematics. Engaging applications include single and multi-step problems, routine and non-routine, presented in a context in which the mathematics is applied. The series includes limited opportunities for students to independently engage in the application of routine and non-routine problems due to the heavily scaffolded tasks.

The instructional materials present opportunities for students to engage in application of grade-level mathematics; however, the problems are scaffolded through teacher led questions. During the Dig In, Explore and Grow, and Think and Grow sections of lessons, teachers are provided with explicit guidance to support students to engage with applications of mathematical content, and/or students are given steps to solve the problem.</td><td>In every lesson, each Think and Grow: Modeling Real Life example is directly followed by a set of Show and Grow exercises that provide students immediate opportunity to independently engage in routine and non-routine application problems. Students have similar opportunities in the Homework & Practice. For example:

Show and Grow
• 3.2 #28, page 78
• 4.5 #14, page 170
• 8.6 #22, page 380

Homework & Practice
• 1.2 #6, page 14
• 4.8 #8, page 190
• 6.5 #10, page 290

Performance tasks also give students opportunity to independently engage in non-routine applications. For example:
• Ch 1-3 STEAM Performance Task, #1a, page 139
• Ch 5 Performance Task, #2, page 253
• Ch 1-11 STEAM Performance Task, #2, page 559
• Ch 13 Performance Task, #4, page 641</td></tr>
</table>

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Indicator 2d -- Balance: The three aspects of rigor are not always treated together and are not always treated separately. There is a balance of the 3 aspects of rigor within the grade.

Ed Reports Review	BIL Counter Evidence
Indicator 2d -- The instructional materials for Big Ideas Grade 4 partially meet expectations that the three aspects of rigor are not always treated together and are not always treated separately.	The Big Ideas Math: Modeling Real Life program consistently across Grades K-8 strives for a balanced approach to rigor. Each section develops a concept from conceptual understanding (Explore and Grow) to procedural fluency (Think and Grow examples) to rigorous application (Think and Grow: Modeling Real Life examples), engaging students in the mathematics and promoting active learning. Every set of practice problems reflects this balance, giving students the rigorous practice they need to achieve mastery. The Teaching Edition front matter was updated in a recent printing to provide detail on the program philosophy concerning rigor. • ***Front matter, page xix***
Indicator 2d -- The instructional materials present opportunities for students to engage in multiple aspects of rigor within a lesson; however, these are often treated separately.	The following examples show two or more aspects of rigor treated together. Conceptual Understanding and Procedural Fluency • 4.7 Example and #1-3, page 180 • 5.4 Example and #1-2, page 218 • 7.2 Example and #1-4, page 312 • 8.2 Example and #1-2, page 354 • ***8.7 Example and #1-2, page 384*** • 9.1 Example and #1-4, page 410 Application and Conceptual Understanding • 2.5 Example and #8, page 60 • ***3.1 Example and #15, page 7* 2** • 4.4 Example and #8, page 164 • 5.4 Example and #10, page 220 • 8.1 Example and #15, page 350 • 10.2 Example and #14, page 454 Conceptual Understanding, Procedural Fluency, and Application • 2.5 Example, page 58 and #6, page 59 • 3.10 Example, page 124 and #6, page 125 • ***11.8 Example and #1, page 538***

Mathematical Practice - Content Connections

Indicator 2e -- The Standards for Mathematical Practice are identified and used to enrich mathematics content within and throughout each applicable grade.

Ed Reports Review	BIL Counter Evidence
Indicator 2e -- The instructional materials reviewed for Big Ideas: Modeling for Real Life Math Grade 4 partially meets expectations for identifying the Mathematical Practices (MPs) and using them to enrich the Mathematical Practices. The MPs are identified in both the Teaching Edition and Student Edition and the practices are connected to the mathematical content. In the Student Edition, MPs are labeled with "MP" and a shortened of version of the MP, such as "Structure, Reasoning, Construct Arguments, Precision, etc." No document correlates the abbreviated title with the Standards for Mathematical Practice. For example, the label "MP Number Sense" could align to several MPs. Additionally, Big Ideas Grade 4 added "MP Logic" as a Mathematical Practice. This added practice does not align with the CCSSM Standards for Mathematical Practice.	We have provided a correlation online at bigideasmath.com for students, aligning the MP labels and other headings in the Student Edition with the Standards for Mathematical Practice. Big Ideas Learning will also send the correlation to existing users of our program. The correlation will also be included in future textbook printings. The page is attached here for your reference. • ***Front matter, page vi***

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Indicator 2f -- Materials carefully attend to the full meaning of each practice standard.	
Ed Reports Review	**BIL Counter Evidence**
Indicator 2f -- The instructional materials do not present opportunities for students to engage in MP1: Make Sense of Problems and Persevere in Solving Them. The instructional materials present few opportunities for students to make sense of problems and persevere in solving them.	Students make sense of problems and persevere in solving them in the Explore and Grows. For example: ***• 5.9 Explore and Grow, page 247*** • 8.9 Explore and Grow, page 395 While the Think and Grow: Modeling Real Life examples are stepped out for students, they illustrate opportunities for students to make sense of problems and persevere in solving them when they independently solve the related problems that follow. For example: Think and Grow: MRL and Show and Grow Homework & Practice ***• 2.5 Example and #8, page 60*** • 2.5 #3-7, page 62 • 4.3 Example and #10-11, page 158 • 4.3 #9, page 160 • 11.2 Example and #16-18, page 504 • 11.2 #12, page 506 • 13.8 Example and #9-10, page 638 ***• 13.8 #8-9, page 640*** Students are encouraged to use the Problem-Solving Plan to think through and solve problems. For example: Think and Grow Apply and Grow: Practice ***• 2.5 Example, page 58*** • 2.5 #2-7, page 59 • 5.9 Example, page 248 • 5.9 #2-7, page 249 • 9.5 Example, page 434 ***• 9.5 #2-6, page 435*** Teaching Edition notes labeled with MP1 give opportunities for the teacher to emphasize these habits to students and for students to use them going forward. For example: • 3.9, page T-120 • 6.1, page T-264 ***• 4.8, page T-188*** • 8.9, page T-398
Indicator 2f -- The instructional materials do not present opportunities for students to engage in MP2: Reason Abstractly and Quantitatively. The instructional materials present few opportunities for students to Reason Abstractly and Quantitatively.	Students have ample opportunities to reason abstractly and quantitatively throughout our program. In addition to the Explore and Grows where students investigate math to understand the reasoning behind the rules, students must use reasoning to solve problems and explain their answers. For example: • 1.1 #12-13, page 8 • 2.3 #14-15, page 47 • 3.4 Explore and Grow, page 87 • 3.9 #17, page 119 • 4.7 Explore and Grow, page 179 • 5.7 Explore and Grow, page 235 ***• 6.2 #13-15, page 272*** • 9.2 #7-8, page 420 • 11.2 #10-11, page 506
Indicator 2f -- The instructional materials do not present opportunities for students to engage in MP4: Model with mathematics. The instructional materials present few opportunities for students to model with mathematics.	Modeling with mathematics is covered throughout our program. Every Think and Grow: Modeling Real Life example is directly followed by corresponding Show and Grow problems for students to engage in MP4. In addition, every Homework & Practice set contains multiple opportunities for students to model with mathematics in the Modeling Real Life exercises. For example: Think and Grow MRL and Show and Grow Homework & Practice • 2.1 Example and #15-17, page 36 ***• 2.1 #13-14, page 38*** ***• 4.6 Example and #13-15, page 176*** • 4.6 #13, page 178 • 8.8 Example and #12-14, page 392 • 8.2 #12-13, page 394 • 11.4 Example and #18-20, page 516 • 11.4 #11-13, page 518 • 13.1 Example and #14-16, page 596 • 13.1 #16-17, page 598

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Indicator 2f -- The instructional materials do not present opportunities for students to engage in MP5: Use appropriate tools strategically. The instructional materials present few opportunities for students to choose their own tools; therefore, the full intent of the MP is not being attended to. MP5 is only identified a total of four times throughout the instructional materials and only in two chapters. Big Ideas: Modeling for Real Life Grade 4 presents limited opportunities for students to choose tools strategically, as the materials indicate what tools should be used.	Students have an opportunity to choose tools strategically. In addition to the specific MP5 labels, the Teaching Edition often indicates where students have a choice of tools. For example: • 1.1 Supporting Learners, page T-4 ***• 2.4 Supporting Learners, page T-52*** • 5.6 Scaffolding Instruction, page T-231 • 13.6 Scaffolding Instruction, page T-625 In the Dynamic Student Edition, students have access to the following math tools at all times. • Balance scale • Flash cards • Four function calculator • Fraction models • Geoboard • Linking cubes • Money • Number frames • Number line • Pattern blocks • Place value • Rekenrek
Indicator 2f -- The instructional materials do not present opportunities for students to engage in MP8: Look for and express regularity in repeated reasoning.	Students have opportunities to express regularity in repeated reasoning throughout our program. In addition to the specific MP labels, the Teaching Edition often indicates where students engage in repeated reasoning. For example: • 3.2 Explore and Grow, page 75 • 4.1 Explore and Grow, page 143 ***• 5.1 Explore and Grow, page 199*** • 6.3 Dig In, page T-273 • 7.2 Dig In, page T-311 • 10.4 Dig In, page T-463
Indicator 2g.i -- Materials prompt students to construct viable arguments and analyze the arguments of others concerning key grade-level mathematics detailed in the content standards.	
Ed Reports Review	**BIL Counter Evidence**
Indicator 2g.i -- The instructional materials reviewed for Big Ideas: Modeling for Real Life Grade 4 partially meet expectations that the instructional materials prompt students to construct viable arguments and analyze the arguments of others concerning key grade-level mathematics. The Student Edition labels Standards of Mathematical Practices with “MP Construct Arguments”, however, these noted activities do not always indicate that the students are constructing arguments or analyzing arguments of others.	We suggest that when students are asked to explain their answers, make plans, make conclusions, and compare answers, they must use what they have learned in building a logical progression of statements that defends their answer. The ability to critique someone else's reasoning also helps students analyze their own work and formulate good explanations. For example: • 1.3 Explore and Grow, page 15 • 2.4 Explore and Grow, page 51 • 3.1 #9, page 74 • 5.5 Explore and Grow, page 223 ***• 7.4 #14, page 325*** • 7.5 #11, page 334 • 8.3 Explore and Grow, page 359 • 9.4 #8, page 432 • 13.3 #8, page 610 • 14.4 Explore and Grow, page 667
Indicator 2g.ii -- Materials assist teachers in engaging students in constructing viable arguments and analyzing the arguments of others concerning key grade-level mathematics detailed in the content standards.	
Ed Reports Review	**BIL Counter Evidence**
Indicator 2g.ii -- The instructional materials reviewed for Big Ideas: Modeling for Real Life Grade 4 partially meet expectations that the instructional materials assist teachers in engaging students in constructing viable arguments and analyzing the arguments of others concerning key grade-level mathematics. There are some missed opportunities where the materials could assist teachers in engaging students in both constructing viable arguments and analyzing the arguments of others. There are examples where the materials do assist teachers in having students develop an argument.	The Teaching Edition contains many instances of guidance, along with probing questions the teacher can ask, to engage students in constructing arguments and analyzing the arguments of others. These are often indicated with either an MP3 inline head or a red "?" icon. For example: MP3 inline head Red "?" icon • 4.2, page 149 • 2.1, page T-33 • 5.3, page 211 • 3.1, page T-70 • 6.6, page T-292 • 5.8, page T-241 • 7.3, page T-317 • 7.2, page T-312 ***• 7.4, page T-323*** ***• 7.3, page T-320*** • 8.1, page 347 • 11.1, page T-498 • 8.7, page 383 • 10.7, page T-482

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BIL Grade 4 - Lessons and Days Devoted to Major Work

		TOTAL		Lessons		Assessments		Supporting Work*	
		Items	Days	Items	Days	Items	Days	Items	Days
TOTAL	**Total**	178	150	94	94	14	14	70	42
	Major	115	97	61	61	9	9	45	27
	Major %	65%+	65%+	65%+	65%+	64%+	64%+	64%+	64%+
Chapter 1	**Total**	10	8	4	4	1	1	5	3
	Major	10	8	4	4	1	1	5	3
Chapter 2	**Total**	11	9	5	5	1	1	5	3
	Major	11	9	5	5	1	1	5	3
Chapter 3	**Total**	16	14	10	10	1	1	5	3
	Major	16	14	10	10	1	1	5	3
Chapter 4	**Total**	14	12	8	8	1	1	5	3
	Major	14	12	8	8	1	1	5	3
Chapter 5	**Total**	15	13	9	9	1	1	5	3
	Major	15	13	9	9	1	1	5	3
Chapter 6	**Total**	12	10	6	6	1	1	5	3
	Major	0	0	0	0	0	0	0	0
Chapter 7	**Total**	11	9	5	5	1	1	5	3
	Major	11	9	5	5	1	1	5	3
Chapter 8	**Total**	15	13	9	9	1	1	5	3
	Major	15	13	9	9	1	1	5	3
Chapter 9	**Total**	11	9	5	5	1	1	5	3
	Major	11	9	5	5	1	1	5	3
Chapter 10	**Total**	13	11	7	7	1	1	5	3
	Major	12	10	6	6	1	1	5	3
Chapter 11	**Total**	15	13	9	9	1	1	5	3
	Major	0	0	0	0	0	0	0	0
Chapter 12	**Total**	10	8	4	4	1	1	5	3
	Major	0	0	0	0	0	0	0	0
Chapter 13	**Total**	14	12	8	8	1	1	5	3
	Major	0	0	0	0	0	0	0	0
Chapter 14	**Total**	11	9	5	5	1	1	5	3
	Major	0	0	0	0	0	0	0	0

* Supporting Work includes Vocabulary, Performance Task, Activity, Chapter Practice, Centers

+ Additionally, it is vital to realize that the major topics presented in earlier chapters are revisited and woven throughout the remainder of the grade in the supporting and additional topics. For examples, please see the citations on page 1 of this counter evidence document.

Think and Grow: Create Number Patterns

A **rule** tells how numbers or shapes in a pattern are related.

Example Use the rule "Add 3." to create a number pattern. The first number in the pattern is 3. Then describe another feature of the pattern.

Create the pattern.

$3 \xrightarrow{+3} 6 \xrightarrow{+3} \_\_\_\_ \xrightarrow{+3} \_\_\_\_ \xrightarrow{+3} \_\_\_\_ \xrightarrow{+3} \_\_\_\_, \ldots$

The numbers in the pattern are multiples of _____.

Example Use the rule "Multiply by 2." to create a number pattern. The first number in the pattern is 10. Then describe another feature of the pattern.

When describing another feature of the pattern, look at the ones digits or the tens digits. Are all of the numbers even or odd?

Create the pattern.

$10 \xrightarrow{\times 2} 20 \xrightarrow{\times 2} \_\_\_\_ \xrightarrow{\times 2} \_\_\_\_ \xrightarrow{\times 2} \_\_\_\_ \xrightarrow{\times 2} \_\_\_\_, \ldots$

The ones digit of each number in the pattern is _____.

Show and Grow I can do it!

Write the first six numbers in the pattern. Then describe another feature of the pattern.

1. Rule: Add 5.
First number: 1

1, _____, _____, _____, _____, _____

2. Rule: Multiply by 3.
First number: 3

3, _____, _____, _____, _____, _____

3. Rule: Subtract 2.
First number: 20

4. Rule: Divide by 2.
First number: 256

Think and Grow: Find Equivalent Metric Lengths

Metric units of length include **millimeters**, centimeters, meters, and **kilometers**.

Metric Units of Length
1 centimeter (cm) = 10 millimeters (mm)
1 meter (m) = 100 centimeters (cm)
1 kilometer (km) = 1,000 meters (m)

Example Find the number of meters in 3 kilometers.

There are ____ meters in 1 kilometer.

$3 \times$ ____ = ____

So, there are ____ meters in 3 kilometers.

Indicator 1b - In this example, students multiply by thousands to find an equivalent length.

Example Find the number of millimeters in 9 meters.

First, find the number of centimeters. Then find the number of millimeters.

There are ____ centimeters in 1 meter.

$9 \times$ ____ = ____ centimeters

There are ____ millimeters in 1 centimeter.

$900 \times$ ____ = ____ millimeters

So, there are ____ millimeters in 9 meters.

Show and Grow I can do it!

Find the equivalent length.

1. 8 km = ____ m

2. 7 m = ____ cm

3. 5 cm = ____ mm

4. 6 km = ____ cm

Think and Grow: Find Equivalent Customary Lengths

Customary units of length include inches, feet, yards, and **miles**.

Customary Units of Length
1 foot (ft) = 12 inches (in.)
1 yard (yd) = 3 feet (ft)
1 mile (mi) = 1,760 yards (yd)

Example Find the number of yards in 2 miles.

There are _____ yards in 1 mile.

2 × _____ = _____

So, there are _____ yards in 2 miles.

Example Find the number of inches in 7 yards.

There are _____ feet in 1 yard.

7 × _____ = _____ feet

There are _____ inches in 1 foot.

21 × _____ = _____ inches

So, there are ________ inches in 7 yards.

Show and Grow I can do it!

Find the equivalent length.

1. 6 mi = _____ yd

2. 4 ft = _____ in.

3. 11 yd = _____ ft

4. 3 mi = _____ ft

Think and Grow: Find Equivalent Customary Capacities

Customary units of capacity include **cups**, **pints**, **quarts**, and **gallons**.

Customary Units of Capacity
1 pint (pt) = 2 cups (c)
1 quart (qt) = 2 pints (pt)
1 gallon (gal) = 4 quarts (qt)

Example Find the number of quarts in 15 gallons.

There are ______ quarts in 1 gallon.

15 × ______ = ______

So, there are ______ quarts in 15 gallons.

Example Find the number of cups in 7 quarts.

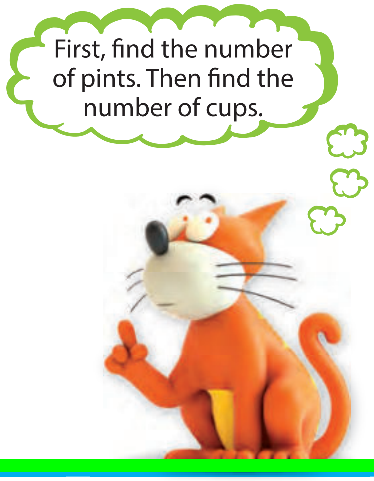
There are ______ pints in 1 quart.

7 × ______ = ______ pints

There are ______ cups in 1 pint.

14 × ______ = ______ cups

So, there are ______ cups in 7 quarts.



Show and Grow I can do it!

Find the equivalent capacity.

1. 4 pt = ______ c

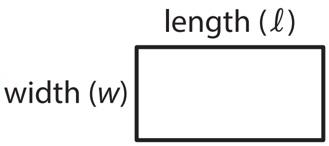
2. 6 qt = ______ pt

3. 9 gal = ______ qt

4. 12 gal = ______ pt

Think and Grow: Use a Formula for Perimeter

Perimeter is the distance around a figure. A **formula** is an equation that uses letters and numbers to show how quantities are related. You can use a formula to show how the length, width, and perimeter of a rectangle are related.



Perimeter of a Rectangle

$P = (2 \times \ell) + (2 \times w)$

perimeter length width

Example Find the perimeter of the rectangle.

The length is _____ feet and the width is _____ feet.

$P = (2 \times \ell) + (2 \times w)$ Formula for perimeter of a rectangle

$= (2 \times$ _____ $) + (2 \times$ _____ $)$

$=$ _____ $+$ _____

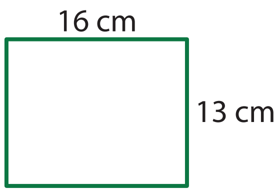
$=$ _____

The perimeter is _____ feet.

Show and Grow I can do it!

Find the perimeter of the rectangle.

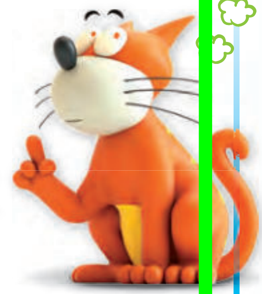
1.



2.

Think and Grow: Use a Formula for Area

Remember, area is measured in square units.



Area is the amount of surface a figure covers. You can use a formula to show how the length, width, and area of a rectangle are related.

length (ℓ)

width (w)

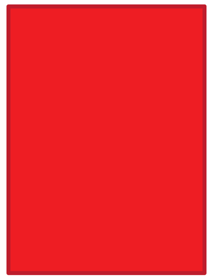
Area of a Rectangle

$$A = \ell \times w$$

area, length, width

Example Find the area of the rectangle.

14 in.



19 in.

The length is ______ inches and the width is ______ inches.

$A = \ell \times w$ Formula for area of a rectangle

$= \_\_\_\_\_ \times \_\_\_\_\_$

$= \_\_\_\_\_$

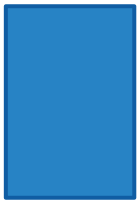
The area is ______ square inches.

Show and Grow *I can do it!*

Find the area of the rectangle.

1. 4 m

6 m



2.

12 yd

20 yd

3.

7 cm

11 cm

4. 5 ft

$1\frac{1}{2}$ ft

Think and Grow: Problem Solving: Perimeter and Area

Example A rectangular board has an area of 1,700 square inches. You cut out a rectangular piece that is 10 inches long and 9 inches wide to make a carnival prop similar to the one shown. What is the area of the prop?

Understand the Problem

What do you know?

- The original board has an area of 1,700 square inches.
- The piece you cut out is 10 inches long and 9 inches wide.

What do you need to find?

- You need to find the area of the carnival prop.

Make a Plan

How will you solve?

- Find the area of the piece you cut out.
- Subtract the area of the piece you cut out from the original area.

Solve

Step 1: Find the area of the piece you cut out.

$A = \ell \times w$

$= \_\_\_\_\_ \times \_\_\_\_\_$

$= \_\_\_\_\_$

Step 2: Subtract the area of the piece you cut out from the original area.

$1{,}700 - \_\_\_\_\_ = \_\_\_\_\_$

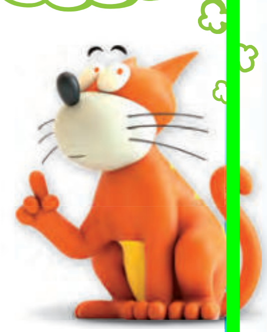
The area of the prop is _____ square inches.

Show and Grow I can do it!

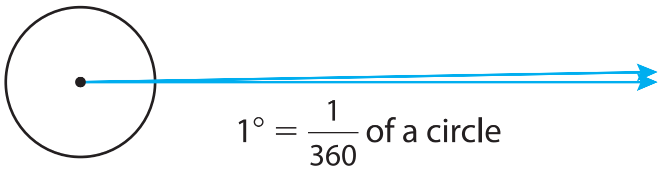
1. Explain how you can check whether your answer above is reasonable.

Think and Grow: Degrees

The symbol for degree is °. 360° is read as "360 degrees."

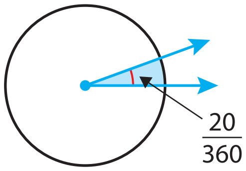


Angles are measured in units called **degrees**. Think of dividing a circle into 360 equal parts. An angle that turns through $\frac{1}{360}$ of a circle measures 1°, and is called a "one-degree angle." A full turn through the entire circle is 360°.



$1° = \frac{1}{360}$ of a circle

Example Find the measure of the angle.



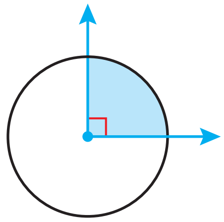
An angle that turns $\frac{1}{360}$ of a circle measures ______ degree.

An angle that turns through $\frac{20}{360}$ of a circle measures ______ degrees.

So, the measure of the angle is ______.

Example Find the measure of a right angle.

Think: A right angle turns through $\frac{1}{4}$ of a circle.



Step 1: Write $\frac{1}{4}$ as an equivalent fraction with a denominator of 360.

$$\frac{1}{4} = \frac{1 \times \square}{4 \times \square} = \frac{\square}{360}$$

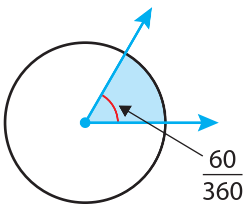
Step 2: Write $\frac{90}{360}$ in degrees. An angle that turns through $\frac{90}{360}$ of a circle measures ______ degrees.

So, a right angle measures ______.

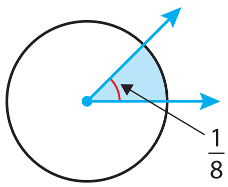
Show and Grow *I can do it!*

Find the measure of the angle.

1.



2.



$$\frac{1}{8} = \frac{1 \times \square}{8 \times \square} = \frac{\square}{360}$$

Think and Grow: Modeling Real Life

Example During 1 day of swim practice, your friend swam 2,600 meters. Your friend's goal was to swim $2\frac{1}{2}$ kilometers. Did he reach his goal?

Make a table that shows the relationship between kilometers and meters.

Kilometers	Meters
1	
$1\frac{1}{2}$	
2	
$2\frac{1}{2}$	
3	

1 kilometer = ______ meters

$1\frac{1}{2}$ × ______ = ______

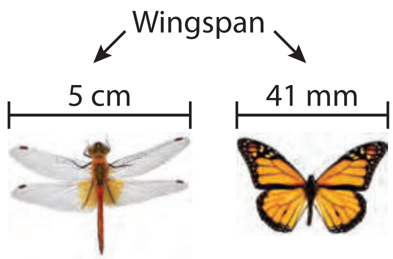
Compare 2,600 meters to $2\frac{1}{2}$ kilometers.

Your friend ____________ reach his goal.

Show and Grow *I can think deeper!*

17. You have 42 millimeters of wire. You need $4\frac{1}{2}$ centimeters of wire to make an earring. Do you have enough wire to make the earring?

18. Which insect's wingspan is longer? How much longer is it?



19. **DIG DEEPER!** There are signs posted every 500 meters along a 5-kilometer race. How many signs are posted?

Think and Grow: Modeling Real Life

Example A football player needs to run $6\frac{1}{3}$ yards to score. The player runs 17 feet. Does the player score?

Make a table that shows the relationship between yards and feet.

Compare $6\frac{1}{3}$ yards to 17 feet.

Yards	Feet
5	
$5\frac{1}{3}$	
$5\frac{2}{3}$	
6	
$6\frac{1}{3}$	

1 yard = _____ feet

$5 \times$ _____ = _____

$5\frac{1}{3} \times$ _____ = _____

The player __________ score.

Show and Grow *I can think deeper!*

16. You have $3\frac{1}{4}$ feet of string. You need 36 inches of string to make a necklace. Do you have enough string to make the necklace?

17. Which snake is longer? How much longer?

Boa Constrictor: 13 feet

Green Anaconda: $9\frac{1}{3}$ yards

18. **DIG DEEPER!** You have 6 yards of ribbon. You wrap 3 feet of ribbon around a present. You wrap 16 inches of ribbon around another present. How many inches of ribbon do you have left?

Think and Grow: Modeling Real Life

Example Your cousin makes a $3\frac{1}{2}$-minute long music video. Your friend makes a 200-second long music video. Who records a longer music video?

Make a table that shows the relationship between minutes and seconds.

Compare $3\frac{1}{2}$ minutes to 200 seconds.

Minutes	Seconds
2	
$2\frac{1}{2}$	
3	
$3\frac{1}{2}$	

1 minute = ______ seconds

$2 \times$ ______ = ______

$2\frac{1}{2} \times$ ______ = ______

Your __________ records a longer music video.

Show and Grow *I can think deeper!*

16. You put a puzzle together in 150 minutes. Your friend puts the same puzzle together in $2\frac{1}{4}$ hours. Who put the puzzle together faster?

17. In the wild, a California sea lion can live to be 20 years old. In captivity, it can live to be 360 months old. Does a California sea lion live longer in the wild or in captivity? How much longer?

18. **DIG DEEPER!** Movie A is 98 minutes long. Movie B is $1\frac{1}{2}$ hours long. Movie C is $1\frac{3}{4}$ hours long. Order the movies from longest to shortest.

Think and Grow: Modeling Real Life

Example In a video game, you make a rectangular castle that is 4 times longer than it is wide. What is the perimeter of the castle?

Multiply 4 and the width of the castle to find the length.

$4 \times 25 = \_\_\_\_$

The length of the castle is ____ yards.

Use a formula to find the perimeter.

$P = (2 \times \_\_\_\_) + (2 \times \_\_\_\_)$

$= \_\_\_\_ + \_\_\_\_$

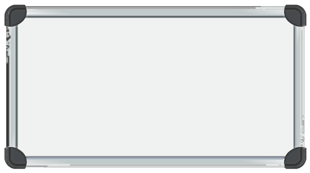
$= \_\_\_\_$

The perimeter of the castle is ____ yards.

Show and Grow *I can think deeper!*

10. A teacher wants to put a border around a rectangular whiteboard. The whiteboard is 2 times longer than it is wide. What is the perimeter of the whiteboard?

1 m



11. You want to put a ribbon border around each rectangular card. Which card requires more ribbon? How much more ribbon?

18 cm

18 cm

14 cm

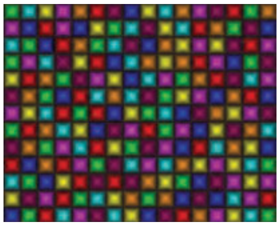
21 cm

12. **DIG DEEPER!** A rectangular flower bed has a length of 6 feet. The width is 48 inches shorter than the length. What is the perimeter of the flower bed?

Think and Grow: Modeling Real Life

Example The length of the rectangular dance floor is 6 feet longer than the width. What is the area of the dance floor?

24 ft



Add 6 feet to the width to find the length.

$24 + 6 =$ ______

The length of the dance floor is ______ feet.

Use a formula to find the area. $A =$ ______ $\times$ ______

$=$ ______

The area of the dance floor is ______ square feet.

Show and Grow I can think deeper!

12. A designer creates a rectangular advertisement for a website. The length of the advertisement is $1\frac{1}{2}$ centimeters longer than the width. What is the area of the advertisement?

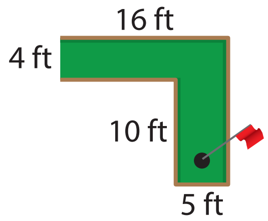
7 cm

13. You create a mural using 4 rectangular posters that are each $4\frac{1}{4}$ feet long and 2 feet wide. You put the posters next to each other with no gaps or overlaps. What is the area of the mural?

14. DIG DEEPER! Two rolls of wrapping paper have the same price. The red roll is 3 feet wide and is 10 yards long when unrolled. The striped roll is $3\frac{1}{2}$ feet wide and 8 yards long when unrolled. Which roll is the better buy? Explain.

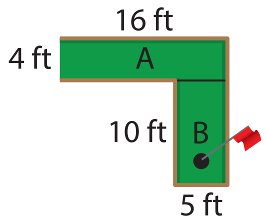
Think and Grow: Modeling Real Life

Example A worker wants to cover the miniature golf putting surface with artificial turf. The putting surface is in the shape of two rectangles. How much turf does the worker need?



Think: What do you know? What do you need to find? How will you solve?

Step 1: Divide the surface into two rectangles. Then find the area of each rectangle.



Rectangle A:

$A = \ell \times w$

$= 16 \times 4$

$=$ ______

Rectangle B:

$A = \ell \times w$

$= 10 \times 5$

$=$ ______

Indicator 1b - In this example, students multiply two-digit numbers by one-digit numbers to find the areas of two rectangles.

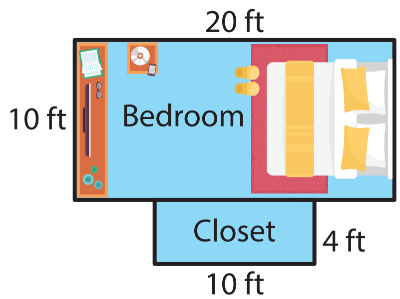
Step 2: Add the areas of the rectangles.

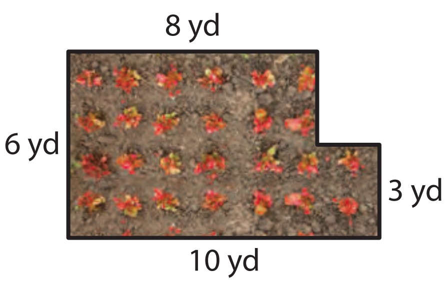
______ + ______ = ______

The worker needs ______ square feet of artificial turf.

Show and Grow *I can think deeper!*

7. You want to install new carpet in the rectangular bedroom and the rectangular closet. How much carpet do you need to cover the floor?





8. A gardener wants to enclose the garden with fencing. The garden is in the shape of two rectangles. How much fencing does the gardener need?

Think and Grow: Modeling Real Life

Example Spokes divide the Ferris wheel into 20 equal parts. What is the angle measure of 1 part?

Write a fraction that represents 1 part.

Because the Ferris wheel has 20 equal parts,

1 part can be represented by the fraction $\frac{\square}{\square}$.

Write $\frac{1}{20}$ as an equivalent fraction with a denominator of 360.

$$\frac{1}{20} = \frac{1 \times \square}{20 \times \square} = \frac{\square}{360}$$

Write $\frac{18}{360}$ in degrees.

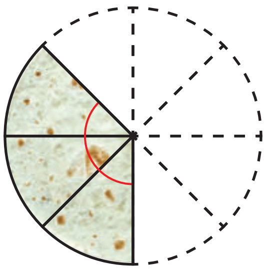
An angle that turns through $\frac{18}{360}$ of a circle measures _____ degrees.

So, the angle measure of 1 part is _____.

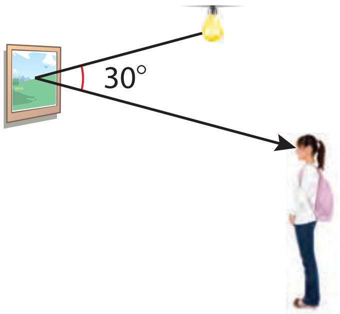
Show and Grow I can think deeper!

17. The game spinner is divided into 10 equal parts. What is the angle measure of 1 part?

18. **DIG DEEPER!** A circular quesadilla is cut into 8 equal pieces. Five pieces are eaten. What is the angle measure formed by the remaining pieces?



19. **DIG DEEPER!** When a light wave hits an object, the object reflects a colored light at an angle to your eye. The color of the reflected light is the color you see. What fraction of a circle is shown by the angle? Explain.



Think and Grow: Create Number Patterns

A **rule** tells how numbers or shapes in a pattern are related.

Example Use the rule "Add 3." to create a number pattern. The first number in the pattern is 3. Then describe another feature of the pattern.

Create the pattern.

$+3$ $+3$ $+3$ $+3$ $+3$

3, 6, ____, ____, ____, ____, . . .

The numbers in the pattern are multiples of ____.

Example Use the rule "Multiply by 2." to create a number pattern. The first number in the pattern is 10. Then describe another feature of the pattern.

When describing another feature of the pattern, look at the ones digits or the tens digits. Are all of the numbers even or odd?

Create the pattern.

$\times 2$ $\times 2$ $\times 2$ $\times 2$ $\times 2$

10, 20, ____, ____, ____, ____, . . .

The ones digit of each number in the pattern is ____.

Show and Grow *I can do it!*

Write the first six numbers in the pattern. Then describe another feature of the pattern.

1. Rule: Add 5.
First number: 1

1, ____, ____, ____, ____, ____

2. Rule: Multiply by 3.
First number: 3

3, ____, ____, ____, ____, ____

3. Rule: Subtract 2.
First number: 20

4. Rule: Divide by 2.
First number: 256

Laurie's Overview

About the Math

This chapter returns to the operations of addition and subtraction, further with multi-digit numbers. We hope that all students have mastered the basic addition and subtraction facts within 20. If this is not the case, students need interventions that will help them master the facts. Drill, particularly in the absence of reasoning, is not an effective intervention. You must first determine what facts the student does know, as these can be useful in learning the unknown facts. The intervention needed must intentionally and explicitly teach the reasoning strategies students missed earlier in their learning.

Addition and subtraction of multi-digit numbers each comprise about half of this chapter. Each operation extends students prior learning to work with up to six-digit numbers. Students have already used the vertical format and have experienced regrouping in both operations. Students with a good understanding of place value are able to apply this to multi-digit addition and subtraction work.

The chapter begins with a lesson on rounding and estimating. Students have already learned rounding, but now will use rounding as a tool for estimation. Later in the chapter, the estimates will be a key tool to check an answer for reasonableness. Some students will become proficient mentally estimating before calculating.

Students will review a variety of strategies from previous grades, including partial sums, counting on, regrouping, and compensation. Compensation is a strategy that many adults use regularly, meaning we look for ways to compute a sum or difference that we can do easily in our heads and then we *compensate* for the change we made to the original problem.

Underlying all of the computation work students do is an understanding of place value and attention to structure. When students learn to see a number composed of its base ten units, they are able to apply their computation strategies to each place value. The standard algorithm is a generalization of computations with single-digit numbers applied to each place value. When addition and subtraction problems are written in a vertical format, like place values have been aligned in the same column.

2.2

Check out the Dynamic Classroom.
BigIdeasMath.com

Laurie's Notes

STATE STANDARDS
4.NBT.B.4

Learning Target

Add multi-digit numbers and check whether the sum is reasonable.

Success Criteria

- Use place value to line up the numbers in an addition problem.
- Add multi-digit numbers, regrouping when needed.
- Estimate a sum to check whether my answer is reasonable.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Explain that when you reason, you think through things in a sensible, logical way. When you check if your sum is reasonable, you check to see if it makes sense and is a logical answer.

Preparing to Teach

Students have practiced regrouping with three-digit addends in third grade. In this lesson, they will continue to practice regrouping, expanding to working with up to six-digit numbers. In this lesson, students will continue to gain conceptual understanding of why aligning place values is important and necessary. They also use their estimate to decide if their answer is reasonable.

Materials

- 10-sided dice

Dig In (Motivate Time)

You, or a student volunteer, rolls three 10-sided dice with the digits 0–9. If dice are numbered 1–10, use 0 if a 10 is rolled. This is done twice so that two sets of three digits are generated. The goal is to form 2 three-digit numbers, find the sum, and come as close to the target as possible without going over.

- "I am going to say a target number, like 500. Then we are going to roll these three dice. You can use the numbers in any order to form a three-digit number. We'll repeat this so a second three-digit number can be formed. You then find the sum of your two numbers. You are trying to get as close to the target number as possible without going over."

Target: 500
Numbers:
7,3,8→ 378
2,0,9→ +209
587

- In the example shown, the sum is greater than 500 so they would not win. You need to decide if it is okay for students to use the 0 in the hundreds place.
- Use targets that are not just hundreds. A target of 739 is interesting.
- **Additional Rule:** Have students write the first three-digit number *before* they know the next set of three numbers.
- **MP2 Reason Abstractly and Quantitatively:** Discuss with students what their reasoning was as they wrote each three-digit number.
- "Today you are going to practice writing and solving multi-digit addition problems vertically. Turn and tell your partner what you remember about regrouping."

3.4

Learning Target

Use the Distributive Property to multiply.

Success Criteria

- Draw an area model to multiply.
- Use known facts to find a product.
- Explain how to use the Distributive Property.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Explain that when one distributes flyers one gives a flyer to each person among many people. The term *Distributive Property* is related to the word *distribute*. The Distributive Property states that you may first add the addends and then multiply, or you may distribute the multiplication to each addend and then add to find the product. The result is the same either way.

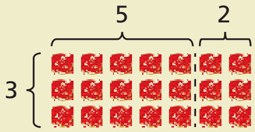
Laurie's Notes

Check out the Dynamic Classroom.
BigIdeasMath.com

STATE STANDARDS
CORE 4.NBT.B.5

Preparing to Teach

Students used the Distributive Property in a previous grade when learning their multiplication facts. They used 5×3 and 2×3 to find 7×3. The arrays were made with counters. The same array is used in this lesson but made with square tiles or the cubes from base ten blocks. A connection is made to dimensions of the array (factors) and the area (product).

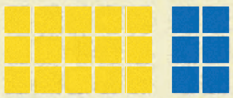


Materials

- color tiles
- base ten blocks

Dig In (Motivate Time)

Each partner is given color tiles and asked to build a rectangle. Partners then combine their tiles to make one rectangle. The dimensions and area of each rectangle are recorded.



- Give one partner 15 color tiles and the second partner 6 color tiles. Using two colors is helpful. "Build a rectangle. No dimension can be 1."
- There is one possibility for each rectangle, 3 by 5 and 3 by 2.
- ? "What is the area of each rectangle?" 15 square units, 6 square units
- "Combine your tiles and make one rectangle. No dimension can be 1."
- There is only one rectangle possible, 3 by 7.
- ? "What is the area of the new rectangle? What are the dimensions?" 21 square units; 3 by 7
- **MP3 Construct Viable Arguments:** "If each partner is given a certain number of tiles to make a rectangle with no dimension equal to 1, will there always be just one rectangle when you combine the tiles?" Give sufficient think time. Elicit responses from several students. In general the answer is no. Sometime the combined tiles will not make a rectangle unless a dimension of 1 is allowed. Example: 3 by 5 and 2 by 4. Sometimes the combined tiles will make more than one rectangle. Example: 3 by 5 and 3 by 3.
- ◉ "You used tiles to make a rectangle. How are the dimensions of the rectangle related to how many tiles you used?" When you multiply the dimensions you get the area and the number of tiles equals the area. "Today you are going to work with the area of rectangles and make a connection to the Distributive Property."

? Teaching Prompt ◉ Learning Target

Laurie's Notes

Indicator 1e - In the Teaching Edition, Laurie's Notes often connect prior knowledge to the lesson content.

Think and Grow

Getting Started

- Discuss the vocabulary card for **partial products**. Students should recall finding partial sums when learning to add. Students have been computing partial products as they have worked with the Distributive Property. We now use specific vocabulary.
- **Supporting Learners:** The shaded rectangles and use of color help connect the computation with where the result is recorded.

Teaching Notes

- Students use place value and partial products to find the product of two numbers. The partial products are written vertically to aid in summing them.
- Write the problem 3×194. Point and ask about the value of each digit in 194. Even when it is not written in expanded form, students should still know the 1 represents 100, 9 represents 90 and 4 represents 4.
- **Model:** "The area model is drawn. Record to show how to find the area of each rectangle." Pause as students write the three multiplication expressions. "Instead of writing the partial products in the area model we are going to record them to the right of the written problem." Be sure students recognize what the factors were for each partial product. Add the partial products.
- **MP2 Reason Abstractly and Quantitatively:** "How do you know the answer is reasonable?" An estimate for 3×194 would be $3 \times 200 = 600$.
- **Model:** "In this example the area model has not been drawn. Tell your neighbor what the model would look like." Listen for three smaller rectangles with dimensions 2 by 3,000, 2 by 100, and 2 by 90. "Why is there no rectangle for the ones place?" There is a 0 in the ones place. "What do you notice about how the partial products are recorded?" They are in a different order. Remind students you can add in any order. Point to each partial product and say aloud what the two factors are.
- **Teaching Tip:** As students try the three exercises, suggest that they record the factors next to each partial product as shown.

$$\begin{array}{rl} 86 & \\ \times \quad 5 & \\ \hline 30 & \leftarrow 5 \times 6 \\ +\ 400 & \leftarrow 5 \times 80 \\ \hline 430 & \end{array}$$

- "Explain to your partner what partial products are and how they are used when you multiply." Circulate and listen to explanations. This is a big lesson and it is okay if students are feeling a little confused. Support learners with area model sketches. Repeated addition can also be used.

ELL Support

After discussing the example, have students work in groups to discuss and complete Exercises 1-3. Lead groups to consider the following: "What place values are there? How do I write each in expanded form? What is each product? What is the total?" Monitor discussion and provide support as needed. Expect students to perform according to their proficiency level.

Beginner students may state numbers or one-word answers.

Intermediate students may use simple sentences, such as, "Multiply three thousands by two."

Advanced students may use detailed sentences and help guide problem solving.

Laurie's Overview

About the Math

A major strand in Grade 4 is using place value understanding and properties of operations to perform multi-digit arithmetic. Students have completed work with multiplication of multi-digit numbers by one- and two-digit numbers. In Grade 3, multiplication facts and the inverse relationship between multiplication and division were used to help students learn division facts. Now, students are ready to explore division of a multi-digit number by a one-digit number.

Understanding Division

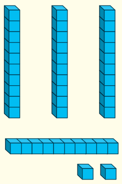
There are two concepts or interpretations of division: fair-shares (partition) and measurement (repeated subtraction). Consider the following examples.

- There are 2,892 cans donated for a food drive. The cans are shared with four locations. How many cans are sent to each location?
- A toy company designs 96 collectible figures. The company releases 6 of the figures each month. How many months will it take to release all of the collectible figures?

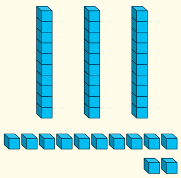
The first problem is a fair-share problem solved by finding 2,892 ÷ 4. The divisor (4) is the number of groups and the quotient (723) is the size of each group. The second problem is a measurement problem solved by finding 96 ÷ 6. The divisor (6) is the size of each group and the quotient (16) is the number of groups. Students should be able to solve both types of problems but it can be confusing when the meaning of the divisor and quotient are changed!

To develop an understanding of division, we use base ten blocks so that students can model and act out the problem. Note that it is easier to solve fair-share problems using this place value manipulative because the idea of partitioning in the standard algorithm can be shown. Consequently, it is important to pay attention to the language we use when posing questions to prompt students' guesses and consideration of possible partial quotients. Our language must match the visual model and the context. Recording partial quotients in the standard algorithm is not intuitive. You will need to guide students through the process. The figures below show the progression to the standard algorithm.

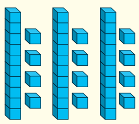
There are three bins to store 42 new basketballs. You want the same number in each bin. How many balls will be in each bin?



(1)



(2)



(3)

$$\begin{array}{rl} 3\overline{)42} & \\ -30 & = 3 \times 10 \\ 12 & \\ -12 & = 3 \times 4 \\ 0 & \end{array}$$

(4)

$$\begin{array}{rl} 14 & \\ 3\overline{)42} & \\ -3 & \text{3 tens} \\ -12 & \\ 12 & \text{12 ones} \\ 0 & \end{array}$$

(5)

(1) There are 42 balls. Ten balls can be placed in each of the three bins; 12 balls remain. (2) Regroup 1 ten as 10 ones. (3) Four balls are placed in each of the three bins. (4) Partial quotients record work done with base ten blocks. (5) 3 tens and 12 ones represent the place value results when finding the quotient.

Divisor	Divisibility Rule
2	The number is even.
3	The sum of the digits is divisible by 3.
5	The ones digit is 0 or 5.
6	The number is even and divisible by 3.
9	The sum of the digits is divisible by 9.
10	The ones digit is 0.

Using Divisibility Rules for 48

2: 48 is even Yes
3: 4 + 8 = 12 and 12 is divisible by 3 Yes
5: 48 does not have 0 or 5 in ones digit No
6: 48 is even and divisible by 3 Yes
9: 4 + 8 = 12 and 12 is not divisble by 9 No
10: 48 does not have 0 in the ones digit No

Students are very familiar with multiples of 10 and skip counting by many numbers, particularly one-digit numbers. We say that a whole number is a multiple of each of its factors. In the earlier example of 15, we say that 3 and 5 are factors of 15, and 15 is a multiple of 3 and 5. Multiples are a result of doing a multiplication problem. The goal is for students to understand the relationship between factors and multiples.

Prime and composite numbers are introduced next by exploring how many rectangular arrays can be made with a given number of tiles. Some numbers of tiles, such as 7, 13, and 29, can only be arranged as one rectangle: 1 by 7, 1 by 13, and 1 by 29. They are prime numbers. Given 8 or 15 tiles, there is more than one rectangular array that can be made (1 by 8 and 2 by 4; 1 by 15 and 3 by 5). These are composite numbers because they have more than two factors.

The final two lessons in this chapter are about patterns, something students have been working with since kindergarten when they clapped when hearing syllables or clapped and tapped a pattern such as, ABB, ABB. In the first pattern lesson, students work with number patterns and begin to formalize the identification of a rule for the pattern. They use the pattern rule to extend a pattern of numbers in a list. Many patterns involve addition and multiplication. Subtraction and division must be used carefully to ensure that the pattern always produces whole numbers. In the subtraction and division examples below, you will not want to extend the pattern.

+3 +3 +3 +3 +3
3, 6, ___, ___, ___, ___,...

×2 ×2 ×2 ×2 ×2
10, 20, ___, ___, ___, ___,...

−5 −5 −5 −5
20, 15, ___, ___, ___.

÷2 ÷2 ÷2 ÷2
16, 8, ___, ___, ___.

The last lesson of this chapter gives students the opportunity to explore both linear and geometric shape patterns. They build on their experience of extending repeating patterns such as AB, AB, or those with longer cores such as ABCC, ABCC. They work with growing patterns, where they need to predict what the 24th shape would be in the ABCC pattern.

The major focus of the chapter is formalizing students' number sense, using what they know of factors and multiples and their relationships. Their new understanding of factors and multiples forms a foundation for the new concepts of prime and composite. All of these ideas are building blocks of a deeper understanding of mathematics.

11.1

Check out the Dynamic Classroom.
BigIdeasMath.com

Laurie's Notes

Learning Target

Write lengths using equivalent metric measures.

Success Criteria

- Compare sizes of metric units of length.
- Write metric lengths using smaller metric units.
- Make tables of equivalent metric lengths.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Write the words *millimeter* and *centimeter* on the board. Ask students to identify the part they have in common. Underline meter and circle the prefixes *milli-* and *centi-*. Explain that *milli-* refers to 1000 and *centi-* refers to 100. So 100 centimeters is 1 meter, and 1,000 millimeters is 1 meter.

STATE STANDARDS CORE
4.MD.A.1, 4.MD.A.2

Preparing to Teach

Students have worked with measurement systems before. This lesson and the next revisit metric measurements in a more formal presentation. In this lesson, students establish benchmarks for metric lengths and convert between metric units.

Materials

- meter stick

Dig In (Motivate Time)

Students establish benchmarks for millimeters, centimeters, meters, and kilometers.

- Pass out meter sticks to each pair of students.
- ? Show part of a meter stick under a document camera. "The entire length is one meter. What is the length from 0 to 1 called?" centimeter "What is the length from one tick mark to the next tick mark called?" millimeter "A millimeter is very small. It takes 1,000 millimeters to make 1 meter."
- **MP4 Model with Mathematics:** "Today you are going to look around the classroom to find two benchmarks each for the three metric units, meter, centimeter, and millimeter. A benchmark is something with a length close to the length of one of our metric units. For example, a car door is about a meter wide. You will share some of your benchmarks with the class." You may want to place coins or an ID card on a desk for students to measure a millimeter width.
- ? Once students have finished finding their benchmarks, make a class list of the benchmarks on the board. "Which benchmarks will you remember?" Possibilities for millimeter: width of a coin or card, thickness of a fingernail; centimeter: width of a base ten block, width of a finger; meter: width of the classroom door, height of the windowsill, width of a desk.
- Add kilometer to the list of benchmarks. For a kilometer: length of 3 trips around a football field, the distance you walk in 10 minutes. You can also mark a distance of 1 kilometer on a map, using two landmarks as the start and end points (such as the school and the library). Note for students that a kilometer is 1,000 meters. Kilometer may be a new term.
- ◉ "We have established benchmarks to remember metric lengths so we can compare their sizes."

Laurie's Overview

About the Math

A major strand in Grade 4 is using place value understanding and properties of operations to perform multi-digit arithmetic. Chapters 1 and 2 focused on place value relationships and developing fluency with multi-digit addition and subtraction using the standard algorithm. All students may not be proficient with these operations. Emerging students should continue to work on fact fluency and modeling whole number operations with base ten blocks.

Chapters 3 and 4 focus on multiplication of multi-digit numbers by one- and two-digit numbers. Students understand multiplication as repeated addition, or arrays of rows and columns. This understanding helped students learn their multiplication facts and we build upon it to introduce multi-digit multiplication.

A key understanding in multiplication is the ability to break numbers apart in flexible ways. Repeated addition and arrays were helpful in learning multiplication facts but they are not strategies to use when solving 4×38. We have to develop strategies for breaking 38 apart and using known 4-facts to find the product. Breaking 38 apart involves place value concepts and using 4-facts requires a deep understanding of the Distributive Property (with addition). How students then record their thinking and strategies for finding 4×38 develops over time and cannot be rushed. In the process of learning to reason about multiplication and record their work, students have opportunities to develop mental math strategies that many, if not most, adults use! Let students take their time.

Indicator 1e - The Laurie's Notes overview emphasizes that the key to multiplication of multi-digit numbers with one- and two-digit numbers is a deep conceptual understanding of place value and the Distributive Property. As students develop and deepen this understanding, they are exposed to a method of recording their work, but the reasoning behind it is the emphasis.

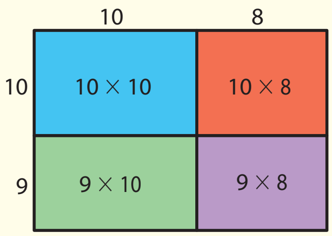
Another key understanding as we move to multiplying multi-digit numbers by multi-digit numbers is the idea of partial products. Students will explore this idea using place value to multiply two multiples of ten, move to area model diagrams, and finally connect the idea to the distributive property.

As students grow as mathematicians, it is expected that they will develop a practice of checking their work for reasonableness. They will develop more confidence and ownership of their work with less dependence on the teacher to affirm their accuracy. This chapter builds on their rounding skills as well as introducing compatible numbers as two tools for estimation. Both are used to check calculated answers for reasonableness. If, after checking a calculation against an estimate, the answer does not seem reasonable, students should be expected to review their work for possible errors or misunderstanding and make appropriate corrections and then check again.

Strategies for Multiplication

There are several strategies that describe students' reasoning as they develop their understanding of multiplication. How students record their thinking and strategy will vary so it is important to have them talk about their written work.

Area Models: Building on their understanding of base ten blocks, students will build area models representing two-digit by two-digit multiplication. Students will break apart, or decompose, the numbers into multiples of ten and ones. Writing the calculations within the squares will help as they add partial products for the final step.



Here, after breaking apart 19 into 10 and 9, and 18 into 10 and 8, students would calculate the area of each section to find the partial products.
$100 + 80 + 90 + 72 = 342$

The Distributive Property: Students will continue to develop an understanding of place value and the Distributive Property begun last chapter. Students break apart or partition the second factor by place value, multiplying the first factor by each number. Then, they do the same with the first factor, break it apart and use the Distributive Property.

$17 \times 25 = 17 \times (20 + 5)$	Break apart 25.
$= (17 \times 20) + (17 \times 5)$	Distributive Property
$= (10 + 7) \times 20 + (10 + 7) \times 5$	Break apart 17.
$= (10 \times 20) + (7 \times 20) + (10 \times 5) + (7 \times 5)$	Distributive Property
$= 200 + 140 + 50 + 35$	Multiply.
$= 425$	Add.

Finally, students will apply what they have learned both in previous chapters and this one. They will practice applying place value, the Associative Property of Multiplication, area models, the Distributive Property, partial products, and regrouping. They will choose and explain their strategies.

Any of these reasoning strategies may be used by any of your students on any given day. There is much to be gained by students sharing their reasoning with others. They develop new insights and practice mental math.

The major focus of the chapter is developing an understanding of multi-digit multiplication strategies and gaining confidence in applying them successfully. There is ample opportunity to practice.

4.6

Laurie's Notes

STATE STANDARDS
4.NBT.B.5

Preparing to Teach

Much of the work in this chapter has used models to find the partial products. In this lesson, the focus is on how to record the partial products using regrouping. It is important that students understand that two pairs of partial products are summed when you use regrouping. Place value plays an important role in the standard multiplication algorithm, so continue to ask students the value of each digit. Do not rush the formalization of the written work.

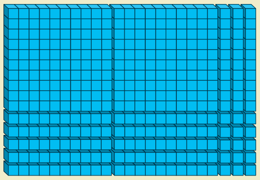
Materials

- base ten blocks
- paper
- colored pencils

Dig In (Motivate Time)

Students use base ten blocks to model multiplication problems and draw an area model for the same problems. Attention is drawn to pairs of partial products. Students' written work is saved for later reference.

- In small groups students use base ten blocks to find 15×23.



- ? "Focus on the top and bottom rectangles in your model. What multiplication problem does the top rectangle represent?" 10×23 "The bottom rectangle?" 5×23 "The large rectangle?" 15×23 You want students to understand the one model can answer all 3 problems.
- ? "Draw an area model of 15×23 on your scrap paper and label only the dimensions." Pause. "Can you use mental math to find the partial products, meaning the area of the four small regions?" yes "Use two colors to write your answers, one color for the top and another color for the bottom."

	20	3
10	200	30
5	100	15

- "Now let's write the problem 15×23 in vertical format as we did yesterday and record the partial products. We can write the partial products in any order, but I'm going to ask you to use a certain order today." Lead students through 5×3, 5×20, 10×3, and 10×20 using the two colors.

$$\begin{array}{r} 23 \\ \times\ 15 \\ \hline 15 \\ 100 \\ 30 \\ 200 \\ \hline 345 \end{array} \qquad \begin{array}{l} 15 + 100 = 115 \\ 30 + 200 = 230 \end{array}$$

- Discuss how the partial sums still add to the product of 15×23, *and* the pairs of partial products sum the product of 5×23 and 10×23.
- Three additional problems that show up in today's lesson are: 41×32, 12×43, and 24×83. Build and draw each. Save students' work.
- "Today we are going to find partial products again. Our written work is going to help us be efficient in multiplying two-digit numbers."

Learning Target

Multiply two-digit numbers.

Success Criteria

- Multiply to find partial products.
- Show how to regroup ones, tens, and hundreds.
- Add partial products to find a product.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Review the word *regroup* by emphasizing the importance of understanding word parts—prefixes, roots, and suffixes. Students should be familiar with the word *group*. Ask them what they remember the prefix *re-* means. Then review the concept of regrouping.

Indicator 1e - The Teaching Edition constantly emphasizes the importance of conceptual understanding and not rushing students to formalizing the process.

ELL Support

After reviewing the example, have students work in pairs to discuss and complete Exercises 1–3. Have one student ask another, "To what numbers do you round? What is your estimate? What is the product?" Have them alternate roles.

Beginner students may write answers. **Intermediate** students may write and state answers using phrases or simple sentences. **Advanced** students may use detailed sentences to answer.

Laurie's Notes

Think and Grow

Getting Started

- It is important not to rush students into formalizing the multiplication process. They need to understand how the partial products are being grouped together. Continue to draw and color code the area model that supports each problem.

Teaching Notes

- **Model:** "We want to find 87 × 64. What is a reasonable estimate for the product?" 90 × 60 = 5,400 Point to the vertically written problem. "Where do we begin? In the first step we only multiply the ones. What is 4 groups of 7" 28 "Can 28 be regrouped?" yes; 2 tens and 8 ones Show how to record this, including writing the 2 tens, the 20, above the 8 tens.
- **MP6 Attend to Precision:** Do not say, "Put down an 8 and carry the 2." This does not relate to place value. "There are 8 ones and 2 groups of 10."
- Continue the problem, referring to the arrows. "What is 4 × 8 tens?" 32 tens "Remember we had 2 groups of 10 when we regrouped the 10 ones. So 32 tens plus 2 tens is 34 tens" Show how to record this. Point to the first partial protect. "4 times 87 is 348"
- Move to step 2. "Now we will multiply 6 tens (60) times 7 ones. What is the answer?" 42 tens or 420 Regroup as 4 hundreds and 2 tens. Show how to record the 2 tens (20) under the 348, and record the regrouped 4 hundreds over the 8 (cross out the 2 tens as it is not part of this calculation). "Next, we multiply 6 tens times 80." Add the regrouped 4 hundreds. Show how to record the 52 hundreds.
- **Teaching Tip:** Continue to refer to the area model to help students make sense of how pairs of partial products are being added. The regrouping is needed in order to add the pair of partial products.
- Use guided instruction as students work on Exercises 1–3. Work for Exercise 1 was done during the Dig In. Have students draw an area model for Exercises 2 and 3 to help develop conceptual understanding of the regrouping process.
- "You are learning to record your thinking with a multiplication problem just as you did when you learned to add and subtract. How secure are you are in finding the partial products?" Encourage students to focus on the process. Recording their thinking will develop in time.

Laurie's Notes

Meeting the needs of all learners.

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are asked to multiply two-digit numbers. They use partial products with regrouping. An estimate is computed first. Are students making sense of the process, or are they thinking only in terms of rules? Are they able to explain what the efficient process means? Some students may not be ready to record in the standard format what is happening in the multiplication process. If students are only comfortable with writing the partial products, do not rush them. You do not want them to practice an algorithm that is not making sense to them yet.

EMERGING students may not be ready to record the partial products with regrouping, or they may begin the process, but need support for step 2. They may continue to be comfortable with using an area model to find the product. If they are arriving at a correct product, do not rush the vertical structure with regrouping.

- **Exercises 4–9:** Encourage students to use regrouping to practice, but they may use any strategy that makes sense to them to find the product. You want to help them move to the next level of understanding. Exercises 4 and 5 were done in the Dig In.
- **Common Error:** In all of the problems, if students do not understand place value, they will make the common error shown. The value of the 4 is 4 tens or 40.

$$\begin{array}{r} 12 \\ \times\ 43 \\ \hline 36 \\ 48 \\ \hline 84 \end{array}$$

PROFICIENT students are making sense of how to record partial products with regrouping. They may make occasional computation errors.

- **Exercise 11:** Reading quickly, this problem may appear correct. Have students copy and complete the problem to the right so they may compare side by side to find the error.
- **Exercise 12:** Provide a set of cards 1–9 for students to manipulate as they explore this problem.

Additional Support

- Provide base ten blocks and blank paper for drawing area models. It is important that students make sense of the process. Adjust the factors so that students are successful in understanding the process first, then increase the factors.

Extension: Adding Rigor

- Refer to Exercise 12. How many different sets of factors can you find? Also, choose other "goal" numbers for students to explore.

Laurie's Notes

ELL Support

Read each problem aloud as students follow along. Clarify unknown vocabulary and explain unfamiliar references. You may want to discuss the planets and types of sharks. Allow students to work in pairs and provide time to complete each exercise. Ask the questions presented and have pairs write their answers on a whiteboard to hold up for your review or indicate *yes* or *no* with a thumbs up or down signal.

Think and Grow: Modeling Real Life

The application example allows students to show their understanding of multiplying two-digit numbers. The story problems include the use of comparison language.

- ? "Do you know how many hours are in one full day on earth?" 24 "Do you know what a day is describing? What is happening on the planet?" A day is one full rotation of the planet. Earth takes 24 hours to rotate one time. Demonstrate with a globe, or a ball.
- "Read the problem. Underline what you know and circle what you are trying to find out." Model so that students are not underlining every word. These are very language-rich problems. You and students should read the problem more than once.
- "What do we know?" Have students write the information they know next to the planet photos. Write 16 hours next to Neptune. Write 5,832 hours next to Venus. Discuss what this means. Venus rotates very slowly!
- ? "Do we know how many hours there are in a day on Mercury?" No; we know there are 88 times as many hours in 1 day on Mercury as one day on Neptune. "What can we write by Mercury?" 88×16
- Exercise 13 is modeled after the example. Again, students should read carefully, underline, label what they know, and at the end, be sure they have answered the actual question.
- Take time for different approaches to be shared for several of the problems. It is important for students to develop confidence in explaining their thinking to peers.
- "Our learning target today was to multiply two-digit numbers. There are different strategies that can be used to find the product. You may be confident in using base ten blocks to find the product. You may be confident using an area model. You may be confident using partial products. You may be confident in the new strategy we tried today with showing the regrouping. I am confident that all of you will learn to multiply correctly. We will continue to practice and learn new strategies."
- **Supporting Learners:** Are there multiplication facts that students are not fluent with? These facts need to be learned so that the lack of fluency does not prevent them from progressing with multi-digit multiplication.

Closure

- **Turn and Talk:** "Tell your partner which strategy you are feeling most confident with. Explain."

Conceptual Development

The fair-share concept is the primary method used in this chapter to develop an understanding of the standard division algorithm. This must be built upon by many experiences connected to division facts, place value, estimation, meaning of remainders, and partial quotients.

The chapter begins with using place value and basic division facts to divide tens, hundreds, and thousands by a one-digit number. To find $270 \div 9$, we write 270 as 27 tens and use the division fact $27 \div 9 = 3$. We reason, 27 tens shared equally in 9 groups is 3 tens, which is 30. We can show this with base ten blocks or a tape diagram. If the dividend is not a known division fact, such as $154 \div 4$, we use compatible numbers to estimate the quotient.

Remainders are introduced using dividends less than 100. This allows students to model the problem using objects, counters, or base ten blocks. It is important for students to make sense of what $12 \div 5$ means, using both the fair-share method and the measurement method.

Students will use partial quotients, with and without remainders, to develop a written record of a division problem. A connection is made to area models used in multiplication. It is helpful to have a context to give meaning to the thought process. In this problem it might be how many five-person teams can be made given 235 people. A student might guess there are at least 20 five-person teams. Knowing $5 \times 20 = 100$, there are still 135 people remaining. Another 20 five-person teams are formed, which leaves 35 people. Finally, 7 more five-person teams are formed. The partial quotients are summed and the quotient means 47 five-person teams are possible. This problem can be represented using the area model shown.

One Way: Partial Quotients

$$\begin{array}{rlr}
5\overline{)235} & & \\
-100 & = 5 \times 20 & 20 \\
\hline
135 & & \\
-100 & = 5 \times 20 & 20 \\
\hline
35 & & \\
-35 & = 5 \times 7 & +\ 7 \\
\hline
0 & & \boxed{}
\end{array}$$

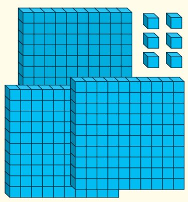
Students need time to use models, sketches, and their own language to represent their thinking. Even when the standard algorithm is introduced, you will have students who are only comfortable with recording partial quotients. Support these students by connecting the physical model and the vertical form to the standard algorithm.

	20	20	7
5	100	100	35

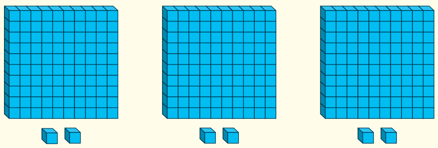
Area = 235 square units

In the last few lessons of the chapter, the problems include zeros in the quotient or dividend. Regrouping thousands, hundreds, or tens is necessary, and attention to place value is important. Again, base ten blocks are used to help students develop a conceptual understanding of how to record their thinking using the standard algorithm.

Find $306 \div 3$.



Model 306



Fair-share 306 in 3 groups

hundreds
ones

$$\begin{array}{rl}
102 & \\
3\overline{)306} & \\
\underline{3} & \text{3 hundreds} \\
006 & \\
\underline{-6} & \text{6 ones} \\
0 &
\end{array}$$

5.5

Laurie's Notes

Check out the Dynamic Classroom.
BigIdeasMath.com

COMMON CORE STATE STANDARDS
4.NBT.B.6

Learning Target

Use partial quotients to divide and find remainders.

Success Criteria

- Use partial quotients to divide.
- Find a remainder.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com*.

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Review the meaning of the word *partial*. If students have difficulty, write it on the board and underline *part*. Explain that something that is partial is part of a whole.

Preparing to Teach

Partial quotients that lead to the standard algorithm were introduced in the last lesson. It is likely that students are still making sense of how to record their thinking. Do not rush this lesson! Support students with base ten blocks and by posing a context that helps them put meaning to the model and how they are representing the work. They use partial quotients again, only in this lesson there are remainders. We continue to record partial quotients to the right and support with an area model.

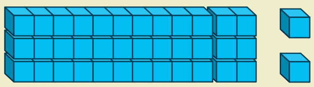
Materials

- base ten blocks
- whiteboards and markers

Dig In (Motivate Time)

Students use base ten blocks and practice drawing an area model for a division problem with a remainder. They recognize there are unit blocks left over that do not fit in the rectangle.

- "You have arranged base ten blocks built into a rectangle to show the relationship between multiplication and division. You also drew area models to help show partial quotients."
- ? "I want you to use base ten blocks to show how to model 38 ÷ 3. To help, think about 38 erasers that you want to share equally in 3 bags. How many erasers will be in each bag?" Students will likely make 3 groups with 12 in each group. There are 2 units remaining.
- ? **MP4 Model with Mathematics:** "How does your model answer the questions about erasers?" There are 12 erasers in each bag, but there are 2 erasers left. Students may say 38 does not divide by 3 evenly. There is a remainder.
- ? "Can you make a rectangle with the 38 base ten blocks so one dimension is 3?" Pause as students move their blocks to form the rectangle. "What are the dimensions of the rectangle you did make?" 3 units by 12 units



- Have students write on their whiteboards to show how partial quotients can be used to solve 38 ÷ 3. There is a remainder of 3.
- ◉ "We are going to do more work with partial quotients today. We will still use an area model to help us think about what partial quotients to record as we are doing the division problem."

$$38 \div 3 = \underline{\qquad}$$

$$\begin{array}{rl} 3\overline{)38} & \\ -30 & = 3 \times 10 \\ \hline 8 & \\ -6 & = 3 \times 2 \\ \hline 2 & \end{array}$$

? Teaching Prompt ◉ Learning Target

Laurie's Notes

Indicator 1e - The Teaching Edition constantly emphasizes the importance of conceptual understanding and not rushing students to formalizing the process.

ELL Support

After reviewing the example, have students work in groups to discuss and complete Exercises 1–3. Provide the following guiding questions to help student discussion: "How many times can the divisor go into the tens? Does a number need to be regrouped? How many are left? Is there a remainder?" Expect students to perform according to their language proficiency level.

Beginner students may write steps and state numbers.
Intermediate students may write, and use phrases and simple sentences to discuss.
Advanced students may use detailed sentences and help guide discussion.

Think and Grow

Getting Started

- This is the first time students see the partial quotients written above the dividend. Place value underlies the recording of partial quotients in the standard algorithm.
- It is important not to rush students into formalizing the division process. They may invent their own strategies for recording the partial quotients. The standard algorithm is not more correct than another method, though it is usually more efficient.
- Use base ten blocks to help students understand the value of the digits they are writing.

Teaching Notes

- **Suggested Context:** There are 79 runners in a race. Runners start in three staggered groups. How many runners in each group?
- **Model:** Write the problem 79 ÷ 3. Display the base ten blocks. "What is the first step if there are 79 runners and we want to put them in 3 groups?" Put 2 tens (20 runners) in each of the 3 groups. "How many tens have we used?" 6 tens (60) "Three groups of 2 tens is 6 tens." Record and explain how to record the quotient above the dividend. Refer to the diagram and place value. "What is the 1 remaining when we subtract?" one group of ten
- From the Dig In and Explore, students should understand that they need to regroup the 1 ten as 10 ones and combine with the 9 ones to make 19 ones. Finish the last step of dividing 19 by 3.
- **MP7 Look for and Make Use of Structure:** The partial quotients are recorded in a new location. Place value is used now. Instead of recording 20 + 6 on the right side of the problem, 26 is recorded above the dividend.
- Point to Newton's thought bubble. Explain how you can use multiplication to check your answers.
- "You used many skills in this problem. You divided to find the partial quotients, 20 and 6. You regrouped 1 ten as 10 ones. You used place value to record the partial quotients. Your learning is at the beginning and it's okay to be a bit confused. We will use models to help us learn."
- **Supporting Learners:** Use base ten blocks for all exercises.
- In Exercise 2, there will be a 0 (0 tens) when the first subtraction is done. The problem is not finished. There are 8 ones to divide.
- "You are dividing a two-digit number by a one-digit number. Remember to think about place value and how you have estimated quotients before. That will help you think about that first partial quotient."

Laurie's Notes

Meeting the needs of all learners.

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are asked to find the quotient of two numbers. They build on their understanding of partial quotients and use place value to record the quotient above the dividend, leading to the standard division algorithm. Regrouping one or more groups of 10 into ones may be required when all the groups of 10 cannot be evenly divided by the divisor. Are students able to state the value of each digit in a multi-digit number? Do students understand how to regroup groups of ten into ones?

EMERGING students may not be ready to record the partial quotients above the dividend. They may not be secure in their understanding of place value and may struggle with regrouping. When dividing they may use the digit and not the value of the digit (6 versus 60). Modeling the division with base ten blocks and explicitly connecting the written record to the model will help students build understanding.

- **Exercise 4:** Model using base ten blocks and connect the model to the written record. Use precise language in regard to place value. (i.e., when recording 1 above the dividend say "1 group of 10." When writing 5 below say "5 groups of 10.")
- **Exercises 5–12:** Have students work with a partner to use base ten blocks to model each division. Monitor how students are recording their work.

PROFICIENT students are secure in their understanding of place value and are able to regroup groups of 10 into ones. When dividing, they understand the value of each digit. They also are comfortable with using base ten blocks to model division and understand how to record the division.

- **Exercises 4–12:** Can students predict when the quotient will be two-digits versus one-digit?
- **Exercise 14:** Be sure students understand the value of each missing digit.

Additional Support

- Many students will not be able to transition to recording the quotient above the dividend. Do not force students to use this convention. Continue to encourage them to use base ten blocks and to record the partial quotients vertically. It is important students make sense of the standard algorithm. This cannot be rushed.

Laurie's Notes

Meeting the needs of all learners.

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students continue their work with division extending it to larger numbers that may require the regrouping of thousands into hundreds, hundreds into tens, or tens into ones. Understanding place value is crucial to understanding the recording of the division. The transition to writing the partial quotients above the dividend continues. Are students able to state the value of each digit in the quotient? Do students understand the meaning of each step in the division process?

EMERGING students may not understand how to regroup, as their understanding of place value is still not secure. When dividing they may use the digit and not the value of the digit. Writing the partial quotients above the dividend may confuse them.

- **Exercises 4–12:** Have students work with a partner to use base ten blocks to model each division. Ask them to explain to each other what is happening in each step of the process. Listen to their discussions and make sure they are using precise language in regard to place value. As you monitor their work, assess their understanding of regrouping.
- **Exercises 4–12:** Note that the divisor is less than the first digit of each dividend. Listen to how students refer to the value of the digits they are writing.

PROFICIENT students have a good understanding of place value and can easily talk about the value of each digit in the division process. They understand how to regroup thousands, hundreds, and tens. They also understand how to record the division and may not need to use the base ten blocks to model the division.

- **Exercise 14:** This exercise provides an opportunity for a rich discussion around regrouping and the meaning of each digit. Engage students in this discussion and not just a discussion of how to do the division correctly.

Additional Support

- While more students may be able to record the quotient above the dividend some are still not able to make sense of the process. Allow students to continue to use base ten blocks and to record the partial quotients vertically as needed.

Name ______________________________

Apply and Grow: Practice

Compare.

10. 6,052 ◯ 6,520

11. 891,634 ◯ 871,634

12. 28,251 ◯ 26,660

13. 324,581 ◯ 32,458

14. 230,611 ◯ 230,610

15. 909,900 ◯ 909,009

16. 7,000 + 100 + 30 + 4 ◯ 7,634

17. 100,003 ◯ ten thousand, three

18. sixteen thousand, four hundred nine ◯ 16,490

19. 400,000 + 60,000 + 1,000 + 300 + 20 + 9 ◯ 461,329

20. Two brands of televisions cost $1,598 and $1,998. Which is the lesser price?

21. DIG DEEPER! Your friend says she can tell which sum is greater without adding the numbers. How can she tell?

34,593 + 6,781

34,593 + 6,609

22. MP **Number Sense** Write all of the digits that make the number greater than 23,489 and less than 26,472.

2 ___?___ ,650

23. YOU BE THE TEACHER Your friend says 38,675 is less than 9,100 because 3 is less than 9. Is your friend correct? Explain.

Name ______________________________

Apply and Grow: Practice

Use a model to find the quotient and the remainder.

5. $13 \div 2 =$ ______ R ______

6. $25 \div 9 =$ ______ R ______

7. $28 \div 8 =$ ______ R ______

8. $15 \div 4 =$ ______ R ______

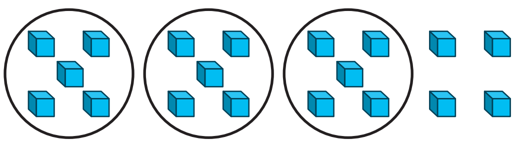
9. $29 \div 6 =$ ______ R ______

10. $11 \div 5 =$ ______ R ______

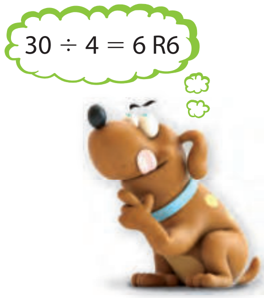
11. Descartes has 23 cat treats to divide equally among 4 friends. How many treats does he give each friend? How many treats are left over?

12. You have 26 markers. How many groups of 3 markers can you make? How many markers are left over?

13. MP **Structure** Write a division equation represented by the model.



14. **YOU BE THE TEACHER** Is Newton correct? Draw a model to support your answer.



Name ____________________

Apply and Grow: Practice

Write the product as a multiple of a unit fraction. Then find the product.

4. $5 \times \frac{2}{3}$

5. $6 \times \frac{5}{8}$

6. $9 \times \frac{7}{4}$

7. $7 \times \frac{4}{12}$

8. $\frac{9}{6} \times 8$

9. $10 \times \frac{20}{100}$

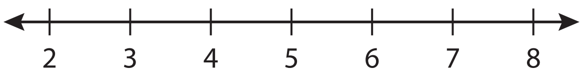
Number Sense Find the unknown number.

10. $\square \times \frac{8}{10} = \frac{16}{10}$

11. $4 \times \frac{\square}{2} = \frac{20}{2}$

12. $3 \times \frac{9}{\square} = \frac{27}{100}$

13. **Reasoning** Without calculating, would you plot the product of 5 and $\frac{3}{6}$ to the left or to the right of 5 on a number line? Explain.



Indicator 2a - In #13, students use a number line to reason and demonstrate their conceptual understanding of multiples of fractions.

14. **Patterns** Describe and complete the pattern.

Expression	Product
$3 \times \frac{1}{5}$	$\frac{3}{5}$
$3 \times \frac{2}{5}$	
$3 \times \frac{3}{5}$	
$3 \times \frac{4}{5}$	
$3 \times \frac{5}{5}$	

Name ______________________________

Apply and Grow: Practice

Find the equivalent amount of time.

5. 7 yr = _____ wk

6. 4 d = _____ min

7. 3 wk = _____ d

8. 6 h = _____ sec

9. 2 yr = _____ mo

10. 1 wk = _____ h

11. 24 h = _____ min

12. 10 yr = _____ d

13. Your friend turns 8 years old today. How many months old is your friend?

14. **Writing** Explain how you can show that 3,000 seconds is less than 1 hour.

15. MP **Structure** The number pairs describe the relationship between which two units of time? Explain.

2 and 104
3 and 156
4 and 208

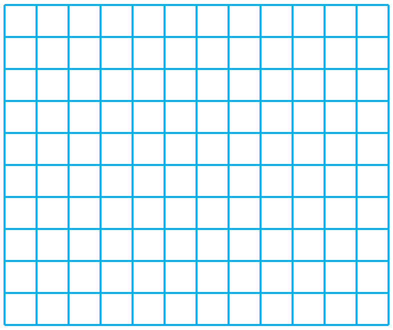
Name ______________________________

Apply and Grow: Practice

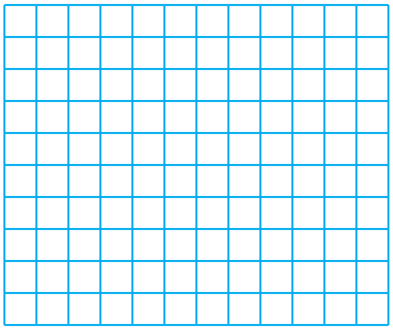
Draw and label the lines with the given description.

3. $\overleftrightarrow{MN} \perp \overleftrightarrow{PQ}$

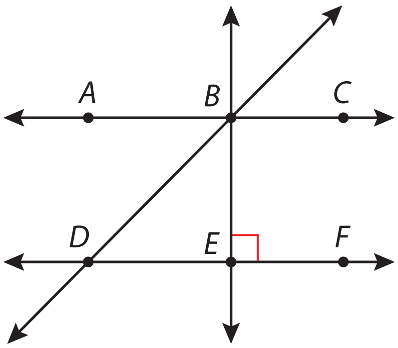
$\overleftrightarrow{MN}$ and $\overleftrightarrow{PQ}$ intersect at point *R*.



4. $\overleftrightarrow{ST}$ and $\overleftrightarrow{UV}$ intersect at point *Z*.



Use the figure.



5. Name a pair of lines that appear to be parallel.

____

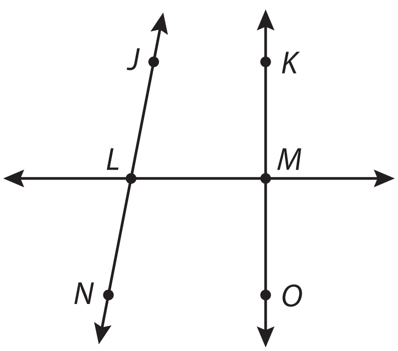
6. Name two lines that are perpendicular.

____

7. Name two intersecting lines.

8. MP **Reasoning** All perpendicular lines are also intersecting lines. Are all intersecting lines perpendicular? Explain.

9. **YOU BE THE TEACHER** Your friend says that $\overleftrightarrow{JN}$ and $\overleftrightarrow{KO}$ are parallel because they do *not* cross. Is your friend correct? Explain.

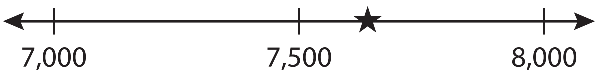


Round the number to the nearest hundred thousand.

13. 628,496

14. 90,312

15. MP **Structure** Round ★ to the nearest thousand and to the nearest ten thousand.



Nearest thousand: ______

Nearest ten thousand: ______

16. MP **Number Sense** Which numbers round to 300,000 when rounded to the nearest hundred thousand?

368,000 302,586 354,634

249,600 34,201 251,799

17. MP **Number Sense** When discussing the price of a laptop, should you round to the nearest thousand or the nearest ten? Explain.

18. **YOU BE THE TEACHER** Your friend says 5,953 rounds to 5,053 when rounded to the nearest hundred. Is your friend correct? Explain.

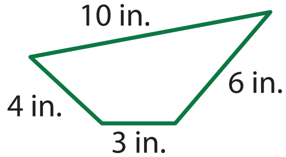
19. **Modeling Real Life** A glassblower is using a furnace to melt glass. When the furnace reaches about 2,000 degrees Fahrenheit, when rounded to the nearest hundred, she can put the glass in. At which temperatures could she put the glass into the furnace?

2005° 1899° 1925° 275° 1002°

Review & Refresh

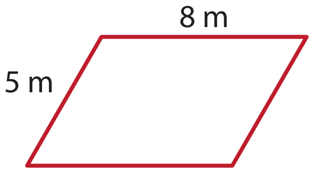
Find the perimeter of the polygon.

20.



Perimeter: ______

21. Parallelogram



Perimeter: ______

22. Square

Perimeter: ______

Find the product.

7. $\begin{array}{r} 399 \\ \times \quad 7 \\ \hline \end{array}$

8. $\begin{array}{r} 7{,}390 \\ \times \quad 4 \\ \hline \end{array}$

9. $\begin{array}{r} 9{,}286 \\ \times \quad 5 \\ \hline \end{array}$

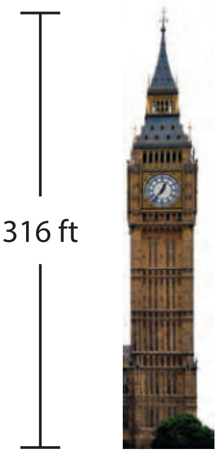
10. MP **Number Sense** Which four numbers are the partial products that you add to find the product of 3,472 and 6?

18,000	2,400	1,800
420	240	12

11. **DIG DEEPER!** The sum of a four-digit number and a one-digit number is 7,231. The product of the numbers is 28,908. What are the numbers?

Indicator 2a - In #10, students use partial products and reasoning to demonstrate their conceptual understanding of multiplication.

12. **Modeling Real Life** The height of the Eiffel Tower is 38 feet more than 3 times the height of Big Ben. What is the height of the Eiffel Tower?



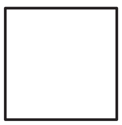
Big Ben

13. **Modeling Real Life** An animal shelter owner has 9 dogs and 4 cats ready for adoption. How much money will the owner collect when all of the animals are adopted?

Review & Refresh

Write all of the names for the quadrilateral.

14. 

15. 

List the factors of the number.

7. 25

8. 56

9. 75

10. 80

11. 93

12. 61

13. MP **Reasoning** Why does a number that has 9 as a factor also have 3 as a factor?

14. DIG DEEPER! The number below has 3 as a factor. What could the unknown digit be?

3 ____ 5

15. MP **Number Sense** Which numbers have 5 as a factor?

50 34 25 1,485 100 48

16. **Modeling Real Life** You and a partner are conducting a bottle flipping experiment. You have 3 bottles with different amounts of water in each. You need to flip each bottle 15 times. If you take turns, will you and your partner each get the same number of flips?

17. **Modeling Real Life** A florist has 55 flowers. She wants to put the same number of flowers in each vase without any left over. Should she put 2, 3, or 5 flowers in each vase? Explain.

Review & Refresh

Compare.

18. 7,914 ◯ 7,912

19. 65,901 ◯ 67,904

20. 839,275 ◯ 839,275

Write the value of the underlined digit.

13. $5.\underline{8}4$

14. $\underline{2}1.03$

15. $67.3\underline{2}$

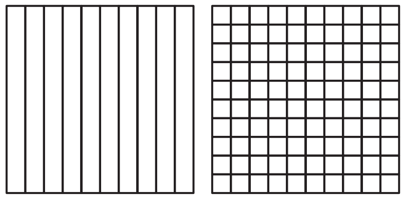
16. $\underline{5}06.19$

17. A clown has 100 balloons. She uses 56 of the balloons to make animals. What portion of the balloons does she use? Write your answer as a decimal.

18. You fill a beaker $4\frac{35}{100}$ times for an experiment. Write this number as a decimal.

19. **YOU BE THE TEACHER** Descartes writes $2\frac{40}{100}$ as 2.04. Is he correct? Explain.

20. **DIG DEEPER!** Shade each model to show 0.6 and 0.60. What do you notice?



21. **Modeling Real Life** You work on the puzzle shown. You connect 78 of the puzzle pieces. What portion of the puzzle have you completed? Write your answer as a decimal.

Review & Refresh

Divide. Then check your answer.

22. $5\overline{)1{,}308}$

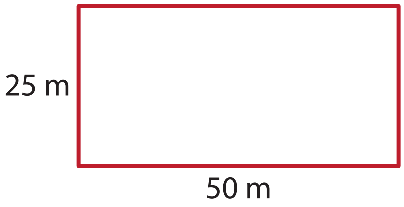
23. $4\overline{)67}$

24. $2\overline{)725}$

5. MP **Number Sense** What is the perimeter of a square tabletop with side lengths of 48 inches?

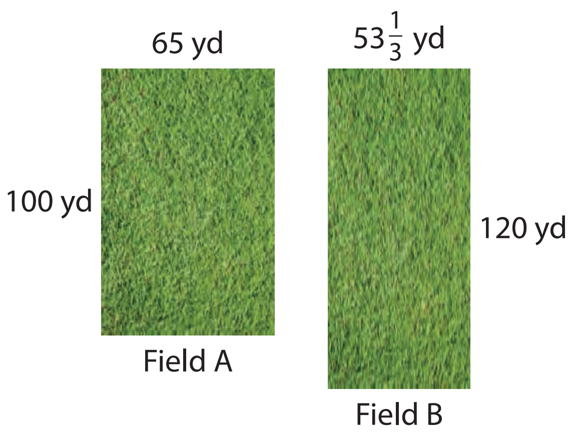
6. MP **Structure** Use the Distributive Property to write $P = (2 \times \ell) + (2 \times w)$ another way.

7. **Open-Ended** Draw a rectangle that has the same perimeter as the one shown, but different dimensions.



8. **Modeling Real Life** A worker places tape around a rectangular shipping label that is 2 times longer than it is wide. How much tape does the worker need?

9. **Modeling Real Life** A coach is painting lines around the perimeter of two rectangular fields. Which field requires more paint?



Review & Refresh

Write the first six numbers in the pattern. Then describe another feature of the pattern.

10. Rule: Subtract 11.
First number: 99

11. Rule: Multiply by 5.
First number: 5

Think and Grow: Modeling Real Life

Example An aquarium has 7 bottlenose dolphins. Each dolphin eats 60 pounds of fish each day. The aquarium has 510 pounds of fish. Does the aquarium have enough fish to feed the dolphins?

Think: What do you know? What do you need to find? How will you solve?

Step 1: How many pounds of fish do all of the dolphins eat?

$$7 \times 60 = \_\_\_\_\_$$

All of the dolphins eat _____ pounds of fish.

Step 2: Compare the number of pounds of fish all of the dolphins eat to the number of pounds of fish the aquarium has.

The aquarium ______________ have enough fish to feed the dolphins.

Show and Grow *I can think deeper!*

26. Students want to make 400 dream catchers for a craft fair. Each dream catcher needs 8 feathers. The students have 3,100 feathers. Do the students have enough feathers for all of the dream catchers?

27. A principal has 3 rolls of 800 raffle tickets each and 5 rolls of 9,000 raffle tickets each. How many raffle tickets does the principal have?

28. You have 2 sheets of 4 stickers each. Your friend has 20 times as many stickers as you. Your teacher has 700 times as many stickers as you. How many stickers do the three of you have in all?

Think and Grow: Modeling Real Life

Daily Sleep Totals	
Koala	★ ★ ★ ★ ★ ⯪
Python	★ ★ ★ ★ ⯪
Tiger	★ ★ ★ ★

Each ★ = 4 hours.

Example How many hours does a koala sleep in 2 weeks?

Find how many hours a koala sleeps each day.

5 ★s = 5 × _____ = _____

1 ⯪ = _____

_____ + _____ = _____

A koala sleeps _____ hours each day.

Multiply to find how many hours a koala sleeps in 2 weeks.

$$\begin{array}{r} 22 \\ \times\ 14 \\ \hline \end{array}$$

A koala sleeps _____ hours in 2 weeks.

Show and Grow *I can think deeper!*

13. Use the table above. How many hours does a python sleep in 3 weeks?

Seeds in Each Packet	
Cauliflower	
Pumpkin	
Cucumber	
Pea	

Each  = 12 seeds.

14. You have 12 packets of pea seeds and 23 packets of cucumber seeds. How many fewer pea seeds do you have than cucumber seeds?

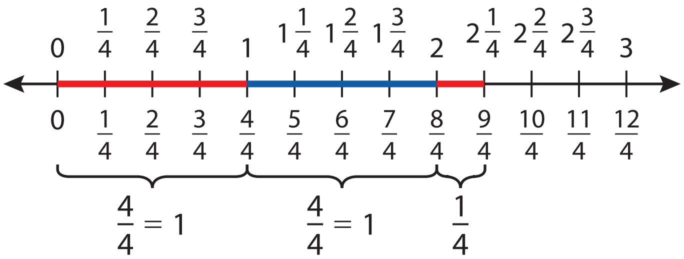
Indicator 2c - #14 is non-routine because students must first interpret the picture graph and use the scale to find the number of pea seeds and the number of cucumber seeds in each packet. Then they find how many pea seeds and cucumber seeds there are in the given numbers of packets. Finally, they find how many fewer pea seeds there are to answer the question.

Think and Grow: Modeling Real Life

Example A construction worker needs nails that are $\frac{9}{4}$ inches long. Which size of nails should the worker use?

Write $\frac{9}{4}$ as a mixed number.

$$\frac{9}{4} = \frac{4}{4} + \frac{4}{4} + \frac{1}{4}$$
$$= 1 + 1 + \frac{1}{4}$$
$$= 2 + \frac{1}{4}$$
$$= \square\frac{\square}{\square}$$



So, the construction worker should use the nails that are $\square\frac{\square}{\square}$ inches long.

Show and Grow *I can think deeper!*

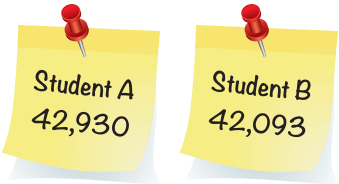
22. You need screws that are $\frac{13}{8}$ inches long to build a birdhouse. Which size of screws should you use?

23. You and your friend each measure the distance between two bean bag toss boards. You record the distance as $3\frac{3}{5}$ meters. Your friend records the distance as $\frac{18}{5}$ meters. Did you and your friend record the same distance? Explain.

24. **DIG DEEPER!** You use a $\frac{1}{3}$-cup scoop to measure $3\frac{1}{3}$ cups of rice. How many times do you fill the scoop?

25. **DIG DEEPER!** A sunflower plant is $\frac{127}{10}$ centimeters tall. A snapdragon plant is $8\frac{9}{10}$ centimeters tall. Which plant is taller? Explain.

4. MP **Reasoning** Your teacher asks the class to write forty-two thousand, ninety-three in standard form. Which student wrote the correct number? What mistake did the other student make?



5. MP **Logic** What is the number?

The number has two periods. The thousands period is written as six hundred eight thousand in word form. The ones period is written as 600 + 80 in expanded form.

6. **Modeling Real Life** Use the table to write the number in standard form, word form, and expanded form.

Braille Numbers									
1	2	3	4	5	6	7	8	9	0
⠁	⠃	⠉	⠙	⠑	⠋	⠛	⠓	⠊	⠚

⠓ ⠚ ⠋ ⠉ ⠚

Indicator 2c - #6 is non-routine because students must first use the table to convert the braille numbers to numerals. Then they must write the number in standard form, word form, and expanded form to answer the question.

7. **Modeling Real Life** Use the number 3,000 + 70 + 1 t

Review & Refresh

Compare.

8. $\frac{1}{6} \bigcirc \frac{2}{6}$

9. $\frac{2}{2} \bigcirc \frac{2}{3}$

10. $\frac{1}{2} \bigcirc \frac{3}{4}$

11. $\frac{1}{4} \bigcirc \frac{2}{8}$

3. A teacher has 68 students take a 25-question test. The teacher checks the answers for 9 of the tests. How many answers does the teacher have left to check?

4. Each day, a cyclist bikes uphill for 17 miles and downhill for 18 miles. She drinks 32 fluid ounces of water after each bike ride. How many miles does the cyclist bike in 2 weeks?

5. MP **Precision** Which expressions can be used to solve the problem?

Twelve friends play a game that has 308 cards. Each player receives 16 cards. How many cards are left?

$(308 - 12) \times 16$ $\qquad$ $308 - (16 \times 12)$

$308 - (12 \times 16)$ $\qquad$ $(308 - 16) - 12$

6. **Modeling Real Life** A child ticket costs \$14 less than an adult ticket. What is the total ticket cost for 18 adults and 37 children?

7. **Modeling Real Life** An artist creates a pattern by alternating square and rectangular tiles. The pattern has 14 square tiles and 13 rectangular tiles. How long is the pattern?

8. **Modeling Real Life** A cargo ship has 34 rows of crates. Each row has 16 stacks of crates. There are 5 crates in each stack. The ship workers unload 862 crates. How many crates are still on the ship?

Review & Refresh

Estimate the product.

9. 4×85 $\qquad$ **10.** 6×705 $\qquad$ **11.** $8 \times 7,923$

Open-Ended Use the rule to generate a pattern of four numbers.

5. Rule: Divide by 5.

6. Rule: Add 8.

7. Rule: Multiply by 9.

8. Rule: Subtract 3.

9. MP **Structure** List the first ten multiples of 9. What patterns do you notice with the digits in the ones place? in the tens place?

Does this pattern continue beyond the tenth number in the pattern?

10. **Modeling Real Life** It takes the moon about 28 days to orbit Earth. How many times will the moon orbit Earth in 1 year?

11. DIG DEEPER! In each level of a video game, you can earn up to 10 points and lose up to 3 points. Your friend earns 9 points in the first level. If he earns and loses the maximum number of points each level, how many total points will he have after level 6?

Review & Refresh

Find the product.

12. $14 \times 23 =$ ______

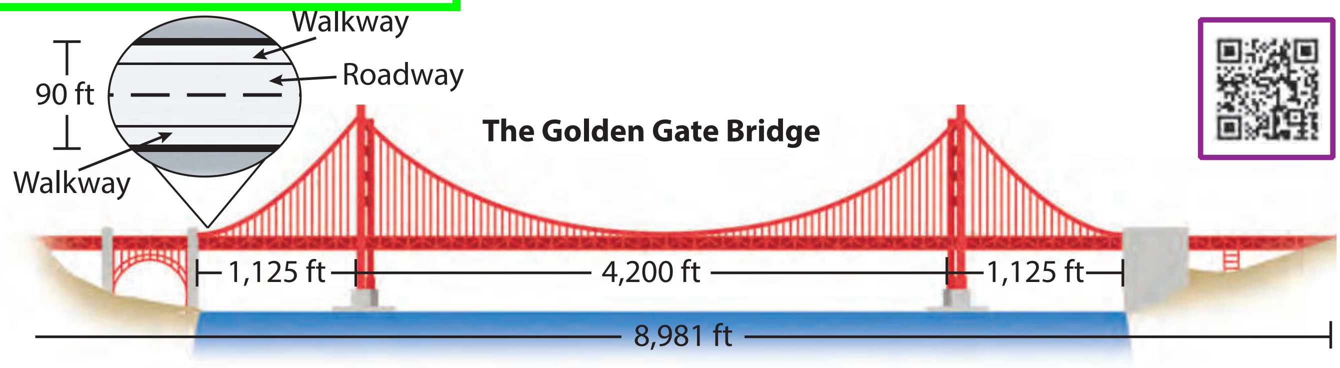
13. $48 \times 60 =$ ______

14. $55 \times 31 =$ ______

Name ____________________

1-3 STEAM Performance Task

Indicator 2c - #1a is non-routine because students must make sense of a complex diagram and description to determine how to calculate the width.



A teacher visits the Golden Gate Bridge in San Francisco, California.

1. Use the figure above to answer the questions.

a. The roadway is 8 times as wide as width of both walkways combined. Each walkway has the same width. How wide is one of the walkways?

b. What is the length of the bridge that is suspended above the water?

c. What is the length of the bridge that is *not* suspended above the water?

2. The teacher wants to estimate the distance between the bridge and the water.

a. He rides in a ferry boat under the bridge. He says that the distance between the bridge and the water is about 5 times the height of the ferry boat. What is the distance between the bridge and the water?

b. The teacher estimates that the height of one tower is about three times the distance between the bridge and the water. What is the teacher's estimate for the height of the tower?

c. You learn the exact height of the tower is 86 feet taller than the teacher's estimate. How tall is the tower?

Name ______________________________

Performance Task 5

The students in fourth grade go on a field trip to a planetarium.

1. The teachers have $760 to buy all of the tickets for the teachers and students. They receive less than $6 in change.

a. Each ticket costs $6. How many tickets do the teachers buy?

b. Exactly how much money is left over?

c. There are 6 groups on the field trip. Each group has 1 teacher. There are an equal number of students in each group. How many students are in each group?

d. Two groups can be in the planetarium for each show. The planetarium has 7 rows of seats with 8 seats in each row. How many seats are empty during each show?

2. The groups will be at the planetarium from 11:00 A.M. until 2:30 P.M. During that time they will rotate through 7 events: the planetarium show, 5 activities, and lunch. The planetarium show lasts 45 minutes. Each activity lasts 22 minutes. Students have 5 minutes between each event. How long does each group have to eat lunch?

3. You learn that the distance around Mars is about twice the distance around the moon. The distance around Mars is 13,263 miles. To find the distance around the moon, do you think an estimate or an exact answer is needed? Explain.

Name ______________________________________

STEAM Performance Task 1–11

An electrical circuit is a pathway of wires that electricity can flow through. Many homes have an electrical panel that provides power to electrical circuits. The circuits are connected to electrical outlets throughout the home.

1. *Watts* are the measure of how much power a circuit can provide. Every electrical current has two components: volts and amps.

$$\text{Watts} = \text{volts} \times \text{amps}$$

a. For a wire that carries 120 volts and 20 amps, how many watts of power are available?

b. For a wire that carries 240 volts and 15 amps, how many watts of power are available?

2. An electrician checks the circuits in your house.

a. One of the circuits has a maximum capacity of 15 amps. The electrician recommends that you only use $\frac{4}{5}$ of the total amps on the circuit. How many amps should be used?

b. The wire from this 15-amp circuit carries 120 volts. How many watts should be used on this circuit?

Appliance	Watts
Refrigerator	750
Blender	500
Toaster	900
Microwave	1,200
Space heater	1,500
Waffle iron	1,000

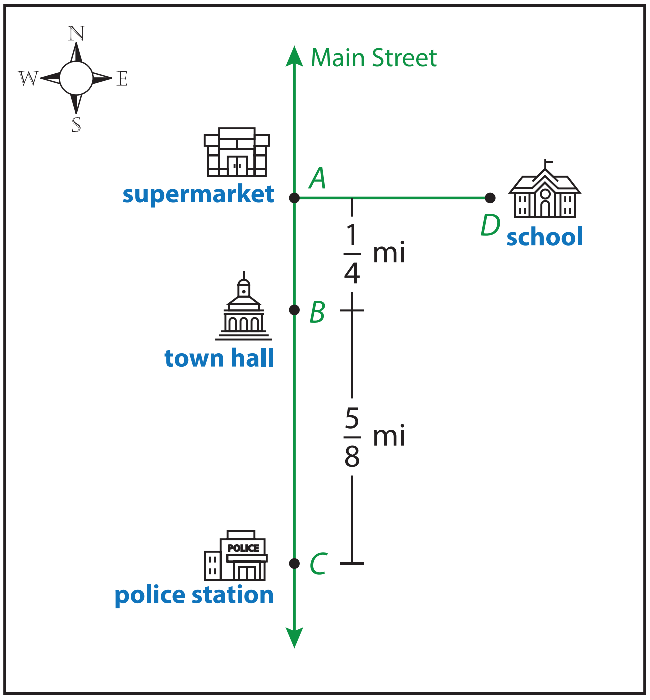
c. Your toaster is plugged in to the 15-amp circuit. Use the table to find another appliance that can be used on the same circuit and stay within the recommended amount of amps.

d. Can you run the microwave and the refrigerator on the 15-amp circuit? Explain.

Name ______________________________

Performance Task 13

A rural town is expanding and needs to plan the construction of new roads.



1. What is another name for Main Street?

2. Use the directions to complete the map.

a. Draw $\overleftrightarrow{BD}$ and label it with a street name of your choice.

b. The library will be at point *E* on $\overleftrightarrow{BD}$ and on the other side of Main Street as the school. Plot and label the library at point *E*.

c. Draw a new road through point *E* that is perpendicular to Main Street. Label it with a street name of your choice.

3. City planners want to construct a new residential neighborhood southeast of the town hall.

a. The measure of $\angle ABD$ is $\frac{1}{6}$ of 360°. What is the measure of the angle?

b. Classify $\angle DBC$. What is its measure?

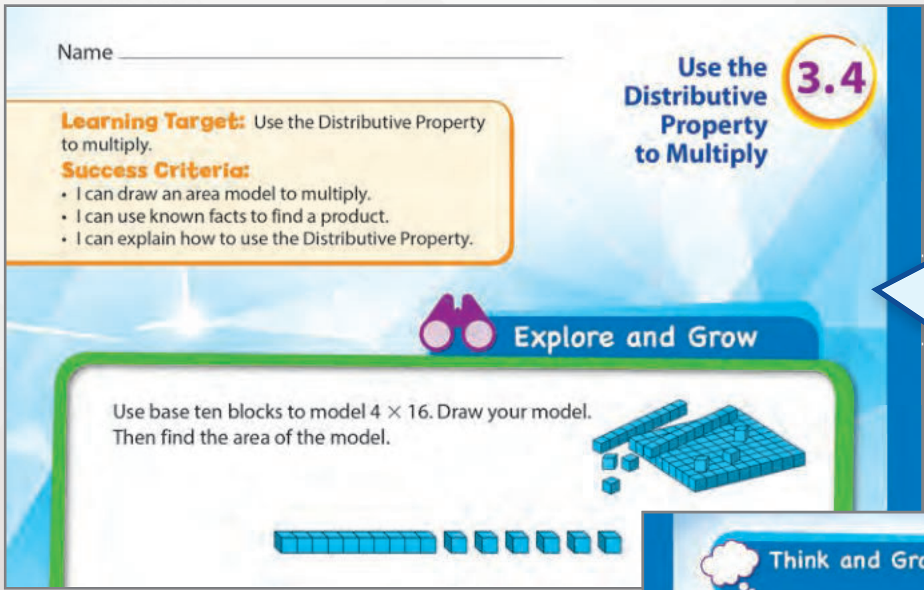
c. Draw a road from point *B* to the new neighborhood. The road divides $\angle DBC$ exactly in half.

4. Is the distance between the supermarket and the police station more than or less than a mile? Explain.

Professional Development

Indicator 2d - The front matter provides detail on the program philosophy concerning rigor through conceptual understanding, procedural fluency, and application.

Rigorous by Design



Name

Use the Distributive Property to Multiply 3.4

Learning Target: Use the Distributive Property to multiply.

Success Criteria:

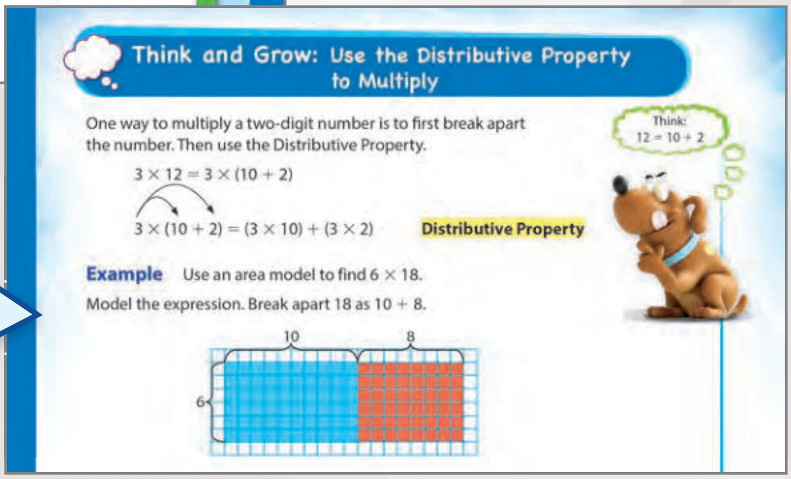
- I can draw an area model to multiply.
- I can use known facts to find a product.
- I can explain how to use the Distributive Property.

Explore and Grow

Use base ten blocks to model 4 × 16. Draw your model. Then find the area of the model.

Conceptual Understanding

Explore and Grows give students a hands-on approach to develop conceptual understanding.



Think and Grow: Use the Distributive Property to Multiply

One way to multiply a two-digit number is to first break apart the number. Then use the Distributive Property.

Think: 12 = 10 + 2

$3 \times 12 = 3 \times (10 + 2)$

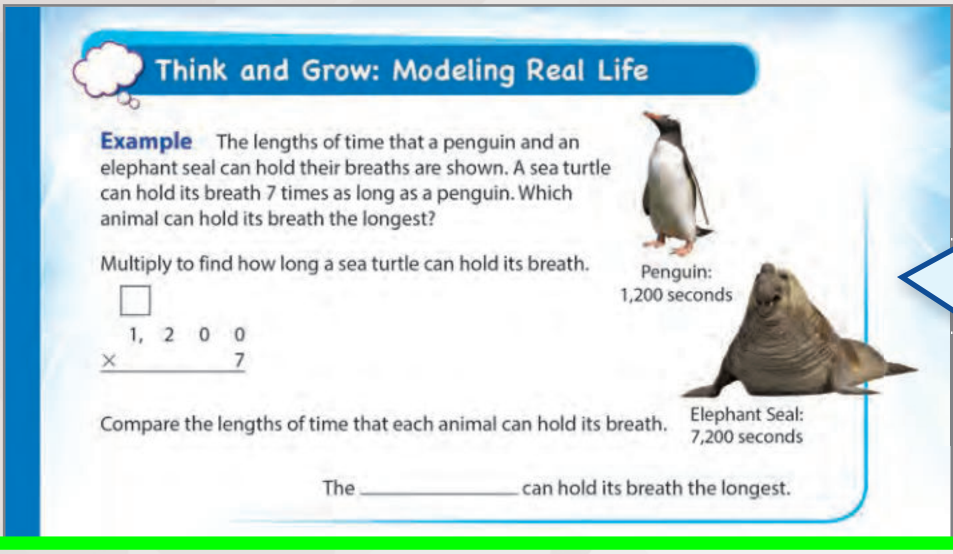
$3 \times (10 + 2) = (3 \times 10) + (3 \times 2)$ **Distributive Property**

Example Use an area model to find 6 × 18.

Model the expression. Break apart 18 as 10 + 8.

Procedural Fluency

Think and Grows follow a gradual release model and give teachers opportunities for flexible instruction, providing opportunities for all levels of learners to attain procedural fluency.



Think and Grow: Modeling Real Life

Example The lengths of time that a penguin and an elephant seal can hold their breaths are shown. A sea turtle can hold its breath 7 times as long as a penguin. Which animal can hold its breath the longest?

Multiply to find how long a sea turtle can hold its breath.

$$\begin{array}{r} 1,\ 2\ 0\ 0 \\ \times \quad\quad 7 \\ \hline \end{array}$$

Compare the lengths of time that each animal can hold its breath.

The ________ can hold its breath the longest.

Application

Think and Grow: Modeling Real Life brings problem solving into the classroom, promoting application of concepts and skills and reaching higher levels of DOK.

Think and Grow: Practice Multiplication Strategies

Example Find 62×40.

One Way: Use place value.

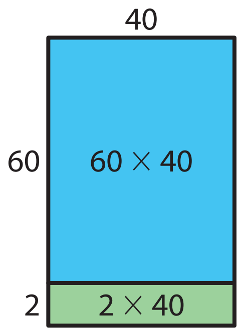
$62 \times 40 = 62 \times$ ____ tens

$=$ ____ tens

$=$ ____

So, $62 \times 40 =$ ____.

Another Way: Use an area model and partial products.



Add the partial products.

$$\begin{array}{r} \boxed{} \\ + \boxed{} \\ \hline \underline{} \end{array}$$

So, $62 \times 40 =$ ____.

Example Find 56×83.

One Way: Use place value and partial products.

$$\begin{array}{rl} 56 & \\ \times\ 83 & \\ \hline \boxed{} & 80 \times 50 \\ \boxed{} & 80 \times 6 \\ \boxed{} & 3 \times 50 \\ + \boxed{} & 3 \times 6 \\ \hline \boxed{} & \end{array}$$

So, $56 \times 83 =$ ____.

Another Way: Use regrouping.

Multiply 56 by 3 ones. Then multiply 56 by 8 tens. Regroup if necessary.

$$\begin{array}{r} \boxed{} \\ \boxed{} \\ 5\ \ 6 \\ \times\ 8\ \ 3 \\ \hline \end{array}$$

So, $56 \times 83 =$ ____.

Show and Grow I can do it!

Find the product.

1. $90 \times 37 =$ ____

2. $78 \times 21 =$ ____

3. $14 \times 49 =$ ____

Think and Grow: Use Partial Quotients to Divide

To divide using **partial quotients**, subtract a multiple of the divisor that is less than the dividend. Continue to subtract multiples until the remainder is less than the divisor. The factors that are multiplied by the divisor are called partial quotients. Their sum is the quotient.

Example Use an area model and partial quotients to find $235 \div 5$.

One Way:

Partial Quotients

$$\begin{array}{rlr}
5\overline{)235} & & \\
-\ 100 & = 5 \times 20 & 20 \\
\hline
135 & & \\
-\ 100 & = 5 \times 20 & 20 \\
\hline
35 & & \\
-\ 35 & = 5 \times 7 & +\ 7 \\
\hline
0 & & \boxed{}
\end{array}$$

So, $235 \div 5 =$ ______.

	20	20	7
5	100	100	35

Area = 235 square units

Another Way:

Partial Quotients

$$\begin{array}{rlr}
5\overline{)235} & & \\
-\ 200 & = 5 \times 40 & 40 \\
\hline
35 & & \\
-\ 35 & = 5 \times 7 & +\ 7 \\
\hline
0 & & \boxed{}
\end{array}$$

So, $235 \div 5 =$ ______.

	40	7
5	200	35

Area = 235 square units

Show and Grow *I can do it!*

Use an area model and partial quotients to divide.

1. $60 \div 4 =$ ______

$$\begin{array}{rlr}
4\overline{)60} & & \boxed{} \\
-\ 40 & = 4 \times ____ & \\
\hline
\boxed{} & & \\
-\ 20 & = 4 \times ____ & +\ \boxed{} \\
\hline
\boxed{} & & \boxed{}
\end{array}$$

	____	____
4	40	20

2. $192 \div 3 =$ ______

$$\begin{array}{rlr}
3\overline{)192} & & \boxed{} \\
-\ \boxed{} & = 3 \times ____ & \\
\hline
\boxed{} & & \\
-\ \boxed{} & = 3 \times ____ & +\ \boxed{} \\
\hline
\boxed{} & & \boxed{}
\end{array}$$

	____	____
3	180	____

Think and Grow: Multiply to Find Equivalent Fractions

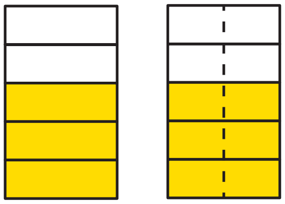
You can find an equivalent fraction by multiplying the numerator and the denominator by the same number.

$$\frac{1}{2} = \frac{1 \times 3}{2 \times 3} = \frac{3}{6}$$

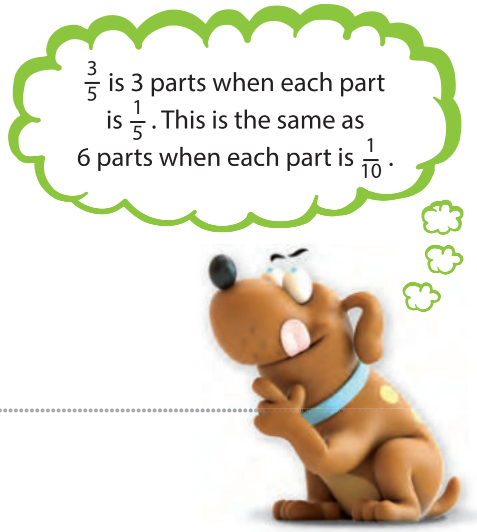
Example Find an equivalent fraction for $\frac{3}{5}$.

Multiply the numerator and the denominator by 2.

$$\frac{3}{5} = \frac{3 \times 2}{5 \times 2} = \frac{\square}{\square}$$



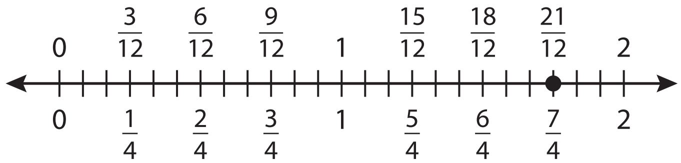
$\frac{\square}{\square}$ is equivalent to $\frac{3}{5}$.



Example Find an equivalent fraction for $\frac{7}{4}$.

Multiply the numerator and the denominator by 3.

$$\frac{7}{4} = \frac{7 \times 3}{4 \times 3} = \frac{\square}{\square}$$



$\frac{\square}{\square}$ is equivalent to $\frac{7}{4}$.

Show and Grow I can do it!

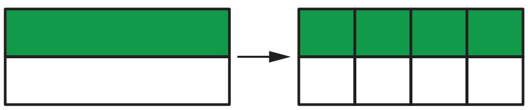
Find an equivalent fraction.

1. $\frac{5}{6} = \frac{5 \times \square}{6 \times \square} = \frac{\square}{\square}$

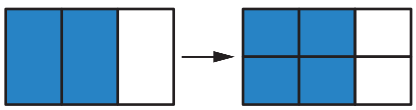
2. $\frac{8}{5} = \frac{8 \times \square}{5 \times \square} = \frac{\square}{\square}$

Find the equivalent fraction.

3. $\frac{1}{2} = \frac{\square}{8}$



4. $\frac{2}{3} = \frac{\square}{6}$

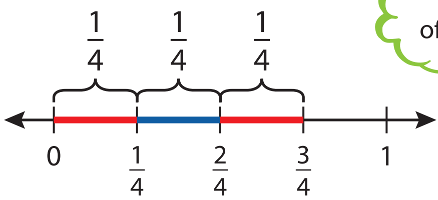


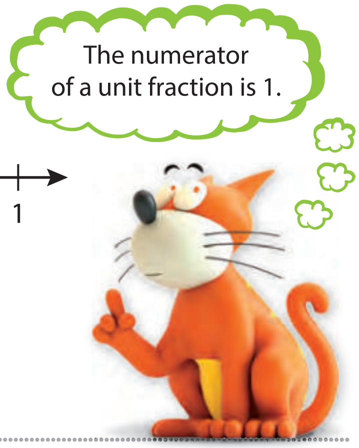
Think and Grow: Decompose Fractions

A **unit fraction** represents one equal part of a whole.
You can write a fraction as a sum of unit fractions.

Example Write $\frac{3}{4}$ as a sum of unit fractions.

The fraction $\frac{3}{4}$ represents 3 parts that are each $\frac{1}{4}$ of the whole.





So, $\frac{3}{4} = \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square}$.

Example Write $\frac{5}{12}$ as a sum of fractions.

One Way: Write $\frac{5}{12}$ as a sum of unit fractions.

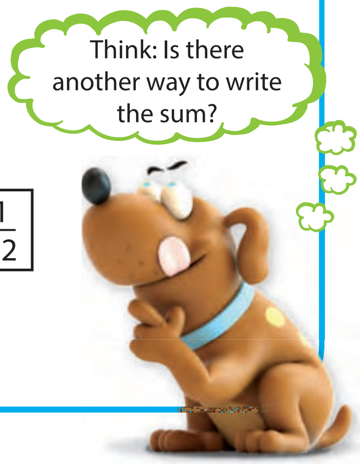
The fraction $\frac{5}{12}$ represents 5 parts that are each $\frac{1}{12}$ of the whole.

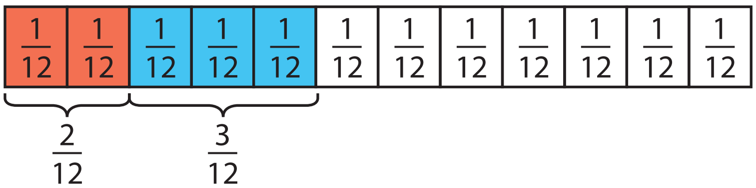
So, $\frac{5}{12} = \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square}$.

Another Way: Write $\frac{5}{12}$ as a sum of two fractions.

Break apart 5 parts of $\frac{1}{12}$ into 2 parts of $\frac{1}{12}$ and 3 parts of $\frac{1}{12}$.

So, $\frac{5}{12} = \frac{\square}{\square} + \frac{\square}{\square}$.





Show and Grow *I can do it!*

1. Write $\frac{4}{5}$ as a sum of unit fractions.

2. Write $\frac{5}{6}$ as a sum of fractions in two different ways.

Think and Grow: Add Mixed Numbers

To add mixed numbers, add the fractional parts and add the whole number parts. Another way to add mixed numbers is to rewrite each number as a fraction, then add.

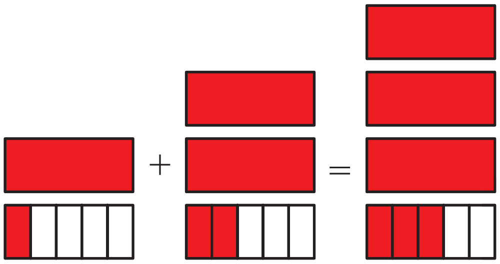
Use the Commutative and the Associative Properties to change the order and the grouping of the addends.

Example Find $1\frac{1}{5} + 2\frac{2}{5}$.

$$1\frac{1}{5} + 2\frac{2}{5} = 1 + \frac{1}{5} + 2 + \frac{2}{5}$$

$$= (1 + 2) + \left(\frac{1}{5} + \frac{2}{5}\right)$$

$$= 3 + \frac{3}{5} = \square\frac{\square}{\square}$$



So, $1\frac{1}{5} + 2\frac{2}{5} = \square\frac{\square}{\square}$.

Indicator 2d - Two aspects of rigor are shown in one example. The calculations encourage procedural fluency, while the model reinforces conceptual understanding.

Example Find $4\frac{2}{8} + 2\frac{7}{8}$.

One Way: Add the fractional parts and then add the whole number parts.

$$\begin{array}{r} 4\frac{2}{8} \\ +\ 2\frac{7}{8} \\ \hline \frac{9}{8} \end{array} \qquad \begin{array}{r} 4\frac{2}{8} \\ +\ 2\frac{7}{8} \\ \hline 6\frac{9}{8} \end{array}$$

Write $6\frac{9}{8}$ as a mixed number.

$$6\frac{9}{8} = 6 + \frac{8}{8} + \frac{1}{8} = \square\frac{\square}{\square}$$

Another Way: Write each mixed number as a fraction, then add.

$$4\frac{2}{8} = 4 + \frac{2}{8} = \frac{32}{8} + \frac{2}{8} = \frac{34}{8}$$

$$2\frac{7}{8} = 2 + \frac{7}{8} = \frac{16}{8} + \frac{7}{8} = \frac{23}{8}$$

$$\frac{34}{8} + \frac{23}{8} = \frac{57}{8}$$

Write $\frac{57}{8}$ as a mixed number.

$$\frac{57}{8} = \frac{56}{8} + \frac{1}{8} = \square\frac{\square}{\square}$$

So, $4\frac{2}{8} + 2\frac{7}{8} = \square\frac{\square}{\square}$.

Show and Grow I can do it!

Add.

1. $1\frac{2}{4} + 2\frac{1}{4} =$ _____

2. $5\frac{1}{10} + 2\frac{9}{10} =$ _____

Think and Grow: Multiples of Unit Fractions

Any fraction can be written as a multiple of a unit fraction with a like denominator.

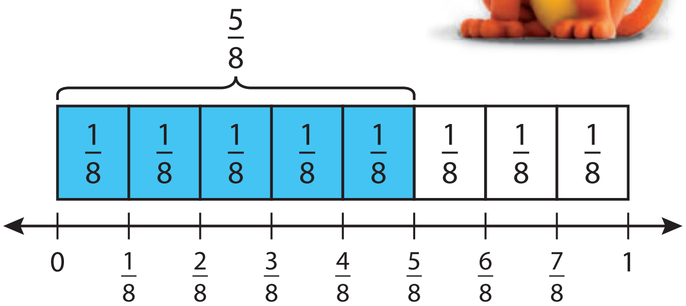
Think: $\frac{5}{8}$ is a multiple of $\frac{1}{8}$.

Example Write $\frac{5}{8}$ as a multiple of a unit fraction.

The fraction $\frac{5}{8}$ represents 5 parts that are each $\frac{1}{8}$ of the whole.

$$\frac{5}{8} = \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square}$$

$$= \underline{\qquad} \times \frac{1}{8}$$



So, $\frac{5}{8} = \underline{\qquad} \times \frac{1}{8}$.

Show and Grow *I can do it!*

Write the fraction as a multiple of a unit fraction.

1. $\frac{2}{3} = \frac{\square}{\square} + \frac{\square}{\square}$

$= \underline{\qquad} \times \frac{1}{3}$

2. $\frac{4}{8} = \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square}$

$= \underline{\qquad} \times \frac{1}{8}$

3. $\frac{6}{5}$

4. $\frac{7}{100}$

Think and Grow: Modeling Real Life

Example The attendance on the second day of a music festival is 10,013 fewer people than on the third day. How many total people attend the three-day music festival?

Day	Attendance
1	76,914
2	85,212
3	?

Think: What do you know? What do you need to find? How will you solve?

Step 1: How many people attend the festival on the third day?

85,212	10,013

a

a is the unknown sum.

$85{,}212 + 10{,}013 = a$

$$\begin{array}{r} 85{,}212 \\ +\ 10{,}013 \\ \hline \boxed{} \end{array}$$

$a =$ ______

Remember, you can estimate $85{,}000 + 10{,}000 = 95{,}000$ to check whether your answer is reasonable.

Step 2: Use *a* to find the total attendance for the three-day festival.

$76{,}914 + 85{,}212 + a = f$

f is the unknown sum.

$76{,}914 + 85{,}212 +$ ______ $= f$

$$\begin{array}{r} 76{,}914 \\ 85{,}212 \\ +\ \boxed{} \\ \hline \boxed{} \end{array}$$

$f =$ ______

You can estimate $80{,}000 + 90{,}000 + 100{,}000 = 270{,}000$ to check whether your answer is reasonable.

______ total people attend the music festival.

Show and Grow *I can think deeper!*

8. A construction company uses 3,239 more bricks to construct Building 1 than Building 2. How many bricks does the company use to construct all three buildings?

Building	Bricks Used
1	11,415
2	?
3	16,352

Think and Grow: Modeling Real Life

Example You perform a science experiment and use 4 times as much hydrogen peroxide as water. You use a total of 10 tablespoons of liquid. How many tablespoons of hydrogen peroxide do you use?

Draw a model.

Water: | ? |
Hydrogen peroxide: | ? | ? | ? | ? |

Total $=$ 10 tablespoons of liquid

Find the number of tablespoons of water.

The model shows ______ equal parts. There are ______ tablespoons of liquid in all.

$5 \times ? = 10$ Think: 5 times what number equals 10?

You use ______ tablespoons of water.

Find the number of tablespoons of hydrogen peroxide.

You use ______ times as much hydrogen peroxide as water.

$2 \times 4 =$ ______

So, you use ______ tablespoons of hydrogen peroxide.

Indicator 2d - Two aspects of rigor are treated together as students use models and equations (conceptual understanding) to solve a real-life problem (application).

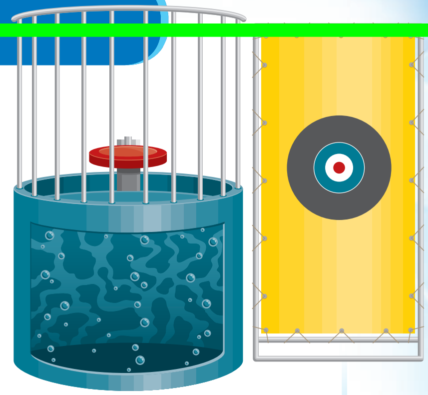
Show and Grow I can think deeper!

15. A bicycle-sharing station on Main Street has 5 times as many bicycles as a station on Park Avenue. There are 24 bicycles at the two stations. How many bicycles are at the Main Street station?

16. In the 2016 Olympics, Brazil won 6 silver medals. France won 3 times as many silver medals as Brazil. How many silver medals did France win?

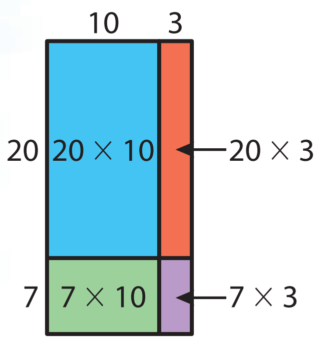
17. Of all the national flags in the world, there are 3 times as many red, white, and blue flags as there are red, white, and green flags. There are 40 flags with these color combinations. How many more flags are red, white, and blue than red, white, and green?

Think and Grow: Modeling Real Life



Example The dunk tank at a school fair needs 350 gallons of water. There are 27 students in a class. Each student pours 13 gallons of water into the tank. Is there enough water in the dunk tank?

Find how many gallons of water the students put in the dunk tank.



$$27 \times 13 = 27 \times (10 + 3)$$
$$= (27 \times 10) + (27 \times 3)$$
$$= (20 + 7) \times 10 + (20 + 7) \times 3$$
$$= (20 \times 10) + (7 \times 10) + (20 \times 3) + (7 \times 3)$$
$$= \_\_\_\_ + \_\_\_\_ + \_\_\_\_ + \_\_\_\_$$
$$= \_\_\_\_ \text{ gallons}$$

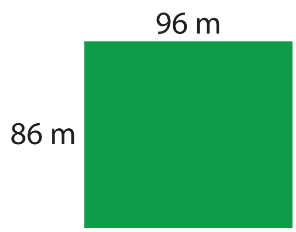
Compare the numbers of gallons.

So, there _____ enough water in the dunk tank.

Show and Grow *I can think deeper!*

8. An event coordinator orders 35 boxes of T-shirts to give away at a baseball game. There are 48 T-shirts in each box. If 2,134 fans attend the game, will each fan get a T-shirt?

9. A horse owner must provide 4,046 square meters of pasture for each horse. Is the pasture large enough for 2 horses? Explain.



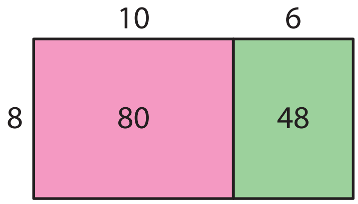
Think and Grow: Modeling Real Life

Example There are 8 students on each tug-of-war team. How many tug-of-war teams are there?

Use an area model and partial quotients to find 128 ÷ 8.

$$\begin{array}{r} 8\overline{)128} \\ -\ 80 = 8 \times 10 \\ \hline 48 \\ -\ 48 = 8 \times 6 \\ \hline 0 \end{array}$$

$\square + \square = \square$



128 ÷ 8 = ______

So, there are ______ tug-of-war teams.

Field Day Activity Sign-Ups

Activity	Number of Students
Kickball	107
Relay race	90
Tug-of-war	128
Volleyball	96
Water balloon toss	156

Show and Grow *I can think deeper!*

Use the table above.

10. There are 5 students on each relay race team. How many relay race teams are there?

11. **DIG DEEPER!** There are 6 students on each volleyball team. There are 4 fewer students on each water balloon toss team than each volleyball team. How many of each team are there?

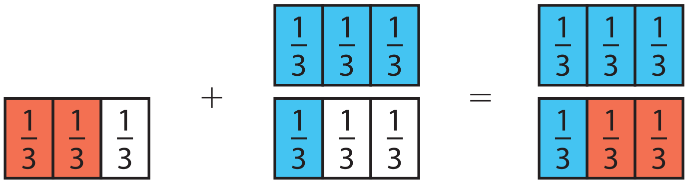
12. Twenty-eight students were absent on the day of sign-ups. They all decide to play kickball. There are 9 students on each kickball team. How many kickball teams are there?

Think and Grow: Modeling Real Life

Example You need $\frac{2}{3}$ cup of hot water and $\frac{4}{3}$ cups of cold water for a science experiment. How many cups of water do you need in all?

Because each fraction represents a part of the same whole you can join the parts.

Use a model to find $\frac{2}{3} + \frac{4}{3}$.



$\frac{2}{3}$ $\qquad$ $\frac{4}{3}$ $\qquad$ $\frac{\square}{\square} =$ ______

So, you need ______ cups of water in all.

Show and Grow *I can think deeper!*

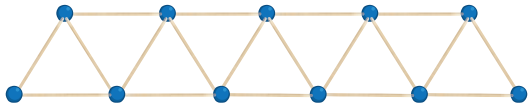
15. You cut a foam noodle for a craft. You use $\frac{2}{4}$ of the noodle for one part of the craft and $\frac{1}{4}$ of the noodle for another part. What fraction of the foam noodle do you use altogether?

16. You make a fruit drink using $\frac{4}{8}$ gallon of orange juice, $\frac{2}{8}$ gallon of mango juice, and $\frac{4}{8}$ gallon of pineapple juice. How much juice do you use in all?

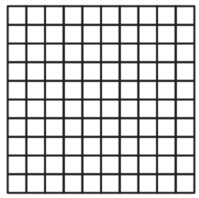
17. **DIG DEEPER!** A community plants cucumbers in $\frac{5}{12}$ of a garden, broccoli in $\frac{3}{12}$ of the garden, and carrots in $\frac{4}{12}$ of the garden. What fraction of the garden is planted with green vegetables?

Think and Grow: Modeling Real Life

Example You use 51 toothpicks to make a bridge. What portion of the container of toothpicks do you use to make the bridge? Write your answer as a decimal.



Draw a model to represent the container of toothpicks. Shade the same number of parts as the number of toothpicks you use to make the bridge.



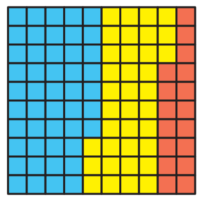
Write the decimal shown by the model.

You use ______ of the container of toothpicks to make the bridge.

Show and Grow *I can think deeper!*

14. A book fair has 100 books. 60 of the books are chapter books. What portion of the books in the book fair are chapter books? Write your answer as a decimal.

15. The model represents the members of a marching band. What portion of the marching band plays a brass instrument? woodwind instrument? percussion instrument? Write your answers as decimals.



- brass instrument
- woodwind instrument
- percussion instrument

16. **DIG DEEPER!** What portion of Earth's surface is *not* covered by water? Write your answer as a decimal.

About $\frac{71}{100}$ of Earth's surface is covered by water.

Think and Grow: Problem Solving: Addition and Subtraction

Example You have 3,914 songs in your music library. You download 1,326 more songs. Then you delete 587 songs. How many songs do you have now?

Understand the Problem

What do you know?

- You have 3,914 songs.
- You download 1,326 more.
- You delete 587 songs.

What do you need to find?

- You need to find how many songs you have now.

Make a Plan

How will you solve?

- Add 3,914 and 1,326 to find how many songs you have after downloading some songs.
- Then subtract 587 from the sum to find how many songs you have now.

Solve

Step 1:

3,914	1,326

k

k is the unknown sum.

$$\begin{array}{r} 3{,}914 \\ +\ 1{,}326 \\ \hline \boxed{} \end{array}$$

$3{,}914 + 1{,}326 = k$

$k =$ ______

Step 2:

n	587

$k =$ ____

n is the unknown difference.

$$\begin{array}{r} \boxed{} \\ -\ \ 587 \\ \hline \boxed{} \end{array}$$

______ $- 587 = n$

$n =$ ______

You have ______ songs now.

Show and Grow I can do it!

1. Explain how you can check whether your answer above is reasonable.

Name ______________________________

Apply and Grow: Practice

Understand the problem. What do you know? What do you need to find? Explain.

2. There are about 12,762 known ant species. There are about 10,997 known grasshopper species. The total number of known ant, grasshopper, and spider species is 67,437. How many known spider species are there?

3. A quarterback threw for 66,111 yards between 2001 and 2016. His all-time high was 5,476 yards in 1 year. In his second highest year, he threw for 5,208 yards. How many passing yards did he throw in the remaining years?

Understand the problem. Then make a plan. How will you solve? Explain.

4. There are 86,400 seconds in 1 day. On most days, a student spends 28,800 seconds sleeping and 28,500 seconds in school. How many seconds are students awake, but *not* in school?

5. A pair of rhinoceroses weigh 14,860 pounds together. The female weighs 7,206 pounds. How much more does the male weigh than the female?

6. Earth is 24,873 miles around. If a person's blood vessels were laid out in a line, they would be able to circle Earth two times, plus 10,254 more miles. How many miles long are a person's blood vessels when laid out in a line?

7. Alaska has 22,041 more miles of shoreline than Florida and California combined. Alaska has 33,904 miles of shoreline. Florida has 8,436 miles of shoreline. How many miles of shoreline does California have?

Think and Grow: Problem Solving: Multiplication

Example A coach buys 6 cases of sports drinks and spends \$60. Each case has 28 bottles. A team drinks 85 bottles at a tournament. How many bottles are left?

Understand the Problem

What do you know?

- The coach buys 6 cases.
- The coach spends \$60.
- Each case has 28 bottles.
- The team drinks 85 bottles.

What do you need to find?

- You need to find how many bottles are left.

Make a Plan

How will you solve?

- Multiply 28 by 6 to find the total number of bottles in 6 cases.
- Then subtract 85 bottles from the product to find how many bottles are left.
- The amount of money the coach spends is unnecessary information.

Solve

Step 1: How many bottles are in 6 cases?

28	28	28	28	28	28

k

k is the unknown product.

$28 \times 6 = k$

$\square$

$$\begin{array}{r} 2\ 8 \\ \times\quad 6 \\ \hline \end{array}$$

$k =$ ______

Step 2: Use k to find how many bottles are left.

85	n

$k =$ ____

n is the unknown difference.

____ $- 85 = n$

$$\begin{array}{r} \square \\ -\quad 85 \\ \hline \end{array}$$

$n =$ ______

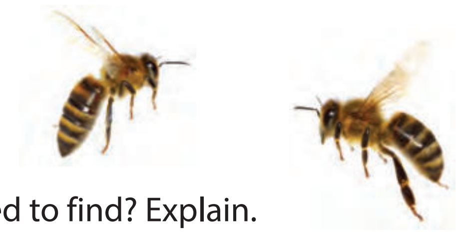
There are ______ bottles left.

Show and Grow *I can do it!*

1. Explain how you can check whether your answer above is reasonable.

Name ____________________

Apply and Grow: Practice



Understand the problem. What do you know? What do you need to find? Explain.

2. A zookeeper has 4 boxes. There are 137 grams of leaves in each box. A koala eats 483 grams of leaves in 1 day. The zookeeper wants to know how many grams of leaves are left.

3. A beekeeper has 2 hives. Hive A produces 14 pounds of honey. Hive B produces 4 times as much honey as Hive A. The beekeper wants to know how many pounds of honey are produced in all.

Understand the problem. Then make a plan. How will you solve? Explain.

4. A runner completes 12 races each year. He improves his time by 10 seconds each year. Each race is 5 kilometers long. The runner wants to know how many kilometers he runs in races in 3 years.

5. A volunteer bikes 4 miles in all to travel from her home to a shelter and back. At the shelter, she walks a dog 1 mile. The volunteer wants to know how many miles she travels doing these tasks for 28 days.

6. Cats have 32 muscles in each ear. Humans have 12 ear muscles in all. How many more muscles do cats have in both ears than humans have in both ears?

7. A school has 5 hallways. Each hallway has 124 lockers. 310 lockers are red. 586 lockers are in use. How many lockers are *not* in use?

Think and Grow: Problem Solving: Time Intervals

Example A dinosaur museum closes in $1\frac{1}{2}$ hours. Do you have enough time to spend 20 minutes at each of 4 exhibits in the museum?

Understand the Problem

What do you know?

- The museum closes in $1\frac{1}{2}$ hours.
- You want to spend 20 minutes at each of 4 exhibits.

What do you need to find?

- You need to find whether you have enough time to spend 20 minutes at each of 4 exhibits before the museum closes.

Make a Plan

How will you solve?

- Find the number of minutes until the museum closes.
- Find the total number of minutes it takes to visit the exhibits.

Solve

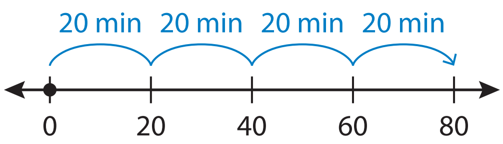
Step 1: Find the number of minutes until the museum closes.

There are _____ minutes in 1 hour.

$1\frac{1}{2} \times$ _____ $=$ _____

There are _____ minutes until the museum closes.

Step 2: Find how many minutes it takes to visit the exhibits.



It takes _____ minutes to visit the exhibits, which is _______ than 90 minutes.

You _______ have enough time to visit the exhibits.

Show and Grow *I can do it!*

1. You have a total of $9\frac{1}{2}$ minutes to complete 4 tasks in a video game. Do you have enough time to spend 150 seconds on each task?

Indicator 2d - On this page, all three aspects of rigor are treated together. Students use the problem-solving plan to solve a real-life problem (application) by using a number line to count forward (conceptual understanding) and using facts to multiply (procedural fluency).

Indicator 2e - The front matter provides a correlation aligning the MP labels and other headings in the Student Edition with the Standards for Mathematical Practice.

Standards for Mathematical Practice

1 Make sense of problems and persevere in solving them.

- Multiple representations are presented to help students move from concrete to representative and into abstract thinking.
- In *Modeling Real Life* examples and exercises, students MAKE SENSE OF PROBLEMS using problem-solving strategies, such as drawing a picture, circling knowns, and underlining unknowns. They also use a formal problem-solving plan: understand the problem, make a plan, and solve and check.

2 Reason abstractly and quantitatively.

- Visual problem-solving models help students create a coherent representation of the problem.
- *Explore and Grows* allow students to investigate concepts to understand the REASONING behind the rules.
- Exercises encourage students to apply NUMBER SENSE and explain and justify their REASONING.

3 Construct viable arguments and critique the reasoning of others.

- *Explore and Grows* help students make conjectures, use LOGIC, and CONSTRUCT ARGUMENTS to support their conjectures.
- Exercises, such as *You Be The Teacher* and *Which One Doesn't Belong?*, provide students the opportunity to CRITIQUE REASONING.

4 Model with mathematics.

- Real-life situations are translated into pictures, diagrams, tables, equations, and graphs to help students analyze relations and to draw conclusions.
- Real-life problems are provided to help students apply the mathematics they are learning to everyday life.
- MODELING REAL LIFE examples and exercises help students see that math is used across content areas, other disciplines, and in their own experiences.

5 Use appropriate tools strategically.

- Students can use a variety of hands-on manipulatives to solve problems throughout the program.
- A variety of tools, such as number lines and graph paper, manipulatives, and digital tools, are available as students CHOOSE TOOLS and consider how to approach a problem.

6 Attend to precision.

- PRECISION exercises encourage students to formulate consistent and appropriate reasoning.
- Cooperative learning opportunities support precise communication.

7 Look for and make use of structure.

- *Learning Targets* and *Success Criteria* at the start of each chapter and lesson help students understand what they are going to learn.
- *Explore and Grows* provide students the opportunity to see PATTERNS and STRUCTURE in mathematics.
- Real-life problems help students use the STRUCTURE of mathematics to break down and solve more difficult problems.

8 Look for and express regularity in repeated reasoning.

- Opportunities are provided to help students make generalizations through REPEATED REASONING.
- Students are continually encouraged to check for reasonableness in their solutions.

The colored words above are used throughout the program to indicate exercises that correlate to the Standards for Mathematical Practice.

Name ____________________

Problem Solving: Division 5.9

Learning Target: Solve multi-step word problems involving division.

Success Criteria:

- I can understand a problem.
- I can make a plan to solve using letters to represent the unknown numbers.
- I can solve a problem using an equation.

Indicator 2f - In the Explore and Grow, students must determine how changing aspects of the original problem may change their plan to solve the problem and whether it will change the answer.

MP1 Make sense of problems and persevere in solving them. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary.... Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Make a plan to solve the problem.

A fruit vendor has 352 green apples and 424 red apples. The vendor uses all of the apples to make fruit baskets. He puts 8 apples in each basket. How many fruit baskets does the vendor make?

MP **Make Sense of Problems** The vendor decides that each basket should have 8 of the same colored apples. Does this change your plan to solve the problem? Will this change the answer? Explain.

Name ____________________

8.9 Problem Solving: Fractions

Learning Target: Solve multi-step word problems involving fractions and mixed numbers.

Success Criteria:

- I can understand a problem.
- I can make a plan to solve.
- I can solve a problem using an equation.

Explore and Grow

Make a plan to solve the problem.

The table shows the tusk lengths of two elephants. Which elephant's tusks have a greater total length? How much greater?

	Right Tusk	Left Tusk
Male Elephant	$4\frac{1}{12}$ ft	$4\frac{3}{12}$ ft
Female Elephant	4 ft	$3\frac{7}{12}$ ft

MP **Make Sense of Problems** A $\frac{7}{12}$-foot long piece of one of the male elephant's tusks breaks off. Does this change your plan to solve the problem? Will this change the answer? Explain.

Think and Grow: Modeling Real Life

Example The attendance on the second day of a music festival is 10,013 fewer people than on the third day. How many total people attend the three-day music festival?

Day	Attendance
1	76,914
2	85,212
3	?

Think: What do you know? What do you need to find? How will you solve?

Step 1: How many people attend the festival on the third day?

85,212	10,013

a

a is the unknown sum.

$85{,}212 + 10{,}013 = a$

$$\begin{array}{r} 85{,}212 \\ +\ 10{,}013 \\ \hline \boxed{} \end{array}$$

$a =$ ______

Remember, you can estimate $85{,}000 + 10{,}000 = 95{,}000$ to check whether your answer is reasonable.

Step 2: Use a to find the total attendance for the three-day festival.

$76{,}914 + 85{,}212 + a = f$

f is the unkn

$76{,}914 + 85{,}212 +$ ___

$$\begin{array}{r} 76{,}914 \\ 85{,}212 \\ +\ \boxed{} \\ \hline \boxed{} \end{array}$$

$f =$ ______

You can estimate $80{,}000 + 90{,}000 + 100{,}000 = 270{,}000$ to check whether your answer is reasonable.

______ total people attend the music festival.

Indicator 2f - This example demonstrates how to approach a problem. The "Think:" prompt reminds students of the questions they can ask themselves to plan a solution pathway. Once students analyze the givens, they can use a diagram as an entry point. Then they use previous knowledge (addition of multi-digit numbers) to answer the question.

Show and Grow *I can think deeper!*

8. A construction company uses 3,239 more bricks to construct Building 1 than Building 2. How many bricks does the company use to construct all three buildings?

Building	Bricks Used
1	11,415
2	?
3	16,352

3. In July, a website receives 379,162 fewer orders than in May and June combined. The website receives 542,369 orders in May and 453,708 orders in June. How many orders does the website receive in July?

4. **Writing** Write and solve a two-step word problem that can be solved using addition or subtraction.

5. **Modeling Real Life** World War I lasted from 1914 to 1918. World War II lasted from 1939 to 1945. How much longer did World War II last than World War I?

6. **Modeling Real Life** Twenty people each donate $9 to a charity. Sixty people each donate $8. The charity organizer wants to raise a total of $1,500. How much more money does the organizer need to raise?

7. **DIG DEEPER!** The blackpoll warbler migrates 2,376 miles, stops, and then flies another 3,289 miles to reach its destination. The arctic tern migrates 11,013 miles, stops, and then flies another 10,997 miles to reach its destination. How much farther is the arctic tern's migration than the blackpoll warbler's migration?

Blackpoll Warbler

Artic Tern

Review & Refresh

Write the time. Write another way to say the time.

8.

9.

10.

Think and Grow: Modeling Real Life

Example A wind farm has 8 rows of new wind turbines and 3 rows of old wind turbines. Each row has 16 turbines. How many turbines does the wind farm have?

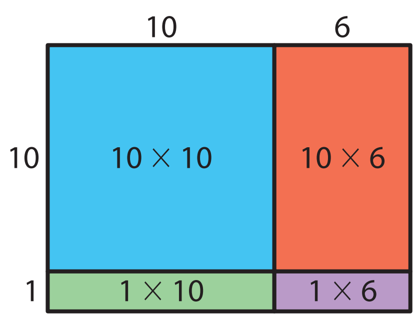
Add the number of rows of new turbines to the number of rows of old turbines.

$8 + 3 =$ ______

There are ______ rows of turbines.

Multiply the number of rows by the number in each row.

11×16



☐	10×10
☐	10×6
☐	1×10
+ ☐	1×6

______ Add the partial products.

The wind farm has ______ turbines.

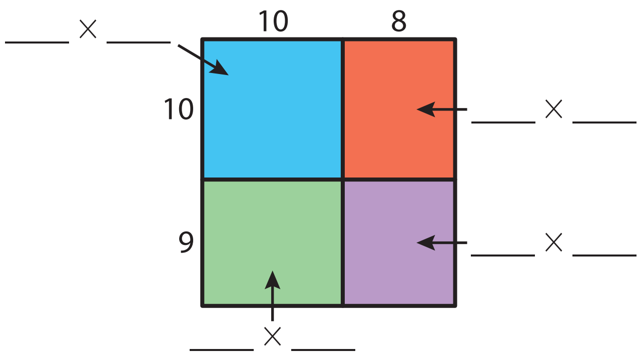
Show and Grow I can think deeper!

10. You can type 19 words per minute. Your cousin can type 33 words per minute. How many more words can your cousin type in 15 minutes than you?

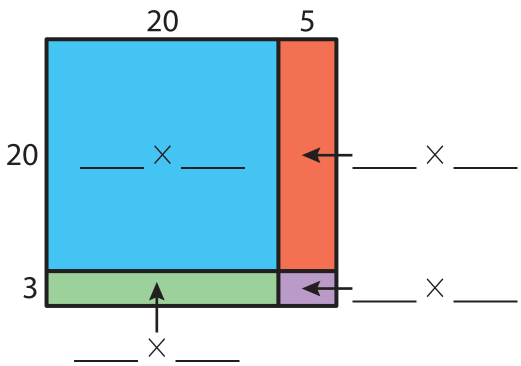
11. A store owner buys 24 packs of solar eclipse glasses. Each pack has 12 glasses. The store did *not* sell 18 of the glasses. How many of the glasses did the store sell?

Use the area model to find the product.

3. $19 \times 18 =$ ______



4. $23 \times 25 =$ ______

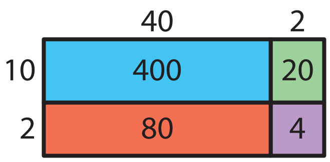


Draw an area model to find the product.

5. $26 \times 31 =$ ______

6. $22 \times 47 =$ ______

7. **YOU BE THE TEACHER** Your friend finds 12×42. Is your friend correct? Explain.



$400 + 80 + 20 + 4 = 504$

8. **Writing** Explain how to use an area model and partial products to multiply two-digit numbers.

9. **Modeling Real Life** A mega-arcade has 9 rows of single-player games and 5 rows of multi-player games. Each row has 24 games. How many games does the arcade have?

Review & Refresh

Find the sum. Check whether your answer is reasonable.

10. $\begin{array}{r} 75{,}420 \\ +\ \ 8{,}596 \\ \hline \end{array}$

11. $\begin{array}{r} 47{,}928 \\ +\ 23{,}657 \\ \hline \end{array}$

12. $\begin{array}{r} 505{,}019 \\ +\ \ 64{,}802 \\ \hline \end{array}$

Think and Grow: Modeling Real Life

Example A restaurant chef has $5\frac{3}{4}$ kilograms of rice. A recipe uses 5,875 grams of rice. Does the chef have enough rice to follow the recipe?

Make a table that shows the relationship between kilograms and grams.

Compare $5\frac{3}{4}$ kilograms to 5,875 grams.

Kilograms	Grams
5	
$5\frac{1}{4}$	
$5\frac{2}{4}$	
$5\frac{3}{4}$	
6	

1 kilogram = ______ grams

5 × ______ = ______

$5\frac{1}{4}$ × ______ = ______

The chef ___________ have enough rice to follow the recipe.

Show and Grow *I can think deeper!*

16. Your goal is to drink 1,500 milliliters of water each day. Yesterday, you drank $2\frac{1}{2}$ liters of water. Did you reach your goal?

17. Which egg has a greater mass? How much greater?

Chicken: 581 g

18. **DIG DEEPER!** A scientist has 3 liters, 818 milliliters, and 410 milliliters of a solution in each of 3 beakers. The scientist wants to divide the solution equally among 7 beakers. How much of the solution should the scientist put into each beaker?

10. MP **Number Sense** The prefix "kilo-" means one thousand. The prefix "milli-" means one thousandth. How does the meaning of each prefix relate to the metric units of mass and capacity in this lesson?

11. MP **Number Sense** When measuring the mass of a chair, how will the size of the unit affect the size of the measurement?

12. **Modeling Real Life** To cook a pound of pasta, you need to boil 4,700 milliliters of water. You fill a pot with $4\frac{1}{4}$ liters of water. Is there enough water in your pot?

Liters	Milliliters
4	
$4\frac{1}{4}$	
$4\frac{2}{4}$	
$4\frac{3}{4}$	
5	

13. DIG DEEPER! A 4,500-gram bag of soil costs \$3, and an 18-kilogram bag of soil costs \$10. Which is the less expensive way to buy 18,000 grams of soil? Explain.

Review & Refresh

Find the difference. Then check your answer.

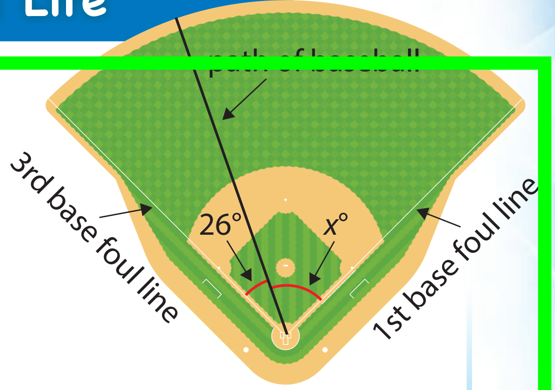
14. $\begin{array}{r} 8,467 \\ -\ 6,753 \\ \hline \end{array}$

15. $\begin{array}{r} 30,052 \\ -\ 5,439 \\ \hline \end{array}$

16. $\begin{array}{r} 85,012 \\ -\ 34,769 \\ \hline \end{array}$

Think and Grow: Modeling Real Life

Example The foul lines on a baseball field are perpendicular. A baseball player hits a ball as shown. What is the measure of the angle between the path of the ball and the 1st base foul line?



Think: What do you know? What do you need to find? How will you solve?

The 3rd base foul line and 1st base foul line are perpendicular.

So, the measure of the angle between the foul lines is ______.

Write an equation to find the measure of the angle between the path of the ball and the 1st base foul line.

$\_\_\_\_ + x = \_\_\_\_$

Use subtraction to solve.

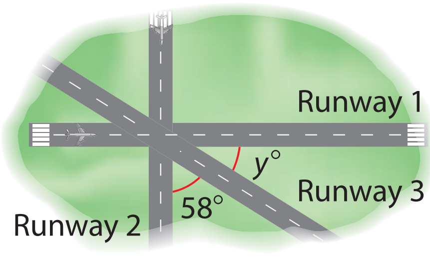
$x = \_\_\_\_ - \_\_\_\_$

$x = \_\_\_\_$

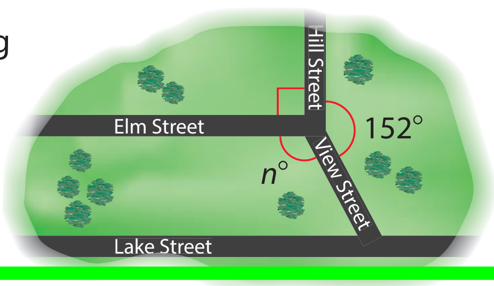
The measure of the angle between the path of the ball and the 1st base foul line is ______.

Show and Grow I can think deeper!

9. Runway 1 and Runway 2 are perpendicular. What is the measure of the missing angle between Runway 1 and Runway 3?



10. DIG DEEPER! What is the measure of the missing angle between View Street and Elm Street?



Indicator 2f - In each exercise, students use their knowledge of the current chapter to make a plan and persevere to solve a real-life application problem.

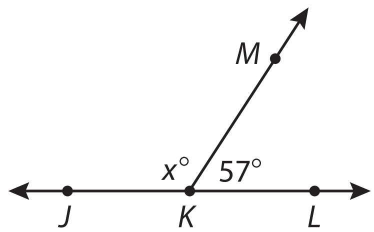
MP1 Make sense of problems and persevere in solving them. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary.... Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

5. MP **Reasoning** $\angle ABC$ and $\angle CBD$ are adjacent. $\angle ABC$
$\angle CBD$ is acute.

Draw and label $\angle ABC$ and $\angle CBD$.

Classify $\angle ABD$.

6. MP **Structure** Which equations can you use to find the measure of angle $\angle MKJ$?



$90 - 57 = x$

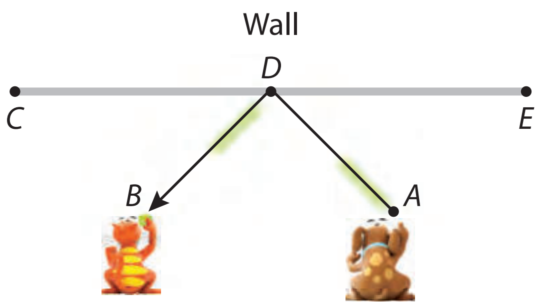
$180 - 57 = x$

$57 + x = 90$

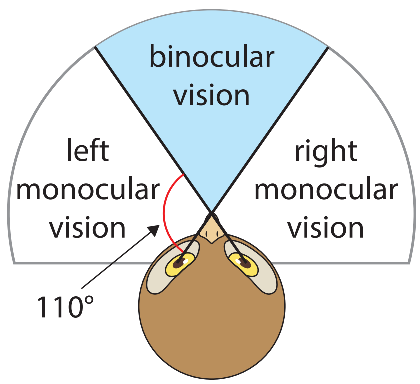
$57 + x = 180$

7. **Ope**
an ob
supp
meas

8. **Modeling Real Life** Newton bounces a ball off of a wall to Descartes. $\overline{AD} \perp \overline{DB}$. The measures of $\angle ADC$ and $\angle BDE$ are equivalent. Find the measures of $\angle ADC$ and $\angle BDE$.



9. **Modeling Real Life** Owls see an object with both eyes at the same time using *binocular vision*. What angle measure describes the owl's binocular vision? Explain.



Review & Refresh

Write the fraction as a money amount and as a decimal.

10. $\frac{49}{100}$

11. $\frac{25}{100}$

12. $\frac{7}{100}$

Think and Grow: Problem Solving: Addition and Subtraction

Example You have 3,914 songs in your music library. You download 1,326 more songs. Then you delete 587 songs. How many songs do you have now?

Understand the Problem

What do you know?

- You have 3,914 songs.
- You download 1,326 more.
- You delete 587 songs.

What do you need to find?

- You need to find how many songs you have now.

Make a Plan

How will you solve?

- Add 3,914 and 1,326 to find how many songs you have after downloading some songs.
- Then subtract 587 from the sum to find how many songs you have now.

Solve

Step 1:

3,914	1,326

k

k is the unknown sum.

$3{,}914 + 1{,}326 = k$

$$\begin{array}{r} 3{,}914 \\ +\ 1{,}326 \\ \hline \boxed{} \end{array}$$

$k =$ ______

Step 2:

n	587

$k =$ ____

n is the unknown difference.

______ $- 587 = n$

$$\begin{array}{r} \boxed{} \\ -\ 587 \\ \hline \boxed{} \end{array}$$

$n =$ ______

You have ______ songs now.

Indicator 2f - Students use the Problem-Solving Plan here and on the next page to help make sense of problems and persevere in solving them.

Show and Grow *I can do it!*

1. Explain how you can check whether your answer above is reasonable.

Name ___________________________________

Apply and Grow: Practice

Understand the problem. What do you know? What do you need to find? Explain.

2. There are about 12,762 known ant species. There are about 10,997 known grasshopper species. The total number of known ant, grasshopper, and spider species is 67,437. How many known spider species are there?

3. A quarterback threw for 66,111 yards between 2001 and 2016. His all-time high was 5,476 yards in 1 year. In his second highest year, he threw for 5,208 yards. How many passing yards did he throw in the remaining years?

Understand the problem. Then make a plan. How will you solve? Explain.

4. There are 86,400 seconds in 1 day. On most days, a student spends 28,800 seconds sleeping and 28,500 seconds in school. How many seconds are students awake, but *not* in school?

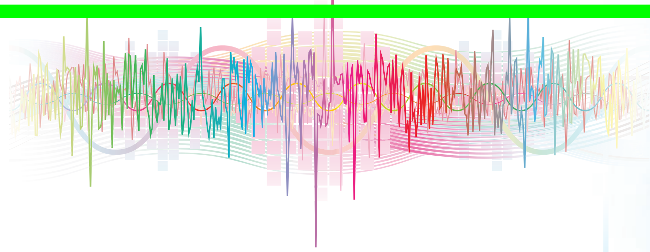
5. A pair of rhinoceroses weigh 14,860 pounds together. The female weighs 7,206 pounds. How much more does the male weigh than the female?

6. Earth is 24,873 miles around. If a person's blood vessels were laid out in a line, they would be able to circle Earth two times, plus 10,254 more miles. How many miles long are a person's blood vessels when laid out in a line?

7. Alaska has 22,041 more miles of shoreline than Florida and California combined. Alaska has 33,904 miles of shoreline. Florida has 8,436 miles of shoreline. How many miles of shoreline does California have?

Think and Grow: Problem Solving: Division

Example The speed of sound in water is 1,484 meters per second. Sound travels 112 more than 4 times as many meters per second in water as it does in air. What is the speed of sound in air?



Understand the Problem

What do you know?

- The speed of sound in water is 1,484 meters per second.
- Sound travels 112 more than 4 times as many meters per second in water as it does in air.

What do you need to find?

- You need to find the speed of sound in air.

Make a Plan

How will you solve?

- Subtract 112 from 1,484 to find 4 times the speed of sound in air.
- Then divide the difference by 4 to find the speed of sound in air.

Solve

Step 1: $1{,}484 - 112 = d$

d is the unknown difference.

$$\begin{array}{r} 1{,}484 \\ -\ \ 112 \\ \hline \boxed{} \end{array}$$

$d =$ ____

Step 2: $d \div 4 = a$

a is the unknown value.

$$\begin{array}{r} \boxed{} \\ 4\overline{)\boxed{}} \end{array}$$

$a =$ ____

The speed of sound in air is ____ meters per second.

Show and Grow *I can do it!*

1. Explain how you can check whether your answer above is reasonable.

Name ____________________

Apply and Grow: Practice

Understand the problem. What do you know? What do you need to find? Explain.

2. A surf shop owner divides 635 stickers evenly among all of her surfboards. Each surfboard has 3 tiki stickers and 2 turtle stickers. How many surfboards does she have?

3. There are 1,008 projects in a science fair. The projects are divided equally into 9 rooms. Each room has 8 equal rows of projects. How many projects are in each row?

Understand the problem. Then make a plan. How will you solve? Explain.

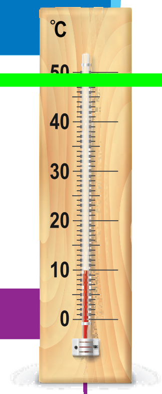
4. Of 78 students who work on a mural, 22 students design it, and the rest of the students paint it. The painters are divided equally among 4 areas of the mural. How many painters are assigned to each area?

5. The Winter Olympics occur twice every 8 years. How many times will the Winter Olympics occur in 200 years?

6. A party planner wants to put 12 balloons at each of 15 tables. The balloons come in packages of 8. How many packages of balloons must the party planner buy?

7. An art teacher has 8 boxes of craft sticks. Each box has 235 sticks. The students use the sticks to make as many hexagons as possible. How many sticks are *not* used?

Think and Grow: Problem Solving: Fraction Operations



Example To convert a temperature from degrees Celsius to degrees Fahrenheit, multiply the Celsius temperature by $\frac{9}{5}$, then add 32. What is the temperature shown by the thermometer in degrees Fahrenheit?

Understand the Problem

What do you know?

- To convert a temperature from degrees Celsius to degrees Fahrenheit, multiply the Celsius temperature by $\frac{9}{5}$, then add 32.
- The thermometer shows 10 degrees Celsius.

What do you need to find?

- You need to find the temperature shown by the thermometer in degrees Fahrenheit.

Make a Plan

How will you solve?

- First, multiply the Celsius temperature, 10 degrees, by $\frac{9}{5}$.
- Then add 32 to the product.

Solve

Step 1: $10 \times \frac{9}{5} = p$

p is the unknown product.

$$10 \times \frac{9}{5} = \frac{\square \times \square}{5} = \frac{\square}{\square}$$

$= \_\_\_\_\_$

$p = \_\_\_\_\_$

Step 2: $p + 32 = f$

f is the unknown sum.

$\_\_\_\_\_ + 32 = \_\_\_\_\_$

$f = \_\_\_\_\_$

So, the temperature shown by the thermometer is _____ degrees Fahrenheit.

Show and Grow *I can do it!*

1. Show how to solve the example above using one equation.

Name ______________________

Indicator 2f - On this page, students use the Problem-Solving Plan to help make sense of the problems and persevere in solving them. In Exercises #2-5, students show that they understand the problem and make a plan to solve. In Exercise #6, students use the Problem-Solving Plan to solve.

Apply and Grow: Prac

Understand the problem. What do you know? What do you need to find? Explain.

2. You make a friendship bracelet with 3 pink strings and 2 blue strings. Each string is $3\frac{3}{4}$ feet long. How many feet of string do you use?

3. A smoothie store worker makes 4 peanut butter banana smoothies and 2 fruit smoothies. The worker uses $\frac{2}{3}$ cup of bananas in each smoothie. How many cups of bananas does the worker need?

Understand the problem. Then make a plan. How will you solve? Explain.

4. Your friend walks her dog for $\frac{1}{4}$ mile each day. She then runs $2\frac{3}{4}$ miles each day. How many total miles does she walk her dog and run in 1 week?

5. Hair donations must be 12 inches long or longer. Your friend's hair is 7 inches long. Her hair grows about $\frac{1}{2}$ inch each month. Can she donate her hair in 8 months?

6. Today you walk $\frac{6}{10}$ mile from the Martin Luther King Jr. Memorial to the Washington Monument. Tomorrow you will walk about 4 times as far from the Washington Monument to the White House. About how much farther will you walk tomorrow?

ELL Support

Read each story aloud as students follow along. Clarify unknown vocabulary and explain unfamiliar cultural references. You may want to point out that the word *cars* in Exercise 19 refers to a part of a subway train, not an automobile. Allow students to work in pairs and provide time to complete each exercise. Ask the questions presented at the end of each and have pairs write their answers on a whiteboard or piece of paper to hold up for your review.

Laurie's Notes

Think and Grow: Modeling Real Life

The application example allows students to show their understanding of using the Distributive Property to rewrite a factor. The story problems include the use of comparison language.

- "Have you ridden on a roller coaster? How fast do you think a roller coaster can go? Is this faster than cars on a highway?"
- "Read the problem. Underline what you know and circle what you are trying to find out." Students should underline the caption.
- **Think-Pair-Share:** Give think time before students discuss the example with a partner. "How can we find 3 times the speed of the roller coaster?" Multiply 3 times 120. "How did you find the product?" Answers vary.
- **MP1 Make Sense of Problems:** Help students decode the comparison sentence in Exercise 18. "The problem says *200 fewer* than *4 times as many* drones. We are not finding 200 fewer than 4. The *4 times as many* needs to be found first." Pause as you read it again. "*200 fewer* than [pause] *4 times as many* drones."
- Exercise 20 does not state the number of vegetables. Instead, the types of vegetables are listed. Students need to count to know there are 3 rows of 4 types of vegetables. There are 3×4 rows and 24 seeds in each row. There are many different ways in which students may find the product. Have students record these methods at the board so they can be discussed and compared.
- "You have seen and heard many strategies that use the Commutative, Associative, and Distributive Properties to multiply. Where do you think you are in your learning? Are there certain types of problems that you are getting more confident with?"
- **Supporting Learners:** Focus on one type of problem, giving additional problems so that students are making progress. For instance, try problems that involve the Distributive Property so students become more confident in expressing a number as a sum or difference.

Closure

- "Mental math strategies that use the Commutative, Associative, and Distributive Properties have to be practiced. We will continue to work on these strategies."
- "Write a multiplication problem that you were unsure of how to solve at the beginning of our class, but now you are pretty confident you can solve it. Write and solve the problem. Share the problem with your partner."

Laurie's Notes

ELL Support

Review the meaning of the word *array* and make sure students distinguish it from the phrase *a ray*. Read each story aloud as students follow along. Clarify unknown vocabulary and explain unfamiliar references, such as solar panels. Provide time to complete each exercise. For each problem, ask how many arrays are possible and have each student hold up the appropriate number of fingers to answer. You may want to have them draw arrays on a whiteboard or piece of paper to hold up for your review.

Think and Grow: Modeling Real Life

The application example allows students to show their understanding of drawing models to use factor pairs to solve a contextual problem.

- **Preview:** "Have you ever put pictures or posters on the walls?" Point to walls in the classroom where rectangular items have been hung close together, particularly in different orientations.
- Have students read the problem. "What do we need to find out?" Make the connection between arrays and area models.
- **MP1 Make Sense of Problems:** In making sense of this problem, note that different arrays are different potential picture arrangements on a wall. Organizing the 30 photos in 3 columns and 10 rows will look different than 10 columns and 3 rows. The number of factor pairs is doubling *only* because of the context.
- Exercise 14 is modeled after the example. The context suggests that the number of factor pairs will be doubled.
- Circulate as students discuss the exercises and solve them.
- Exercises 15 and 16 add a constraint to the problem. Not all the array arrangements can be used in the situations described. One strategy is to draw all the possibilities then eliminate those that do not satisfy the problem. Reminding students about rows and columns may help with the contextual problems.
- **Supporting Learners:** Provide Grid Paper and encourage students to draw all the possibilities. Then encourage them to reread the situation to clarify which models are needed. Drawing the models first will help them to make sense of the problems. Remind them to be sure to answer the question being asked.
- "You have been drawing area models to find a product. The side lengths of the rectangles are the factor pairs. What strategies are you using to find all the factor pairs? Are you more confident in your learning now than at the beginning of class?"

Closure

- "We need to set up the 24 chairs in our classroom to watch a movie. If we are setting them up in an array, how many different ways could we do it? What are the ways?"
- You want students to note the difference between the factor pairs (1-24, 2-12, 3-8, 4-6) and the ways they can arrange the chairs. Interchanging the rows and columns looks very different in the class!

ELL Support

Read each story aloud as students follow along. Clarify unknown vocabulary and explain unfamiliar cultural references, such as a zipline. Allow students

Indicator 2f - The Teaching Edition encourages teachers to ask students to summarize the problem before trying to solve.

MP1 Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary.... Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Laurie's Notes

Think and Grow: Modeling Real Life

These applications allow students to continue to show their understanding of how to read a problem and use it to build a problem-solving plan for situations related to multiplication.

- **Preview:** If ziplines are unfamiliar to your students, allow them to share any attraction they have attended with different prices for adults and children. Examples may include amusement parks, movie theaters, and so on.

? **Turn and Talk:** "Read the example. Without giving details about actual numbers, what is this problem about?" Give students time to talk and then share.

- **MP1 Make Sense of Problems:** You want to hear the essence of the problem without details. Example: *Ticket prices for adults and children are different and you know how many of each were sold. How much more was made on the adult tickets versus child tickets?* This is the big view of the problem that students need to understand before they look for the known information and so on.
- Letters are used throughout this example to represent answers to the sub-questions. Students may notice a connection of the letters chosen here to what they represent, *a* for money earned from adult tickets, *c* for money earned from child tickets. Students may ask why use a letter when you could use words *money earned from adult tickets*? We could use all of the words. "What is the advantage to using a single letter?"

? **MP1 Make Sense of Problems and Persevere in Solving Them:** "Complete Exercise 7. Compare your answers with your partner. If answers differ, compare the sections of your problem-solving plan. Where do you agree? disagree? Why? Is your answer reasonable?" Have students compare the first part, the amount of seats in all, before beginning work on the second question.

- **Supporting Learners:** Continue to provide the Problem-Solving Plan or additional paper. Help students devise sub-goals as they determine what they need to find.

"You have learned to make a problem-solving plan. Tell your partner how the plan helped you solve a problem today."

Closure

- Use exit cards. Solving a problem also includes looking back to see if a solution is reasonable. Can you make up two unreasonable answers for Exercise 7 that would tell you something is wrong with your solution?

ELL Support

Read each problem aloud as students follow along. Clarify unknown vocabulary and explain unfamiliar references. You may want to review that $\frac{1}{4}$ dollar is 25¢.

Allow students to work in pairs and provide time to complete each exercise. Ask for the answer to each problem and have students write on a whiteboard or piece of paper to hold up for your review.

Laurie's Notes

Think and Grow: Modeling Real Life

These applications allow students to show their understanding of multi-step problem solving and extending a numeric pattern.

- **Preview:** Discuss daily fitness goals they may have or goals that family members may have. Walking certain distances each day is very common.
- Read the problem and then have students read again to themselves. Have students share what they know and what they are trying to solve.
- ? **MP1 Make Sense of Problems:** "Tell your partner what we have to find out before we can solve the problem. How can we do that?" continue the pattern Students must identify the pattern in order to continue it.
- ? "How are the numbers in the table changing?" Their language may not be precise. They may say, *the numbers are adding* $\frac{2}{10}$ *each time*. "Can you use that information to continue the pattern?" yes
- Have students work with a partner to find the distances walked on Thursday and Friday.
- ? **MP1 Make Sense of Problems:** Do students know that they haven't answered the question yet? Ask them to re-read the problem. "Have we answered the question posed?" no "What else do we need to do?" Find how many kilometers they walked for the week.
- **MP1 Persevere in Solving Problems:** Students have an entry point. Give them time to talk and share their thinking. Have them solve the problem and compare answers.
- Exercise 7 is the same type of problem. Students may be ready to try this independently or with a partner. Encourage students to use the same steps as in the example to solve.
- "Today we solved word problems by identifying the information in the problem and the question being asked. You had to find a middle step before answering the main question. This takes time and practice." Have students show with their thumb signals how they are doing with each success criteria.

Closure

- "What helped you solve the problem? Were you clear about what information was known?" You want students to reflect on the problem-solving process. "What did you learn about solving problems today?"

12. **MP Number Sense** In the number 93,825, is the value in the ten thousands place 10 times the value in the thousands place? Explain.

13. **MP Reasoning** Write the greatest number possible using each number card once. Then write the least six-digit number possible.

6 1 3 8 9 5

Greatest: ________ Least: ________

Modeling Real Life Use the table.

14. The height of which mountain has a 3 in the thousands place?

15. What is the value of the digit 5 in the height of K2? in the height of Mount Everest? How do these values relate to each other?

16. **DIG DEEPER!** The tallest mountain in the world is shown in the table. Which mountain is it?

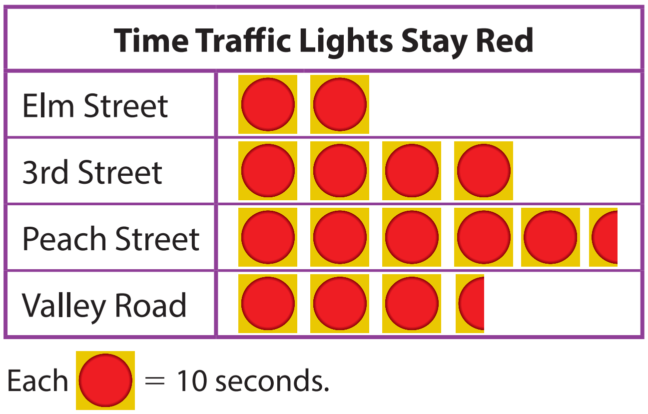
Mountain	Height (feet)
K2	28,251
Mont Blanc	15,771
Mount Everest	29,035
Mount Kinabalu	13,455
Mount Rainier	14,411
Mount Whitney	14,494

Review & Refresh

17. Use the graph to answer the questions.

How many seconds did the Peach Street traffic light stay red?

How many more seconds did the Valley Road traffic light stay red than the Elm Street traffic light?



Name ____________________

Apply and Grow: Practice

Find the difference. Then check your answer.

5. $96{,}090 - 5{,}130$

6. $42{,}648 - 9{,}169$

7. $57{,}502 - 4{,}380$

8. $43{,}629 - 18{,}101$

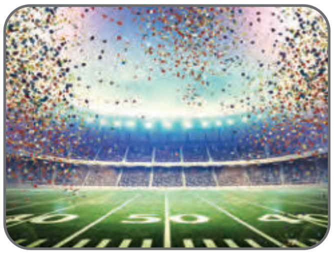
9. $425{,}631 - 86{,}942$

10. $600{,}470 - 307{,}281$

11. 281,660 − 44,521 = ________

12. 798,400 − 5,603 = ________

13. 103,219 people attended a championship football game last year. 71,088 people attend the game this year. How many more people attended the game last year than this year?



14. MP **Number Sense** Find and explain the error. What is the correct difference?

$$\begin{array}{r} 435{,}450 \\ -\ \ 71{,}945 \\ \hline 444{,}515 \end{array}$$

15. MP **Number Sense** Which statements describe the difference of 32,064 and 14,950?

The difference is about 17,000.

The difference is less than 17,000.

The difference is greater than 17,000.

The difference is 17,000.

Name ______________________

3.4 Use the Distributive Property to Multiply

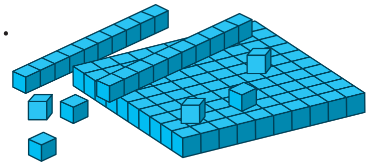
Learning Target: Use the Distributive Property to multiply.

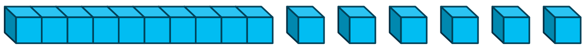
Success Criteria:

- I can draw an area model to multiply.
- I can use known facts to find a product.
- I can explain how to use the Distributive Property.

Explore and Grow

Use base ten blocks to model 4×16. Draw your model. Then find the area of the model.





$4 \times 16 =$ _____

Break apart 16 to show two smaller models. Find the area of each model. What do you notice about the sum of the areas?

Area = _____ Area = _____

MP Reasoning How does this strategy relate to the Distributive Property? Explain.

Name ______________________________

Apply and Grow: Practice

Use properties to find the product. Explain your reasoning.

4. 7×798

5. 350×6

6. 106×5

7. 4×625

8. 395×8

9. $2 \times 7 \times 15$

10. 430×2

11. 8×150

12. $3 \times 1{,}997$

13. $25 \times 9 \times 2$

14. 404×6

15. $4 \times 2{,}004$

16. **Which One Doesn't Belong?** Which expression does *not* belong with the other three?

$(3 \times 30) + (3 \times 7)$ $\qquad$ $(3 \times 40) - (3 \times 3)$

$3 \times (30 + 7)$ $\qquad$ $3 \times 3 \times 7$

17. MP **Number Sense** Use properties to find each product.

$9 \times 80 = 720$, so $18 \times 40 =$ _____.

$5 \times 70 = 350$, so $5 \times 72 =$ _____.

Name ______________________________

4.7 Practice Multiplication Strategies

Learning Target: Use strategies to multiply two-digit numbers.

Success Criteria:
- I can choose a strategy to multiply.
- I can multiply two-digit numbers.
- I can explain the strategy I used to multiply.

Explore and Grow

Choose any strategy to find 60×80.

Multiplication Strategies
Place Value
Associative Property of Multiplication
Area Model
Distributive Property
Partial Products
Regrouping

Choose any strategy to find 72×13.

MP **Reasoning** Explain why you chose your strategies. Compare your strategies to your partner's strategies. How are they the same or different?

Name ____________________

5.7 Divide Multi-Digit Numbers by One-Digit Numbers

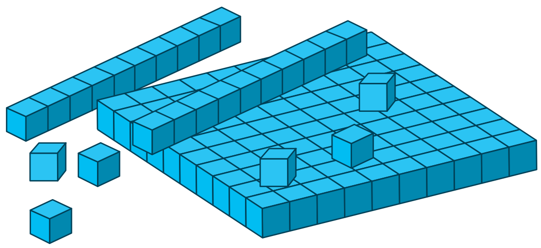
Learning Target: Divide multi-digit numbers by one-digit numbers.

Success Criteria:

- I can use place value to divide.
- I can show how to regroup thousands, hundreds, or tens.
- I can find a quotient and a remainder.

Explore and Grow

Use a model to divide.
Draw each model.



$348 \div 3$

$148 \div 3$

MP **Reasoning** Explain why the quotient of $148 \div 3$ does *not* have a digit in the hundreds place.

List the factors of the number.

7. 25

8. 56

9. 75

10. 80

11. 93

12. 61

13. MP **Reasoning** Why does a number that has 9 as a factor also have 3 as a factor?

14. DIG DEEPER! The number below has 3 as a factor. What could the unknown digit be?

3 ____ 5

15. MP **Number Sense** Which numbers have 5 as a factor?

50 34 25 1,485 100 48

Indicator 2f - In #13-15, students use reasoning and their knowledge of factors to solve the problems.

MP2 Reason abstractly and quantitatively - Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

16. **Modeling Real Life** You and a p
are conducting a bottle flipping
experiment. You have 3 bottles w
different amounts of water in ea
need to flip each bottle 15 times
take turns, will you and your par
each get the same number of fli

Review & Refresh

Compare.

18. 7,914 ◯ 7,912

19. 65,901 ◯ 67,904

20. 839,275 ◯ 839,275

7. **Number Sense** Which expressions are equivalent to $4 \times \frac{7}{8}$?

$(4 \times 7) \times \frac{1}{8}$ $\frac{28}{8}$ 4×7 $\frac{32}{7}$ $\frac{7}{8} + \frac{7}{8} + \frac{7}{8} + \frac{7}{8}$

8. **Number Sense** Which is greater, $6 \times \frac{6}{2}$ or $5 \times \frac{7}{2}$? Explain.

9. **Structure** Your friend fills a $\frac{3}{4}$-cup measuring cup with rice 2 times. Write an equation to show how much rice she uses.

10. **Modeling Real Life** You are making a tornado in each of 2 bottles. Each bottle needs to contain $\frac{20}{4}$ cups of water. You only have a $\frac{1}{4}$-cup measuring cup. How many times do you need to fill the measuring cup?

11. **DIG DEEPER!** You and your friend are each selling 12 coupon books. So far, you have sold $\frac{2}{6}$ of your books. Your friend has sold 3 times as many as you. What fraction of your friend's coupon books has she sold?

Review & Refresh

Find the product.

12. $12 \times 47 =$ ______

13. $35 \times 31 =$ ______

14. $58 \times 49 =$ ______

10. **Number Sense** The prefix "kilo-" means one thousand. The prefix "milli-" means one thousandth. How does the meaning of each prefix relate to the metric units of mass and capacity in this lesson?

11. **Number Sense** When measuring the mass of a chair, how will the size of the unit affect the size of the measurement?

12. **Modeling Real Life** To cook a pound of pasta, you need to boil 4,700 milliliters of water. You fill a pot with $4\frac{1}{4}$ liters of water. Is there enough water in your pot?

Liters	Milliliters
4	
$4\frac{1}{4}$	
$4\frac{2}{4}$	
$4\frac{3}{4}$	
5	

13. **DIG DEEPER!** A 4,500-gram bag of soil costs $3, and an 18-kilogram bag of soil costs $10. Which is the less expensive way to buy 18,000 grams of soil? Explain.

Review & Refresh

Find the difference. Then check your answer.

14. $\begin{array}{r} 8{,}467 \\ -\ 6{,}753 \\ \hline \end{array}$

15. $\begin{array}{r} 30{,}052 \\ -\ 5{,}439 \\ \hline \end{array}$

16. $\begin{array}{r} 85{,}012 \\ -\ 34{,}769 \\ \hline \end{array}$

Think and Grow: Modeling Real Life

Example About how many more pounds does the whale shark weigh than the orca?

Whale Shark:
40,364 pounds

Orca:
8,095 pounds

Round the weight of each animal to the nearest thousand because you do not need a precise answer.

Orca: ________ Whale shark: ________

Subtract the estimated weight of the orca from the estimated weight of the whale shark.

40,364 → ☐

− 8,095 → − ☐

☐

The whale shark weighs about ________ more pounds than the orca.

Show and Grow *I can think deeper!*

Local Election Results	
Candidate	**Number of Votes**
Candidate A	250,311
Candidate B	84,916

15. About how many more votes did Candidate A receive than Candidate B?

16. Mount Saint Helens is a volcano that is 8,363 feet tall. Mount Fuji is a volcano that is 4,025 feet taller than Mount Saint Helens. About how tall is Mount Fuji?

17. An educational video has 6,129 fewer views than a gaming video. The educational video has 483,056 views. About how many views does the gaming video have?

Estimate the sum or difference.

9. 864,733 − 399,608 = ________

10. 134,034 + 26,987 = ________

11. MP **Number Sense** Descartes estimates a difference by rounding each number to the nearest ten thousand. His estimate is 620,000. Which problems could he have estimated?

694,506 − 73,421	886,789 − 265,064
675,896 − 51,309	704,322 − 82,156

12. MP **Reasoning** When might you estimate the difference of 603,476 and 335,291 to the nearest hundred? to the nearest hundred thousand?

13. **Modeling Real Life** A storm causes 23,890 homes to be without power on the east side of a city and 18,370 homes to be without power on the west side. About how many homes altogether are without power?

14. **Modeling Real Life** You walk 5,682 steps. Your teacher walks 4,219 steps more than you. About how many steps does your teacher walk?

Indicator 2f - In #13-14, students use mathematics to model and solve real-life problems.

MP4 Model with mathematics. Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation.... Mathematically proficient students who can apply what they know... are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Review & Refresh

Find the product.

15. $3 \times 3 \times 2 =$ ______

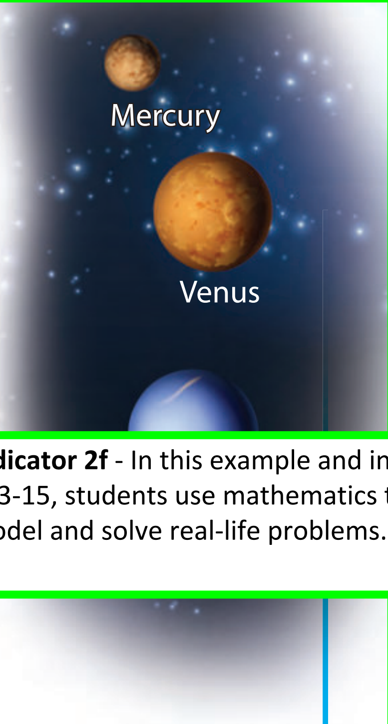
18. $6 \times 2 \times 3 =$ ______

19. $4 \times 9 \times 2 =$ ______

20. $4 \times 10 \times 2 =$ ______

Think and Grow: Modeling Real Life

Example There are 16 hours in 1 day on Neptune. There are 88 times as many hours in 1 day on Mercury as 1 day on Neptune. There are 5,832 hours in 1 day on Venus. Are there more hours in 1 day on Mercury or 1 day on Venus?



Multiply to find how many hours there are in 1 day on Mercury.

$$\begin{array}{r} {\scriptstyle 4} \\ 88 \\ \times \quad 16 \\ \hline 528 \\ + \quad 880 \\ \hline \boxed{} \end{array}$$ hours

Compare.

Indicator 2f - In this example and in #13-15, students use mathematics to model and solve real-life problems.

So, there are more hours in 1 day on ________.

Show and Grow *I can think deeper!*

13. A ninja lanternshark is 18 inches long. A whale shark is 16 times as long as the ninja lanternshark. A hammerhead shark is 228 inches long. Is the whale shark or the hammerhead shark longer?

14. There are 24 science classrooms in a school district. Each classroom receives 3 hot plates. Each hot plate costs $56. How much do all of the hot plates cost?

15. Fourteen adults and 68 students visit the art museum. What is the total cost of admission?

Art Museum Admission Prices	
Adult	$26
Student	$19

Find the product. Check whether your answer is reasonable.

7. Estimate: ________

$51 \times 62 =$ ________

8. Estimate: ________

$37 \times 13 =$ ________

9. Estimate: ________

$49 \times 78 =$ ________

10. Newton plays 21 basketball games. He scores 12 points each game. How many points does he score in all?

11. **DIG DEEPER!** When you use regrouping to multiply two-digit numbers, why does the second partial product always end in 0?

12. **Number Sense** Find the missing digits.

$$\begin{array}{r} 3\;4 \\ \times \quad \square\;5 \\ \hline 1\,\square\,\square \\ +\; 2,0\;4\;0 \\ \hline 2,2\,\square\;0 \end{array}$$

13. **Modeling Real Life** A tiger dives 12 feet underwater. An otter dives 25 times deeper than the tiger. A walrus dives 262 feet underwater. Does the otter or walrus dive deeper?

Review & Refresh

14. Complete the table.

Standard Form	Word Form	Expanded Form
6,835		
		70,000 + 4,000 + 100 + 2
	five hundred one thousand, three hundred twenty-nine	

Think and Grow: Modeling Real Life

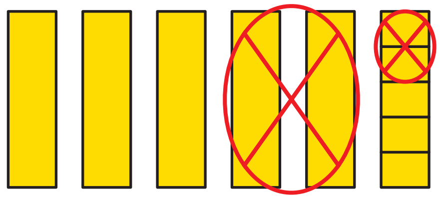
Example A replica of the Eiffel Tower is 6 inches tall. It is $2\frac{2}{5}$ inches taller than a replica of the Space Needle. How tall is the replica of the Space Needle?

Find the difference between the height of the Eiffel Tower replica, 6 inches, and $2\frac{2}{5}$ inches.

Write each measurement as a fraction. $6 = \frac{30}{5}$ $2\frac{2}{5} = \frac{10}{5} + \frac{2}{5} = \frac{12}{5}$

Subtract $\frac{12}{5}$ from $\frac{30}{5}$. $\frac{30}{5} - \frac{12}{5} = \frac{18}{5}$

Write $\frac{18}{5}$ as a mixed number. $\frac{18}{5} = \frac{15}{5} + \frac{3}{5} = \square\frac{\square}{\square}$



So, the Space Needle replica is $\square\frac{\square}{\square}$ inches tall.

Show and Grow *I can think deeper!*

12. A cook has a 5-pound bag of potatoes. He uses $2\frac{1}{3}$ pounds of potatoes to make a casserole. How many pounds of potatoes are left?

13. A half-marathon is $13\frac{1}{10}$ miles long. A competitor runs $9\frac{6}{10}$ miles. How many miles does the competitor have left to run?

14. **DIG DEEPER!** You want to mail a package that weighs $18\frac{2}{4}$ ounces. The weight limit is 13 ounces, so you remove $4\frac{3}{4}$ ounces of items from the package. Does the lighter package meet the weight requirement? If not, how much more weight do you need to remove?

Subtract.

7. $5\frac{6}{10} - 3$

8. $13 - 2\frac{1}{2}$

9. $18 - 14\frac{6}{8}$

10. **MP Reasoning** Explain why you rename $4\frac{1}{3}$ when finding $4\frac{1}{3} - \frac{2}{3}$.

11. **DIG DEEPER!** Find the unknown number.

$$10\frac{3}{12} - \square\frac{\square}{\square} = \frac{4}{12}$$

12. **Modeling Real Life** A rare flower found in Indonesian rain forests can grow wider than a car tire. How much wider is the flower than a car tire that is $1\frac{11}{12}$ feet wide?

Rafflesia arnoldii

13. **Modeling Real Life** Your tablet battery is fully charged. You use $\frac{32}{100}$ of the charge listening to music, and $\frac{13}{100}$ of the charge playing games. What fraction of the charge remains on your tablet battery?

Review & Refresh

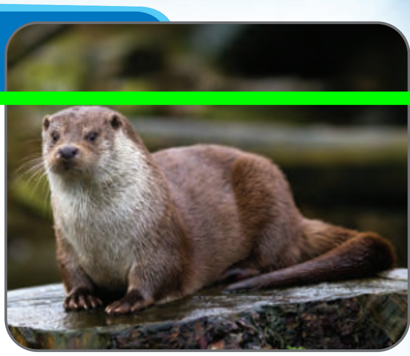
Divide. Then check your answer.

14. $5\overline{)84}$

15. $4\overline{)51}$

16. $8\overline{)89}$

Think and Grow: Modeling Real Life



Example A river otter eats 64 ounces of food each day. A zookeeper has $3\frac{1}{2}$ pounds of fish to feed the otter. Does the zookeeper have enough food to feed the otter for 1 day?

Make a table that shows the relationship between pounds and ounces.

Compare 64 ounces to $3\frac{1}{2}$ pounds.

Pounds	Ounces
3	
$3\frac{1}{2}$	
4	
$4\frac{1}{2}$	

1 pound = _____ ounces

$3 \times$ _____ = _____

$3\frac{1}{2} \times$ _____ = _____

The zookeeper __________ have enough food to feed the otter for 1 day.

Show and Grow *I can think deeper!*

18. The weight limit of a bridge is 10,000 pounds. Can the van cross the bridge?

Weight: $4\frac{1}{4}$ tons

19. Your backpack weighs $3\frac{1}{2}$ pounds. You take a 4-ounce book out of your backpack. How many ounces does your backpack weigh now?

20. **DIG DEEPER!** A 195-pound man has twenty-five 40-pound packages to deliver. Can he bring all of the packages on the elevator at once? Explain.

9. A hippopotamus weighs 4 tons. What is the weight of the hippopotamus in pounds?

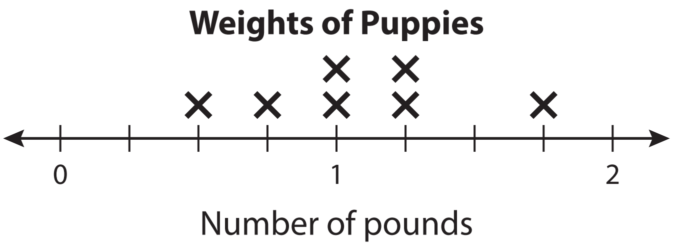
10. **Writing** Explain how to compare tons to ounces.

11. **Modeling Real Life** Workers need 20,000 pounds of concrete to create a driveway. The boss orders $10\frac{3}{4}$ tons of concrete. Does he order enough?

Tons	Pounds
10	
$10\frac{1}{4}$	
$10\frac{2}{4}$	
$10\frac{3}{4}$	
11	

12. **Modeling Real Life** You buy crushed tomatoes in 6-ounce cans. You want to make a recipe that calls for $1\frac{1}{2}$ pounds of crushed tomatoes. How many cans do you need to make the recipe?

13. **DIG DEEPER!** How many more ounces does the heaviest puppy weigh than the lightest puppy?



Review & Refresh

Find the sum.

14. $\frac{2}{8} + \frac{4}{8} =$ ______

15. $\frac{1}{2} + \frac{4}{2} =$ ______

16. $\frac{5}{12} + \frac{3}{12} + \frac{1}{12} =$ ______

Think and Grow: Modeling Real Life

Example There are direct ferry routes between each pair of cities on the map. Draw line segments to represent all of the possible ferry routes. How many ferry routes did you draw in all?

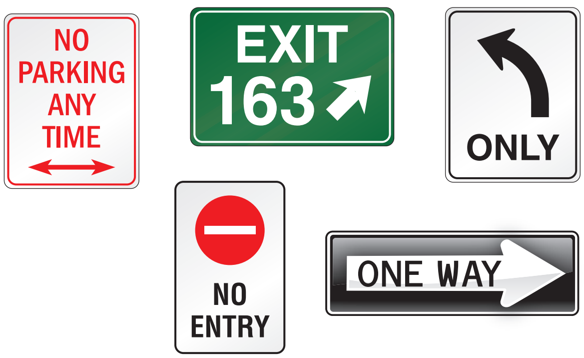
Start at Poole. Draw a line segment from Poole to each of the other cities. Repeat this process until a route is shown between each city.

You draw _____ ferry routes in all.

Show and Grow *I can think deeper!*

14. There are direct flights between each pair of cities on the map. Draw line segments to represent all of the possible flight routes. How many flights routes did you draw in all?

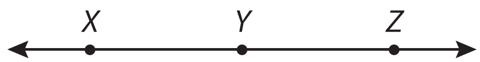
15. Which road signs contain a figure that looks like a ray?



16. Which letters in the banner can be made by drawing line segments? Explain.

10. **Writing** Explain the difference between a line and a line segment.

11. **MP Structure** Name the figure in as many ways as possible.



12. **MP Structure** Draw and label a figure that has four points, two rays, and one line segment.

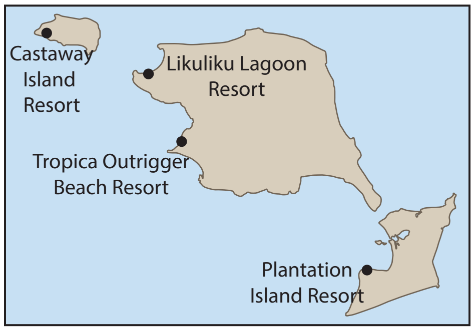
DIG DEEPER! Write whether the statement is *true* or *false*. If false, explain.

13. A line segment is part of a line. ________

14. A ray is part of a line segment. ________

15. There are an infinite number of points on a line. ________

16. **Modeling Real Life** There are direct helicopter flights between each pair of resorts on the map. Draw line segments to represent all of the possible flight routes. How many flight routes did you draw in all?



17. **Modeling Real Life** Which road signs contain a figure that looks like it is made of only line segments?

Review & Refresh

Compare.

18. 0.15 ◯ 0.16 **19.** 2.4 ◯ 2.42 **20.** 6.90 ◯ 6.9

Laurie's Notes

ELL Support

Have students work in pairs to practice verbal language as they complete Exercises 1–6. Have one student ask another, "What is the value of the underlined digit?" Have them alternate roles asking and answering.

Beginner students may write the answer. **Intermediate** students may state the answer. **Advanced** students may answer using a sentence.

Think and Grow

Getting Started

- Posting an anchor chart of the base ten block values and corresponding place values they represent will help students make the connections between the models and the place values. Show expanded, word, and standard forms of a three-digit number so students think about a number in various ways when determining the value of a digit within a three-digit number.
- Introduce the vocabulary card for **place value chart**. Review the difference between place value and value. The place value is either ones, tens, hundreds, or thousands. These connect to the base ten blocks of units, rods, flats, or cubes. The digit is the number of blocks, and the value is the worth of those blocks.
- Introduce the vocabulary cards for **period**, **ones period**, and **thousands period**.

Teaching Notes

- Discuss the place value chart for 427,682. "What does it mean that *the value of each place is 10 times the value of the place to the right*?" This is a key understanding that can be modeled. Comment on the three forms in the chart.
- **Model:** "How does the chart help us find the value of the 5?" 5 is in the one thousands place value so it has a value of 5 one thousands, or 5000. Elicit responses for the questions posed.
- **Turn and Talk:** "How does the value of the digit 4 change from the tens place to the hundreds place?" It went from 40 to 400. "How does this relate to place value?" Moving the 4 from the tens place to the hundreds place increases the value of the number by 10 times.
- In Exercises 1–4, students may only name the digit. Probe by asking about the position of the number. "What changes when the digit moves to another place value position?"
- **Supporting Learners:** Some students may need to build a model or draw a quick sketch. Continue to make Place Value Mats available.
- You may need to model Exercise 5 with students. You are trying to make a correct statement that compares 20 and 200, and there are two multiplicative comparisons: 200 is 10 times 20, and 20 is one-tenth times 200. The latter comparison is more advanced. Start the comparison for them. "The value of 2 in 200 is …" This is the last success criterion.
- "How confident are you with the names of first six place values? Can you tell the value of any digit in a multi-digit number?" Students use their thumbs signals. The last success criterion is related to Exercises 5 and 6. Were students independent in answering Exercise 6?

ELL Support

After completing the examples, have students work in pairs to complete Exercises 1 and 2. Have each student use a different strategy to complete the problems, then compare their processes and answers.

Beginner students may write or draw the steps of the process.
Intermediate students may share their answers using phrases

Indicator 2f - The Teaching Edition indicates that students can continue to use tools as needed for support.

MP5 Use appropriate tools strategically. Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations.... Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Laurie's Notes

Think and Grow

Getting Started

- These strategies are not new, however not all students will recall or be confident in using all of them. Encourage them to refer to the student examples created earlier.
- The familiarity with rounding using place value and the practice of breaking apart numbers using expanded notation will help students with both the partial sums and the compensation strategy.

Teaching Notes

? **Model:** "We are going to use two different strategies to find the sum of 3,025 + 2,160. In the first example we will use partial sums. Why are there blank spaces in the expanded form?" The number 3,025 has 0 hundreds and 2,160 has 0 ones. "Will we need to regroup in this problem? Explain." no; None of the digits in any place value sum to more than 10 of that unit.

- Another way is to use compensation to add. Emphasize that this is a mental math strategy. We are writing it here for further clarification and to record thinking when using this strategy. Normally, it would not be written. Note that the thinking is in past tense. "You added 25 less than 3,025, so you need to add 25 to the answer."
- **Supporting Learners:** Modeling with base ten blocks could be used to visually represent both ways in the example. Particularly when using compensation, students can see the 25 removed (subtracted), and then put back (added) in the thinking process.
- **Model:** Counting on is often used when making change, so students may be familiar with a context for this strategy. Students who are less familiar may be confused about where to begin. Model the language for counting on from the least number.
- Another way is to use compensation to subtract. Again, using compensation is typically a mental math strategy. It is written so students can conceptualize thinking about the steps. Remind them that it is past tense. You subtracted 16 more than 5,984, so you must add 16 to the answer.
- **Supporting Learners:** Providing graph paper will allow more space for calculations. Encourage students to think about their choice before "jumping in."

"You have practiced various strategies for adding and subtracting multi-digit numbers. Can you explain why a certain strategy is a good choice for a problem?"

Laurie's Notes

Meeting the needs of all learners.

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students are asked to find the quotient of two numbers. They build on their understanding of partial quotients and use place value to record the quotient above the dividend, leading to the standard division algorithm. Regrouping one or more groups of 10 into ones may be required when all the groups of 10 cannot be evenly divided by the divisor. Are students able to state the value of each digit in a multi-digit number? Do students understand how to regroup groups of ten into ones?

EMERGING students may not be ready to record the partial quotients above the dividend. They may not be secure in their understanding of place value and may struggle with regrouping. When dividing they may use the digit and not the value of the digit (6 versus 60). Modeling the division with base ten blocks and explicitly connecting the written record to the model will help students build understanding.

- **Exercise 4:** Model using base ten blocks and connect the model to the written record. Use precise language in regard to place value. (i.e., when recording 1 above the dividend say "1 group of 10." When writing 5 below say "5 groups of 10.")
- **Exercises 5–12:** Have students work with a partner to use base ten blocks to model each division. Monitor how students are recording their work.

PROFICIENT students are secure in their understanding of place value and are able to regroup groups of 10 into ones. When dividing, they understand the value of each digit. They also are comfortable with using base ten blocks to model division and understand how to record the division.

- **Exercises 4–12:** Can students predict when the quotient will be two-digits versus one-digit?
- **Exercise 14:** Be sure students understand the value of each missing digit.

Additional Support

- Many students will not be able to transition to recording the quotient above the dividend. Do not force students to use this convention. Continue to encourage them to use base ten blocks and to record the partial quotients vertically. It is important students make sense of the standard algorithm. This cannot be rushed.

Laurie's Notes

Meeting the needs of all learners.

Apply and Grow: Practice

SCAFFOLDING INSTRUCTION

Students continue their study of angles. In this section, they learn to use a protractor to draw and measure angles. They also create a strong mental image of a right angle. They use that image to help them categorize angles as acute or obtuse by observing the angle and comparing it to their image of a right angle.

EMERGING students can measure an angle using a protractor but will sometimes use the wrong scale and get the wrong answer. They also neglect to categorize the angle in every problem. Such an observation can help them to self-check their answer.

- **Exercises 3 and 4:** These are straightforward exercises asking students to measure an angle using their protractor. They are then asked to classify the angle. These students should be able to categorize these angles even before measuring.
- **Exercises 5–8:** Students draw angles with a specific measure using their protractors. A self-check here is to categorize their angles by observation and see if that matches the angle measure.
- **Exercises 9 and 10:** These exercises ask about the technique for using a protractor. Both demand a general understanding of how the protractor can be correctly used to measure angles.

PROFICIENT students can categorize angles as acute or obtuse by observation and use this information to self-check angle measures or angles they draw.

- **Exercises 3–8:** Students use their protractors to measure angles or draw angles with specific angle measures.
- **Exercise 9:** This exercise gets at the basic set up of the protractor, where one side of the angle is paired with 0 on the scale. Why is that so?
- **Exercise 10:** Ask students to explain how Newton might have avoided an incorrect answer if he had categorized the angle as an acute angle.

Extension: Adding Rigor

- Draw a 60° angle and draw a ray down the middle to divide it in half. Use a protractor to measure one of the new angles.

Name ______________________

3.2 Multiply Tens, Hundreds, and Thousands

Learning Target: Use place value to multiply by tens, hundreds, or thousands.

Success Criteria:
- I can find the product of a one-digit number and a multiple of ten, one hundred, or one thousand.
- I can describe a pattern when multiplying by tens, hundreds, or thousands.

Explore and Grow

Use models to find each product. Draw your models.

$4 \times 3 =$ _____	$4 \times 30 =$ _____
$4 \times 300 =$ _____	$4 \times 3{,}000 =$ _____

What pattern do you notice?

MP **Repeated Reasoning** How does 3×7 help you to find $3 \times 7{,}000$? Explain.

Name ____________________

Multiply by Tens 4.1

Learning Target: Use place value and properties to multiply by multiples of ten.

Success Criteria:
- I can use place value to multiply by multiples of ten.
- I can use the Associative Property to multiply by multiples of ten.
- I can describe a pattern with zeros when multiplying by multiples of ten.

Explore and Grow

Model each product. Draw each model.

$2 \times 3 =$ _____	$2 \times 30 =$ _____
$2 \times 300 =$ _____	$2 \times 3{,}000 =$ _____

What pattern do you notice in the products?

MP Repeated Reasoning How can the pattern above help you find 20×30?

Name ______________________

5.1 Divide Tens, Hundreds, and Thousands

Learning Target: Use place value to divide tens, hundreds, or thousands.

Success Criteria:
- I can divide a multiple of ten, one hundred, or one thousand by a one-digit number.
- I can explain how to use place value and division facts to divide tens, hundreds, or thousands.

Explore and Grow

Use a model to find each missing factor. Draw each model. Then write the related division equation.

$\_\_\_\_ \times 2 = 8$	$\_\_\_\_ \times 2 = 80$
$\_\_\_\_ \times 2 = 800$	$\_\_\_\_ \times 2 = 8{,}000$

Indicator 2f - Students analyze their answers above, determine a pattern, and apply that pattern to a new problem.

MP8 Look for and express regularity in repeated reasoning - Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts....As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

What pattern do you notice?

MP **Repeated Reasoning** Explain how $12 \div 4$ can help you find $1{,}200 \div 4$.

6.3

Laurie's Notes

Check out the Dynamic Classroom.
BigIdeasMath.com

STATE STANDARDS
4.OA.B.4

Learning Target

Understand the relationship between factors and multiples.

Success Criteria

- Tell whether a number is a multiple of another number.
- Tell whether a number is a factor of another number.
- Explain the relationship between factors and multiples.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Explain the words *relate* and *relationship*. Draw a family tree and ask students to describe how different individuals are related. Explain that factors and multiples are also related.

Preparing to Teach

This lesson connects much of the work students have been exploring. Factors and divisibility will be related to multiples. Multiples are what we get when multiplying a number by a whole number. Students may be more familiar with finding multiples by skip counting.

Materials

- chart paper

Dig In (Motivate Time)

Students work in small groups to explore multiples and patterns.

- Students work in groups of 2-4. Each group is given chart paper and assigned a number. Numbers should be 6, 5, 4, then continue with the other single digits depending on the number of groups. You might use 8, 2, and 3 as the next numbers assigned. Patterns are more difficult to observe in the multiples of 7 and 9.
- The group lists the multiples of their assigned number on the chart paper, at least to 100, but possibly more. For example, the 6 group will write "6, 12, 18, 24, 30,…"
- **Supporting Learners:** Students can use a hundred chart and/or skip counting if they are not fluent with multiplication facts.
- **MP8 Look for and Express Regularity in Repeated Reasoning:** "What patterns do you notice in your list?" Have students do a gallery walk to look at other lists before sharing as a class. Students should notice last-digit patterns, but may find others.

6, 12, 18, 24, 30,
36, 42, 48, 54, 60,
66, 72, 78, 84, 90,
96, 102, 108, 114, 120

- **Extension:** "Are there multiples of 3 in the 6 list? multiples of 7? multiples of 2 on the 5 list?"
- **Extension:** Distribute the Hundred Chart Instructional Resource and have students shade in the multiples on their list to explore additional patterns and similarities.
- "You have been exploring multiples. The past few days you have been finding factors. Today you are going to learn about the relationship between factors and multiples."

7.2

Check out the Dynamic Classroom.
BigIdeasMath.com

Laurie's Notes

STATE STANDARDS
4.NF.A.1

Learning Target

Use multiplication to find equivalent fractions.

Success Criteria

- Multiply a numerator and a denominator by a chosen number.
- Multiply to find equivalent fractions.
- Explain why multiplication can be used to find equivalent fractions.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Ask students if they know what a generator is. Lead them to understand that it generates energy/electricity, which means that it makes or creates energy. Then ask them what they think the title of the lesson means.

Preparing to Teach

Students explored equivalent fractions in the last lesson. The goal today is for students to recognize that without drawing an area model or number line model, they can use multiplication to find equivalent fractions. Models are used to develop this concept.

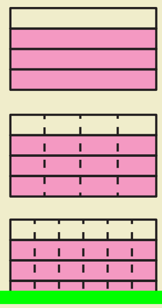
Materials

- whiteboards and markers

Dig In (Motivate Time)

Students use an area model and explore what happens when it is divided into smaller parts. In particular, they examine the number of shaded pieces and the total number of pieces.

- Students work in small groups. Five groups is ideal.
- **Note:** The initial area model can be drawn multiple ways. The sample shown is with horizontal parts. This allows additional parts to be created by drawing vertical lines.
- "Use your whiteboards to draw an area model for $\frac{3}{4}$." Suggest they make it large enough to do some work with! Still leave room to write.
- ? "Why is this a model of $\frac{3}{4}$?" Listen for the whole is divided into four equal parts and three of the parts are shaded.
- "Your group is going to use your model to find an equivalent fraction for $\frac{3}{4}$, and each group will find a different equivalent fraction. I will tell you how many equal parts you need."
- Give each group a different number of equal parts but do not announce the numbers in order: 12, 20, 8, 16, 24. "Discuss how you will accomplish the task before you start working."
- You want all of the groups to present their models and explain how they accomplished the task. They should name their fraction and explain how they know it is equivalent to $\frac{3}{4}$.



$\frac{3}{4}$

$\frac{9}{16}$

$\frac{18}{24}$

- ? **MP8 Repeated Reasoning:** Listen for the same quantity is shaded, meaning it is still $\frac{3}{4}$ of the whole. Do students recognize that each original part $\left(\frac{1}{4}\right)$ was divided into three equal parts making twelve equal parts?
- Record the equivalent fractions groups find. Ask for observations. They may mention multiplication facts without observing multiplication as a method for finding equivalent fractions.
- "You found equivalent fractions for $\frac{3}{4}$ and observed patterns involving multiplication. Today, you will learn how to use multiplication to find equivalent fractions."

? Teaching Prompt   Learning Target

10.4

Laurie's Notes

Check out the Dynamic Classroom.
BigIdeasMath.com

STATE STANDARDS
4.NF.C.7

Learning Target

Compare decimals to the hundredths place.

Success Criteria

- Choose a strategy to compare two decimals.
- Use the symbols <, >, and = to compare two decimals to the hundredths place.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Review the symbols <, >, and = and their meanings. You may want to review strategies for comparing fractions or whole numbers.

Preparing to Teach

Students compared whole numbers in Chapter 1 using inequality symbols. They also used equivalent fractions in order to compare fractions. The strategies used to compare whole numbers are applied to decimals in this lesson.

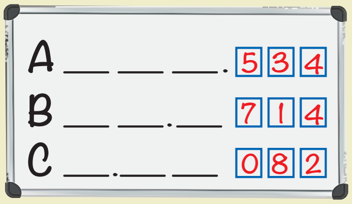
Materials

- whiteboards and markers
- base ten blocks
- Decimal Place Value Mat (Hundredths)*
- Decimal Squares-Tenths*
- Decimal Squares-Hundredths*

**Found in the Instructional Resources*

Dig In (Motivate Time)

Students are given three digits and asked to fill in the blanks to form the greatest and least numbers possible.



- Distribute whiteboards and markers. Explain that you are going to give them three numbers and the blanks to fill in for a number. See three samples.
- "Use the numbers 5, 3, and 4 to form the greatest number possible and then the least number possible." Circulate and observe.
- **MP3 Construct Viable Arguments:** "How do you know your first number is the greatest number possible?" The hundreds place is the greatest place value, so put the greatest number there. Put the next greatest number in the tens place. Write the least number in the ones place. Ask for similar reasoning for the least number possible.
- Draw two copies of Example B and have students write the greatest and least mixed numbers using 7, 1, and 4. Again, ask students to share their strategy. Do they understanding that tens and ones are both greater place values than tenths?
- Repeat similar directions and questioning for Example C using the numbers 0, 8, and 2.
- **MP8 Look for and Express Regularity in Repeated Reasoning:** "Are you hearing similar reasoning for all three examples?" Do students notice the reversal of the digits going from greatest to least (543 versus 345)?
- "In today's lesson you are going to compare decimals to the hundredths place. In Example 3, 8.20 was the greatest number you could write and 0.28 was the least."

Teaching Prompt
Learning Target

Name ______________________

1.3 Compare Multi-Digit Numbers

Learning Target: Use place value to compare two multi-digit numbers.

Success Criteria:

- I can explain how to compare two numbers with the same number of digits.
- I can use the symbols <, >, and = to compare two numbers.

Explore and Grow

Goal: Make the greatest number possible.

Draw a Number Card. Choose a place value for the digit. Write the digit in the place value chart. Continue until the place value chart is complete.

Thousands Period			Ones Period		
Hundreds	**Tens**	**Ones**	**Hundreds**	**Tens**	**Ones**

Compare your number with your partner's. Whose number is greater?

MP **Construct Arguments** Explain your strategy to your partner. Compare your strategies.

Name ______________________

Use Strategies to Add and Subtract

2.4

Learning Target: Use strategies to add and subtract multi-digit numbers.

Success Criteria:

- I can use strategies to add multi-digit numbers.
- I can use strategies to subtract multi-digit numbers.

Explore and Grow

Choose any strategy to find 8,005 + 1,350.

Addition and Subtraction Strategies
Partial Sums
Compensation
Counting On
Regrouping

Choose any strategy to find 54,000 − 10,996.

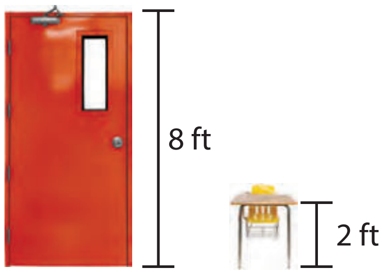
MP **Reasoning** Explain why you chose your strategies. Compare your strategies to your partner's strategies. How are they the same or different?

7. The House of Representatives has 335 more members than the Senate. The Senate has 100 members. How many members does the House of Representatives have?

8. A lion's roar can be heard 5 miles away. The vibrations from an elephant's stomp can be felt 4 times as many miles away as the lion's roar can be heard. How many miles away can the vibrations be felt?

9. MP **Reasoning** Newton says the equation $270 = 30 \times 9$ means 270 is 30 times as many as 9. Descartes says it means 270 is 9 times as many as 30. Explain how you know they are both correct.

10. MP **Precision** Compare the door's height to the desk's height using multiplication and addition.



11. **Open-Ended** Write a comparison statement for a sum of 28.

12. **Modeling Real Life** There are 12 shepherds and retrievers in all at a dog park. There are 2 times as many shepherds as retrievers. How many retrievers are there?

13. **Modeling Real Life** Pythons sleep 6 times as long as horses. Horses sleep 3 hours each day. How many hours do pythons sleep each day?

14. **DIG DEEPER!** You have 8 times as many dimes as nickels. You have 18 dimes and nickels altogether. How much money do you have in all?

Review & Refresh

Find the missing factor.

15. $7 \times \_\_\_\_ = 280$	**16.** $\_\_\_\_ \times 30 = 270$	**17.** $8 \times \_\_\_\_ = 640$
18. $\_\_\_\_ \times 90 = 540$	**19.** $2 \times \_\_\_\_ = 40$	**20.** $\_\_\_\_ \times 50 = 350$

Name ________________________

5.5 Use Partial Quotients with a Remainder

Learning Target: Use partial quotients to divide and find remainders.

Success Criteria:

- I can use partial quotients to divide.
- I can find a remainder.

Explore and Grow

Use an area model to find 125 ÷ 5.

Can you use an area model to find 128 ÷ 5? Explain your reasoning.

MP **Construct Arguments** Explain to your partner how your model shows that 5 does *not* divide evenly into 128.

Name ____________________

Indicator 2g.i - In #14, students must build a logical argument to defend how they know whether a fraction is greater than, less than, or equal to 1 just by looking at it.

MP3 Construct viable arguments and critique the reasoning of others. Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and -- if there is a flaw in an argument -- explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades.... Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Apply and Grow: Practice

Compare. Use a model to help.

4. $\frac{4}{12} \bigcirc \frac{7}{10}$

5. $\frac{1}{2} \bigcirc \frac{3}{6}$

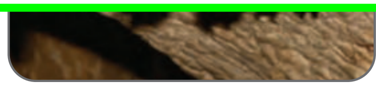
7. $\frac{5}{5} \bigcirc \frac{12}{12}$

8. $\frac{4}{2} \bigcirc \frac{7}{10}$

10. $\frac{5}{4} \bigcirc \frac{3}{8}$

11. $\frac{6}{12} \bigcirc \frac{4}{5}$

13. A black bear hibernates for $\frac{7}{12}$ of 1 year. A ba
hibernates for $\frac{1}{4}$ of 1 year. Which animal hibernates longer? How do you know?



14. **Writing** Explain how you can tell whether a fraction is greater than, less than, or equal to 1, just by looking at the numerator and the denominator.

15. **DIG DEEPER!** You and your friend pack a lunch. You eat $\frac{2}{6}$ of your lunch. Your friend eats $\frac{3}{4}$ of his lunch. Can you tell who ate more? Explain.

Compare. Use a model to help.

4. $\frac{9}{10} \bigcirc \frac{97}{100}$

5. $\frac{3}{8} \bigcirc \frac{2}{6}$

6. $\frac{1}{3} \bigcirc \frac{4}{12}$

7. $\frac{7}{2} \bigcirc \frac{6}{5}$

8. $\frac{1}{10} \bigcirc \frac{2}{12}$

9. $\frac{3}{4} \bigcirc \frac{4}{6}$

10. MP **Structure** Compare $\frac{3}{8}$ and $\frac{1}{4}$ two different ways.

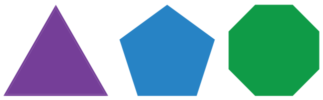
11. **Modeling Real Life** A sailor is making a ship in a bottle. The last thing he needs to do is seal the bottle with a cork stopper. He tries a $\frac{3}{4}$-inch cork stopper, but it is too small. Should he try a $\frac{1}{2}$-inch cork stopper or a $\frac{4}{5}$-inch cork stopper next? Explain.

12. **DIG DEEPER!** Order the lengths of hair donated from greatest to least.

Student	Hair Lengths Donated (feet)
Student A	$\frac{3}{4}$
Student B	$\frac{11}{12}$
Student C	$\frac{5}{6}$

Review & Refresh

13. Extend the pattern of shapes by repeating the rule "triangle, pentagon, octagon." What is the 48th shape in the pattern?



_____ _____ _____ _____ _____ _____ …

Name ______________________

8.3 Add Fractions with Like Denominators

Learning Target: Add fractions with like denominators.

Success Criteria:

- I can use models to add fractions.
- I can use a rule to add fractions.
- I can explain how to add fractions with like denominators.

Explore and Grow

Write each fraction as a sum of unit fractions. Use models to help.

$\frac{3}{6}$	$\frac{5}{6}$

How many unit fractions did you use in all to rewrite the fractions above? How does this relate to the sum $\frac{3}{6} + \frac{5}{6}$?

MP Construct Arguments How can you use the numerators and the denominators to add fractions with like denominators? Explain why your method makes sense.

7. **MP Reasoning** Without calculating, is the product of 7 and $5\frac{3}{4}$ greater than or less than 35? Explain.

8. **YOU BE THE TEACHER** Your friend finds the product of 4 and $2\frac{8}{10}$. Is your friend correct? Explain.

$$4 \times 2\frac{8}{10} = (4 \times 3) - \left(4 \times \frac{2}{10}\right)$$
$$= 12 - \frac{8}{10}$$
$$= \frac{112}{10}$$
$$= 11\frac{2}{10}$$

9. **Number Sense** Between which two whole numbers does the product of 9 and $7\frac{1}{8}$ lie?

10. **Modeling Real Life** Athlete A holds a $2\frac{1}{2}$-kilogram plate while doing squats. Athlete B holds a plate that is 4 times heavier than Athlete A's. How many kilograms is the plate held by Athlete B?

11. **DIG DEEPER!** A zoo nutritionist orders $5\frac{1}{4}$ tons of apples and $7\frac{2}{4}$ tons of bananas each year to feed the animals. She orders 6 times as many tons of herbivore pellets than tons of fruit. How many tons of herbivore pellets does the nutritionist order?

Review & Refresh

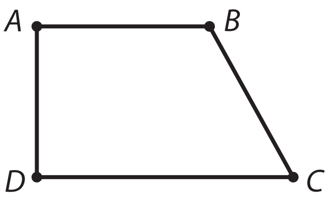
Subtract.

12. $9\frac{1}{4} - 6\frac{1}{4} =$ ______

13. $6\frac{1}{3} - 2\frac{2}{3} =$ ______

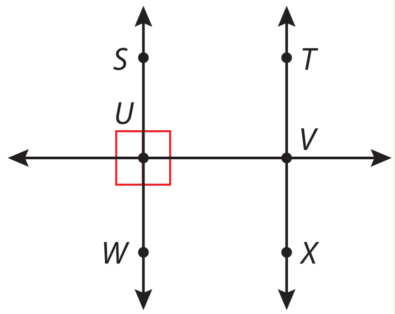
14. $8\frac{4}{12} - 1\frac{10}{12} =$ ______

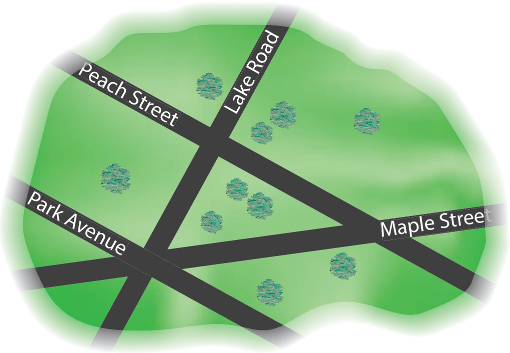
6. **MP Structure** Name two line segments that appear to be parallel. Then name two line segments that appear to be perpendicular.



7. **MP Reasoning** Can two lines that share a point be parallel? Explain.

8. **DIG DEEPER!** $\overleftrightarrow{SW}$ is parallel to $\overleftrightarrow{TX}$, and $\overleftrightarrow{SW}$ is perpendicular to $\overleftrightarrow{UV}$. Can angle $\angle TVU$ be acute? Explain.

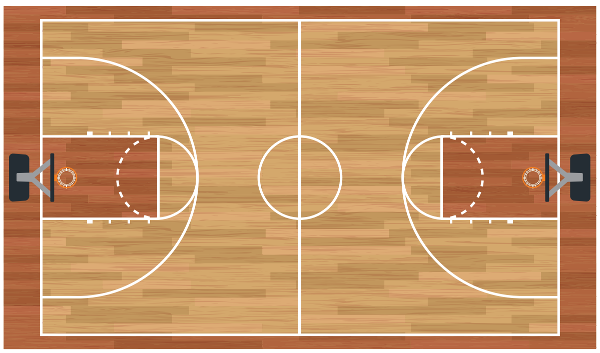




9. **Modeling Real Life** Which street appears to be parallel to Park Avenue?

10. **Modeling Real Life** Which street appears to be perpendicular to Peach Street?

11. **Modeling Real Life** Trace and label a pair of line segments that appear to be parallel and a pair of line segments that appear to be perpendicular.



Review & Refresh

Find the equivalent amount of time.

12. 20 min = ______ sec

13. 6 yr = ______ wk

Name ____________________

Classify Triangles by Angles 14.4

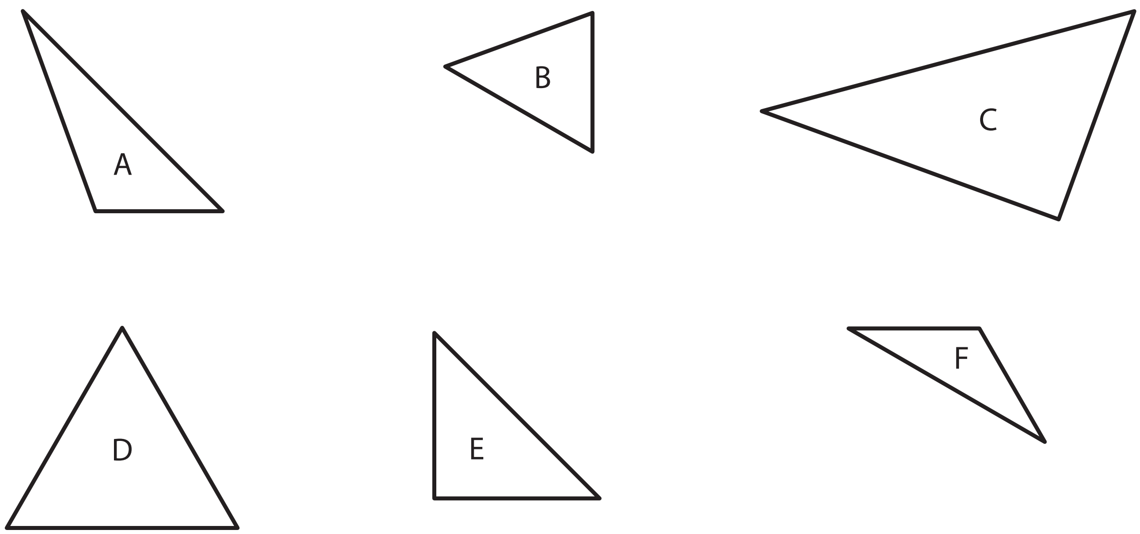
Learning Target: Classify triangles by their angles.

Success Criteria:

- I can identify an angle as right, acute, or obtuse.
- I can use angles to classify a triangle.
- I can use angles and sides to classify a triangle.

Explore and Grow

Sort the triangles into two or more groups using their angle measures. Explain how you sorted the triangles.



MP **Construct Arguments** Your friend says a triangle that has three angles with the same measure also has three sides with the same length. Is your friend correct? Explain.

Name ____________________

4.2 Estimate Products

Learning Target: Use rounding and compatible numbers to estimate products.

Success Criteria:

- I can use rounding to estimate a product.
- I can use compatible numbers to estimate a product.
- I can explain different ways to estimate a product.

Explore and Grow

Choose an expression to estimate each product. Write the expression. You may use an expression more than once.

20×20	20×25
25×40	40×20

21×24	26×38	23×17	42×23
20 $\times$ **25**	**25** $\times$ **40**	**20** $\times$ **20**	**40** $\times$ **20**

Compare your answers with a partner. Did you choose the same expressions?

Check students' work.

MP **Construct Arguments** Which estimated product do you think will be closer to the product of 29 and 37? Explain your reasoning.

25×40

30×40

25 is less than 29 and 40 is greater than 37. Rounding one factor down and one factor up will produce an estimate that is closer to the actual product.

Explore and Grow

- Discourage student from actually computing any of these products.
- Emphasize the direction *You may use an expression more than once.* This is not a matching activity, and there are several correct answers.
- If students did not select the same factors, have them explain to one another why they selected the factors they did.
- **MP3 Construct Viable Arguments:** Listen for students to support their choice with logical reasoning. Models and drawing may be part of their explanation.

Name ____________________

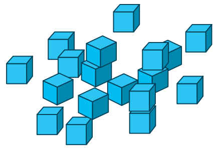
5.3 Understand Division and Remainders

Learning Target: Use models to find quotients and remainders.

Success Criteria:
- I can use models to divide numbers that do not divide evenly.
- I can find a quotient and a remainder.
- I can interpret the quotient and the remainder in a division problem.

Explore and Grow

Use base ten blocks to determine whether 14 can be divided equally among 2, 3, 4, or 5 groups. Draw and describe your models.



2 equal groups	3 equal groups
$2 \times 7 = 14$	$3 \times 4 = 12$ $12 + 2 = 14$
4 equal groups	**5 equal groups**
$4 \times 3 = 12$ $12 + 2 = 14$	$5 \times 2 = 10$ $10 + 4 = 14$

MP **Structure** Explain why the units that are left over cannot be put into a group.

The units left over are less than the number of equal groups.

Explore and Grow

- Even if you have done the Dig In, it's important for each student to draw the quick sketch and describe what their model means.
- Base ten blocks are used to make the connection to place value. Students should begin by regrouping a ten as 10 ones.
- The groups should be distinguishable. Drawing a ring is sufficient.
- **MP3 Construct Viable Arguments:** Have several students share why the units left over could not be put into a group.
- **MP6 Attend to Precision:** Do not suggest 14 ÷ 4 cannot be done. It can. The quotient is 3.5 or $3\frac{1}{2}$. The division cannot be done *a whole number of times*.

Laurie's Notes

Think and Grow

Getting Started

- Students will recognize the pattern blocks pictured. Review the shape names to aid in discussing student thinking. The first example is a repeating pattern, while the second example is a growth pattern.

Teaching Notes

? **Model:** Read the first example directions aloud. Point to the pattern pictured. "What comes next?" green triangle "How many shapes are used before a repeat occurs in this pattern?"

? **Turn and Talk:** "How will this help you figure out what shape is the 42nd shape?"

- **MP3 Construct Viable Arguments:** Solicit explanations as to how they can find the 42nd shape. Ask other students to critique each other's reasoning.
- **Model:** "Describe the dot pattern to your partner and how to continue the pattern." Some may describe the pattern as an *add 4* pattern. This is true, but won't be helpful when determining a much later position. Some will see multiples of 4 or will notice the figure number matches the number of columns. Both of these together can be used to determine there are 100 dots in the 25th figure.
- Exercise 1 may be confusing to some, as the triangle is repeated within the repeating pattern. Extending the pattern multiple times if necessary will help to clarify this.
- **Extension:** Refer to the first example. Challenge students to find the shape at a variety of other positions. Students can work with partners to challenge one another.
- **Supporting Learners:** Patterns can be extended further if desired to help students make a visual connection. Provide pattern blocks and dot paper.

"You have had to do some good thinking about the patterns! To figure out what shape is at a given position in a pattern, you had to describe the pattern first. What shapes are there before it starts to repeat? Are you feeling pretty confident at this point? Is there a part that is still challenging for you? Can you describe the challenge?"

ELL Support

After reviewing the examples, have students work in groups to discuss and complete Exercises 1 and 2. Expect students to perform according to their language proficiency level.

Beginner students may draw patterns and write one-word answers.
Intermediate students may draw and use phrases and simple sentences to discuss.
Advanced students may use detailed sentences and help guide discussion.

7.3

Laurie's Notes

Check out the Dynamic Classroom.
BigIdeasMath.com

COMMON CORE STATE STANDARDS
4.NF.A.1

Learning Target

Use division to find equivalent fractions.

Success Criteria

- Find the factors of a number.
- Find the common factors of a numerator and denominator.
- Divide to find equivalent fractions.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Remind students that in everyday language a factor is a circumstance that influences an outcome. Then ask them to explain what a factor is in math. Clarify any misunderstandings. Then discuss the meaning of the term *common factor*.

Preparing to Teach

Students are familiar with the inverse relationship between multiplication and division. If you can find equivalent fractions by multiplying the numerator and denominator of a fraction by the same number, can you also divide each by the same number? Yes, if the number is a factor of both numbers. Note that while $\frac{1}{2}$ is the simplified fraction for $\frac{12}{24}$, our focus is on the process. The fractions $\frac{12}{24}$ and $\frac{1}{2}$ are equivalent, and we show that by dividing the numerator and denominator of $\frac{12}{24}$ by 12.

Materials

- whiteboards and markers

Dig In (Motivate Time)

Students write fractions that are equivalent to fractions you write on the board. Although it has not been shown yet, many students will intuitively divide the numerator and denominator by a common factor. Some students will not.

- "You have used models and multiplication to find equivalent fractions. I'm going to write some fractions and I want you to write a fraction that is equivalent to mine." Write $\frac{7}{14}$.
- Have students display their whiteboards. You will likely have at least two correct answers. Ask a student who multiplied to explain how they know they are correct. Then ask a student who wrote $\frac{1}{2}$ to explain.

$\frac{7}{14}$
Student A: $\frac{1}{2}$
Student B: $\frac{14}{28}$

- **MP3 Critique the Reasoning of Others:** "What do you think of [Student A]'s reasoning? Do you think you can always divide both the numerator and denominator by the same number?"
- "Let's try a few more examples." Examples: $\frac{4}{8}$, $\frac{10}{15}$, $\frac{20}{25}$, and $\frac{50}{150}$. Each time have students display their fractions and call on a few to explain their process.
- "You have found equivalent fractions by multiplying and dividing. You divided the numerator and denominator by the same number. On the Explore and Grow page, we will look at area models to help us make sense of why division can be used to find equivalent fractions."

7.4

Laurie's Notes

Check out the Dynamic Classroom.
BigIdeasMath.com

COMMON CORE STATE STANDARDS
4.NF.A.2

Learning Target

Compare fractions using benchmarks.

Success Criteria

- Compare a fraction to a benchmark of $\frac{1}{2}$ or 1.
- Use a benchmark to compare two fractions.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Write the word *benchmark* on the board and ask students what two words they can identify in it. Explain that often a compound word means something completely different from the meanings of its parts. A benchmark is a standard with which you compare something. In math, it is a number with which you compare other numbers.

Preparing to Teach

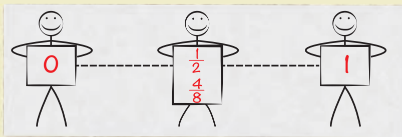
We want students to have a good understanding of the benchmarks $\frac{1}{2}$ and 1. Benchmarks are quantities that we use often and they can be used as a reference. In this lesson, students compare a fraction to a benchmark and also compare two fractions by comparing each to the same benchmark.

Materials

- index cards
- string

Dig In (Motivate Time)

Students use a number line and locate fractions equivalent to $\frac{1}{2}$. Then they estimate the location of a fraction greater than or less than $\frac{1}{2}$.



- "Some numbers are commonly used for comparisons or reference points. The fraction $\frac{1}{2}$ is very common and we call it a benchmark. We w

Indicator 2g.ii - The Teaching Edition encourages teachers to ask probing questions to engage students in constructing arguments and analyzing the arguments of others.

- "I need two volu number line." Ask labels 0 and 1. "N them a label with
- **MP3 Construct Viable Arguments:** "How do you know where to stand? Do you agree with [Name]'s explanation?"
- **Turn and Talk:** "Tell your partner a fraction that is equivalent to $\frac{1}{2}$." Elicit responses. Expect to hear $\frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{6}{12}, \frac{10}{20}, \frac{50}{100}$.
- "Where would $\frac{4}{8}$ be located?" Ask about other equivalent fractions. Do students understand that all of them are located at $\frac{1}{2}$? Hand the student at $\frac{1}{2}$ a label with $\frac{4}{8}$ written on it.
- Write $\frac{5}{8}$ on an index card. "Where is $\frac{5}{8}$ located?" Ask a volunteer to position themselves where they think $\frac{5}{8}$ would be and explain their reasoning. Do the same with $\frac{3}{8}$. Repeat with other fractions.
- You are listening for students to compare their numbers to $\frac{1}{2}$.
- "You have compared a fraction to $\frac{1}{2}$. You know that 4 out of 8 equal parts is equivalent to $\frac{1}{2}$, so 3 out of 8 equal parts is less than $\frac{1}{2}$. Use your thumb signals to show how confident you are in naming fractions equivalent to $\frac{1}{2}$."

? Teaching Prompt   ◉ Learning Target

Name ________________

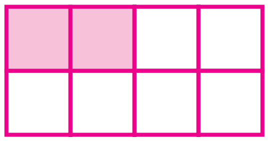
8.1 Use Models to Add Fractions

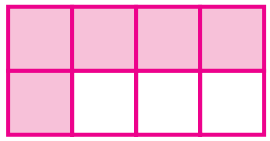
Learning Target: Use area models and number lines to add fractions.

Success Criteria:
- I can use an area model to add fractions.
- I can use a number line to add fractions.
- I can explain what it means to add fractions.

Explore and Grow

Draw models to show $\frac{2}{8}$ and $\frac{5}{8}$.





Use your models to find $\frac{2}{8} + \frac{5}{8}$. Explain your method.

$\frac{7}{8}$; ***Sample answer:*** **There are 2 + 5, or 7 parts shaded.**

MP **Repeated Reasoning** Write two fractions that have a sum of $\frac{6}{8}$. Explain your reasoning.

Sample answer: $\frac{2}{8} + \frac{4}{8} = \frac{2+4}{8} = \frac{6}{8}$

Explore and Grow

- If you have done the Dig In you may want to move to the Think and Grow.
- **MP4 Model with Mathematics:** Ask several volunteers to share their models. Hopefully, you will have both number line and area models.
- **MP3 Construct Viable Arguments:** "You added the numerators to get 7. You did not you add the denominators to get 16. Can you explain why?" You want to hear reference to the units, or parts (eighths). When you add 2 tens and 5 tens you get 7 tens, not 7 *twenties*. The units (parts) remain the same.

Name ____________________

Add Mixed Numbers 8.7

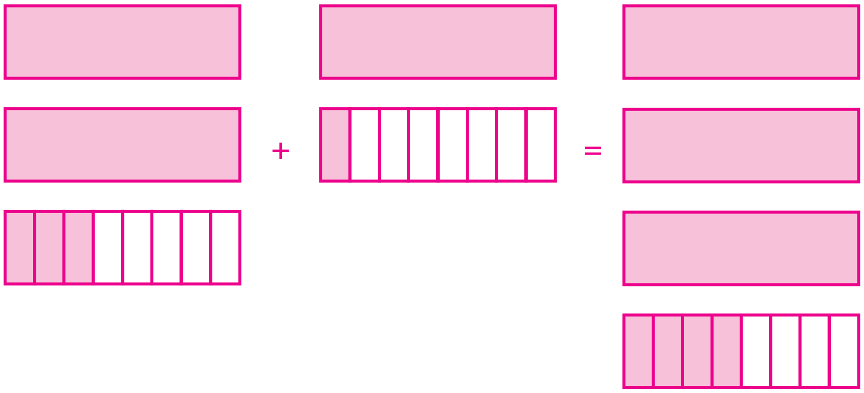
Learning Target: Add mixed numbers with like denominators.

Success Criteria:

- I can add fractional parts and whole number parts of mixed numbers with like denominators.
- I can use equivalent fractions to add mixed numbers with like denominators.
- I can explain two ways to add mixed numbers with like denominators.

Explore and Grow

Use a model to find $2\frac{3}{8} + 1\frac{1}{8}$.



$2\frac{3}{8}$ + $1\frac{1}{8}$ = $3\frac{4}{8}$

Construct Arguments How can you use the whole number parts and the fractional parts to add mixed numbers with like denominators? Explain why your method makes sense.

Add the whole number parts.
Add the numerators (with like denominators).
A mixed number is the sum of the whole number parts and the fractional parts.

Explore and Grow

- Circulate as students draw the models. Are they using the same size unit for the whole and the fraction? Are they drawing eighths fairly accurately? If you have not shown them a strategy for drawing eighths, this would be a good time. Drawing them in order, left to right, is difficult and generally not accurate.
- **MP3 Construct Viable Arguments:** Discuss the questions posed. Are they connecting their argument to the definition of a mixed number? It is the sum of a whole number and a fraction. They may say $2\frac{3}{8} = 2 + \frac{3}{8}$ and $1\frac{1}{8} = 1 + \frac{1}{8}$. So, $2 + \frac{3}{8} + 1 + \frac{1}{8} = 3 + \frac{4}{8}$ or $3\frac{4}{8}$.

ELL Support

Explain that $1 is a bill and that other common bills include $5, $10, and $20. After demonstrating the examples, have students work in groups to discuss and complete Exercise 1. Expect students to perform according to their language proficiency level.

Beginner students may write numbers and draw money to support work on the problem.
Intermediate students may use phrases or simple sentences to contribute to discussion.
Advanced students may use detailed sentences and help guide discussion.

Laurie's Notes

Think and Grow

Getting Started

- Students have not studied decimal operations, so the exercises are intentionally concrete and visual. Life experiences students have had or not had with money will be evident in this lesson.

Teaching Notes

- There are four examples, each one solved by one of the operations, although students may use different strategies.
- Have students work in small groups to solve all four examples. They should be prepared to describe their solution strategy.
- Give students less than 10 minutes to finish all four examples and then pull them back together for a class discussion.
- **MP3 Construct Viable Arguments:** Focus on one example at a time. Ask a volunteer from a group to (a) explain their strategy for solving and (b) why the strategy makes sense. The focus is on the process, not the answer.
- **MP3 Critique the Reasoning of Others:** Ask volunteers from other groups to critique the reasoning offered. Did they give a valid reason for the strategy they used? Again, focus on the process not the answer. How they carried out the strategy may vary.
- **Extension:** "In the last example, could three friends share the money equally? How about four friends?" Explain.
- Exercise 1 is a division problem. Most students will need to draw or manipulate play money in order to solve. Some will write the division problem 225 ÷ 3. Ask them to share their reasoning with the class. How did they know to divide? What does 225 represent? If solving the problem with play money they will need to regroup and exchange bills and coins just as is done with the written division problem. Two dollar bills cannot be divided into three groups, so regroup $2 as eight quarters.
- "You have used the four operations to solve a number of problems. What helped you know which operation to use?" Have students share their thinking with a partner and then discuss as a class. The problems require a conceptual understanding of each operation. The situation or context is understood by the students and that is the key to knowing what operation to perform.

2.1

Laurie's Notes

Check out the Dynamic Classroom.
BigIdeasMath.com

STATE STANDARDS
4.NBT.A.3, 4.NBT.B.4

Learning Target

Use rounding to estimate sums and differences.

Success Criteria

- Use rounding to estimate a sum.
- Use rounding to estimate a difference.
- Explain what happens when I round to different place values.

Warm-Up

Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*

- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support

Discuss the words *sum* and *difference*. The word *sum* is a homophone that sounds like *some*. Urge them to listen to context so they understand which is meant. Explain that *difference* has another meaning in everyday life. It is used when comparing things—to point out the parts that are not the same.

Preparing to Teach

Students used both number lines and place value to round in the last chapter. In this lesson, students will make the connection that rounding can be used as a form of estimation. They will explore when estimating is "all that is needed" versus accuracy. Later, they will use rounding as a form of estimation to check multi-digit sums and differences for reasonableness.

Materials

- index cards

Dig In (Motivate Time)

Students will explore situations to determine if rounding is "good enough" or if an exact answer is needed.

- Create a list of relevant situations on index cards for your students, such as the following:
  - Borrow markers from the art room for our posters.
  - Ask the cafeteria for enough spoons for our class.
  - Read for about half an hour this afternoon.
  - Practice math facts for a short time every day.
  - Study your spelling words for the test tomorrow.
- Create enough situations for each student or group.
- **Turn and Talk:** Discuss with your partner possible amounts that answer your situation. "Is an exact amount needed, or is an "about" amount good enough?"
- Come back to the large group. Help students sort the cards into two groups: Exactly vs. About.
- If time allows, have students generate more ideas for the discussion.
- "Today you are going to practice rounding to different place values to estimate adding and subtracting multi-digit numbers. Why will this be helpful?"

Laurie's Notes

ELL Support

Have students work in pairs to practice verbal language as they complete Exercises 1–4. Have one student ask another the following, as appropriate: "What is your addition comparison? multiplication comparison? equation?" Have them alternate roles asking and answering questions.

Beginner students may write the answers.

Intermediate and **Advanced** students may read aloud the answers.

Think and Grow

Getting Started

- A tape diagram is a visual model for a multiplication relationship.
- A bar diagram is a visual model for an addition relationship.
- The Commutative Property is used in this lesson in order to write two comparison sentences for one known fact such as $24 = 4 \times 6$.

Teaching Notes

- Review what a tape diagram is if you did not use the folded paper activity for the Dig In. Note there are two different tape diagrams for 24. There is also an additional section above each tape diagram that represents the number 24 is being compared to.
- **Model:** "The two tape diagrams are models for the equation $24 = 4 \times 6$. How are the models the same? How are they different? Tell your partner what you think." Listen for both models represent the number 24. One has four sections of 6 and the other has six sections of 4.
- "You can write two comparison sentences for the multiplication equation $24 = 4 \times 6$: 24 is 4 *times* as many as 6 and 24 is 6 *times* as many as 4."
- "What other language can you use to compare two numbers?" Listen for greater than, less than, more, fewer, greater, less, and so on.
- **Model:** This example begins with the comparison sentences and students write the equations. "A bar diagram shows the relationship between two parts and the whole. The parts are 4 and 8 and the whole is 12." Record $12 = 4 + 8$. In the second problem 12 is 3 times (3 is the number of sections) as many as 4 (the value of each part) so $12 = 3 \times 4$.
- **MP6 Attend to Precision:** Both examples compare the numbers 4 and 12. You want students to be able to distinguish between the additive comparison (12 is 8 more than 4) and the multiplicative comparison (12 is 3 times as many as 4).
- **Supporting Learners:** Focus on how to interpret a bar diagram and a tape diagram.
- Note the difference in Exercises 3 and 4. Some students may need to build the arrays and that is okay.
- "You have written comparison sentences from a multiplication equation. You have also written addition and multiplication equations from a comparison sentence. Do you see these two problems reverse the direction of your thinking?"

5.8

Check out the Dynamic Classroom.
BigIdeasMath.com

Laurie's Notes

Learning Target
Divide by one-digit numbers.

Success Criteria
- Use place value to divide.
- Explain why there might be a 0 in the quotient.
- Find a quotient and a remainder.

Warm-Up
Practice opportunities for the following are available in the Resources by Chapter or at *BigIdeasMath.com.*
- Daily skills
- Vocabulary
- Prerequisite skills

ELL Support
Review the meanings of the words *quotient* and *remainder*. Ask students to explain each. Perform several division problems that include remainders and ask them to identify an example of each within each problem.

COMMON CORE STATE STANDARDS
4.NBT.B.6

Preparing to Teach

Students continue to investigate division by one-digit numbers and in this lesson the focus is on zeros in the quotients or dividend. Regrouping thousands, hundreds, or tens will be necessary, and attention to place value is very important. Again, work with base ten blocks so students develop a conceptual understanding of how we record our thinking in the standard algorithm.

Materials
- base ten blocks
- whiteboards and markers

Dig In (Motivate Time)

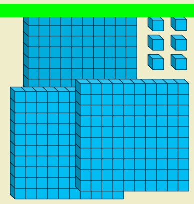
Students use base ten blocks to find a quotient where there is a zero in the quotient.

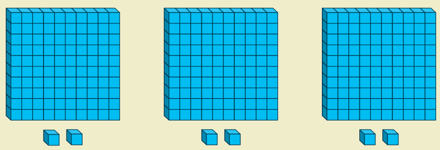
Indicator 2g.ii - The Teaching Edition encourages teachers to ask probing questions to engage students in using what they have learned to construct a logical argument.

- "I want you to ... 306 ÷ 3." State ... problem. (306 ... each row?)

? "What is a reasonable estimate and why?" Some students will know the exact quotient. Ask them to explain their thinking.

? MP5 Use Appropriate Tools Strategically: It is important for students to manipulate the base ten blocks to see that there are no tens in the quotient. The first figure shows 306. "Tell your partner how to divide the hundreds into three groups." Put 1 hundred in each group. "What remains?" There are 6 ones. "Are there any tens to divide?" no "Can you divide the 6 ones into three groups?" yes, 2 in each group.





- Guide students through the process of recording on their whiteboards the steps taken to find 306 ÷ 3. Probe student understanding of why the 0 placeholder is needed in the quotient. "How would the answer be read if we didn't use the zero?"

hundreds
ones

$$\begin{array}{r l} 102 & \\ 3\overline{)306} & \\ \underline{3} & \text{3 hundreds} \\ 006 & \\ \underline{-6} & \text{6 ones} \\ 0 & \end{array}$$

- **Extension:** Find 360 ÷ 3.

◉ "You used the base ten blocks to find 306 ÷ 3. You had a quotient with a 0 in the tens place. Today you are going to do more division where there may be zeros in the quotient or dividend."

? Teaching Prompt ◉ Learning Target

ELL Support

Have students work in pairs to practice verbal language as they complete Exercises 1–4. Provide the following questions to guide their work: “What number do you multiply the numerator and denominator by? What is the new numerator? What is the new denominator? Expect students to perform according to their language proficiency level.

Beginner students may write fractions, and contribute to discussion with phrases.
Intermediate students may write fractions and use simple sentences to contribute to discussion.
Advanced students may use sentences to contribute to discussion.

Laurie’s Notes

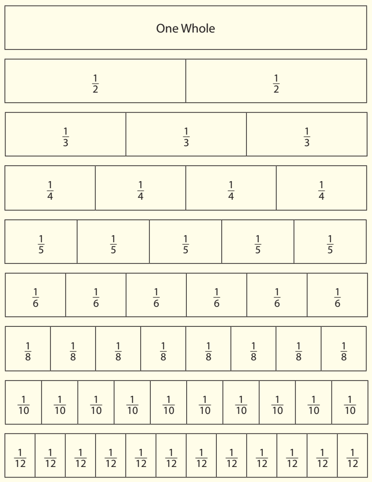
Think and Grow

Getting Started

- Add to the anchor chart. If the area model and number line model of equivalent fractions have been drawn, annotate with multiplication strategy.

Teaching Notes

- Write the procedure for finding equivalent fractions. Make the connection to earlier examples students have done.
- **Model:** “We want to find fractions equivalent to $\frac{3}{5}$. We need to multiply the numerator and denominator by the same number. In the example, we multiply by 2.” Point to the area model. “The amount of the whole that is shaded stayed the same. The number of pieces doubled (5 to 10) since we multiplied by 2, and the number of shaded pieces doubled (3 to 6) since we multiplied by 2.”
- ? “In this problem, can you explain what would have happened if we had multiplied both the numerator and denominator by 4? by 10?” Can students explain that the resulting fractions would be equivalent? The number of parts would be 20 and the number of shaded parts would be 12.
- **Model:** “We can use this procedure to find equivalent fractions on a number line.” Write $\frac{7}{4}$. “Now multiply the numerator and denominator by 3. The result is $\frac{21}{12}$.” Be sure students can distinguish between the fourths and twelfths on the number line. Each length of $\frac{1}{4}$ has been divided into three equal parts, each $\frac{1}{12}$ unit long.
- In Exercises 1 and 2, have students draw a model to explain their process.



- The models are important and should not be ignored simply because students know the process and can multiply correctly. Do they understand why the process works?
- **Extension:** Look at equivalent fractions on the Equivalent Fractions Instructional Resource. Identify which number the numerator and denominator were multiplied by.
- “Turn and tell your partner why you can multiply the numerator and denominator by the same number to find equivalent fractions.”

ELL Support

Read each problem aloud as students follow along. Clarify unknown vocabulary and explain unfamiliar references. You may want to have students share their experiences with hiking or using a puzzle cube. Allow students to work in pairs and provide time to complete each exercise. Ask for the answer to each problem and have students write on a whiteboard or piece of paper to hold up for your review.

Laurie's Notes

Think and Grow: Modeling Real Life

These applications allow students to show their understanding of using division to find equivalent fractions within a real-world context.

- Read and discuss the example. Have any students gone hiking? Share experiences. Explain what a kilometer is, if needed.
- "Tell your partner what we are trying to find out."
- The example is set up to step you through the process. Work through each step having students explain what to do.
- ? Ask assessing questions for each step such as, "The example shows that we will divide 70 and 100 by some number. How would we know we need to divide instead of multiply if that was not given to us? How can you find the number with which we will divide?"
- ? Discuss Newton's question. "Why might you want to write the fraction in tenths?" Have several students share ideas.
- **Supporting Learners:** Provide a multiplication table if students are unsure of their facts. Remind students of the inverse nature of multiplication and division. Often, thinking *What number times __ would equal __* is easier than thinking of the divisor. Students can draw models or use Fraction Strips as needed.
- Exercises 20–22 continue to provide a context for finding equivalent fractions. All problems provide the new denominator for which to find the equivalence. Students may not recognize the given denominator as it is written in word form and not as a fraction.
- Exercise 20 mentions that there are six faces on a cube. This is not essential information, but does give the reasoning to find sixths.
- **Supporting Learners:** Students may need support in setting up the equivalence equations from the word problems. Model Exercise 20 and then have students set up the remaining two exercises.
- Discuss the success criteria with students. Can they recognize where they did each one in the lesson? After discussing where it was in the lesson, have them give a thumb signal to show how they are doing with that specific aspect of today's learning.

Closure

? Write the fraction $\frac{12}{24}$ for students to see. "There are five equivalent fractions you can find for $\frac{12}{24}$ that have lesser denominators. How many can you find?" $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{6}{12}$

ELL Support

Read each problem aloud as students follow along. Clarify unknown vocabulary and unfamiliar references. Verify that students understand the table shown. You may want to explain that *swam* is the past form of *swim*, and that *wingspan* is a compound word that would be divided as *wing* and *span*, not *wings* and *pan*. Allow students to work in pairs and provide time to complete each exercise. Ask for the answer to each problem and have students write on a whiteboard or piece of paper to hold up for your review. You can check the answer to yes/no questions by asking students to use a thumbs up or down signal.

Laurie's Notes

Think and Grow: Modeling Real Life

These applications provide students with the framework to visualize metric units and to convert between them in real-world settings.

- ? **Preview:** "What do you notice in the table in the example?" It includes mixed numbers for kilometers.
- ? "Read the example with your partner. How might the table help you to solve the problem?" It relates kilometers and meters, and includes $2\frac{1}{2}$ in the table.
- ? Fill in the first line on the table. "How can you use this fact to fill in the next line?" Students could solve an equation as shown to the right. Before showing that method, check if students can reason that if 1 km = 1,000 m, then $1\frac{1}{2}$ km = 1,000 m + another half of 1,000, or 500 m. So $1\frac{1}{2}$ km = 1,500 m.
- ? "Do you see a pattern in the table? Who can fill in the next blanks?" The number of meters increases by 500 for each blank.
- Relate the reasoning above to the equations to the right of the table. Student pairs work to fill in all the blanks at the right. Have a volunteer explain what they put into each blank.
- ? "Which way do you like better? Use that method to solve Exercise 17."
- Show a solution for each strategy for Exercise 17 on the document camera.
- Students complete Exercises 18 and 19 while you circulate to observe their progress.
- Share explanations under a document camera and discuss the different ways students can support their answer.
- **Supporting Learners:** Suggest students find as much information as possible with patterns or comparisons using the table before writing any equations.
- **Common Error:** For Exercise 19, students might post a sign at the start of the race.
- "Where are you in your learning today? Are you comfortable changing from one metric unit to another? Can you remember how the prefixes help to convert one unit to another?"

Closure

- "Today we learned two new metric lengths, millimeter and kilometer. We also learned how the prefixes of the measurement units help you remember how to convert one metric length unit to another."
- $2\frac{1}{2}$ cm = ____ mm