Grade 3: Missions

The table outlines the missions, lessons, and estimated duration of Grade 3 content on Zearn.

Mission	Title	Lessons	Weeks
1	Multiply and Divide Friendly Numbers	21	6
2	Measure It	21	6
3	Multiply and Divide Tricky Numbers	21	6
4	Find the Area	16	4
5	Fractions as Numbers	29	8
6	Display Data	9	2
7	Shapes and Measurement	19	4
Totals		**136**	**36**

Note: Weeks are estimates based on 4 lessons completed per week. Actual time will vary by student.

Grade 3: Standards

The tables show where the new Grade 3 standards are covered on Zearn.

Operations & Algebraic Thinking	
STANDARD	**MISSION**
3.OA.1	1, 3
3.OA.2	1
3.OA.3	1, 3
3.OA.4	1, 3
3.OA.5	1, 3
3.OA.6	1, 3
3.OA.7	1, 3
3.OA.8	1, 3, 7
3.OA.9	3

Numbers & Operations in Base 10	
STANDARD	**MISSION**
3.NBT.1	2
3.NBT.2	2
3.NBT.3	3

Geometry	
STANDARD	**MISSION**
3.G.1	7
3.G.2	5

Measurement & Data	
STANDARD	**MISSION**
3.MD.1	2
3.MD.2	2
3.MD.3	6
3.MD.4	6, 7
3.MD.5	4
3.MD.6	4
3.MD.7	4, 7
3.MD.8	7

Numbers & Operations - Fractions	
STANDARD	**MISSION**
3.NF.1	5
3.NF.2	5
3.NF.3	5

Summary

Grade 3 mathematics is about:

1. Developing understanding of multiplication and division and strategies for multiplication and division within 100
2. Developing understanding of fractions, especially unit fractions (fractions with numerator 1)
3. Developing understanding of the structure of rectangular arrays and of area
4. Describing and analyzing two-dimensional shapes

Key Areas of Focus for Grades 3-5:

Multiplication and division of whole numbers and fractions—concepts, skills, and problem solving

Required Fluency:

3.OA.7 Multiply and divide within 100
3.NBT.2 Add and subtract within 1000

Standards for Mathematical Practice:

MP.1 Make sense of problems and persevere in solving them.

MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.

MP.4 Model with mathematics.

MP.5 Use appropriate tools strategically.

MP.6 Attend to precision.

MP.7 Look for and make use of structure.

MP.8 Look for and express regularity in repeated reasoning.

Mission 1

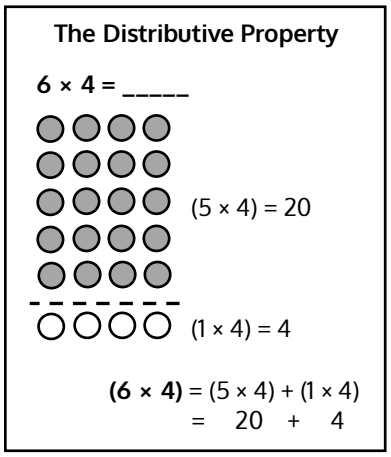
Multiply and Divide Friendly Numbers

OVERVIEW

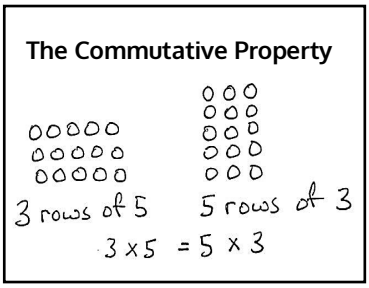
This mission begins the year by building on students' fluency with addition and their knowledge of arrays. In Topic A, students initially use repeated addition to find the total from a number of equal groups (**2.OA.4**). As students notice patterns, they let go of longer addition sentences in favor of more efficient multiplication facts (**3.OA.1**). Lessons in Topic A move students' Grade 2 work with arrays and repeated addition a step further by developing skip-counting rows as a strategy for multiplication. Arrays become a cornerstone of the mission. Students use the language of multiplication as they understand what factors are and differentiate between the size of groups and the number of groups within a given context. In this mission, the factors 2, 3, 4, 5, and 10 provide an entry point for moving into more difficult factors in later missions.

The study of factors links **Topics A and B**; Topic B extends the study to division. Students understand division as an unknown factor problem and relate the meaning of unknown factors to either the number or the size of groups (**3.OA.2, 3.OA.6**). By the end of Topic B, students are aware of a fundamental connection between multiplication and division that lays the foundation for the rest of the mission.

In Topic C, students use the array model and familiar skip-counting strategies to solidify their understanding of multiplication and practice related facts of 2 and 3. They become fluent enough with arithmetic patterns to add or subtract groups from known products to solve more complex multiplication problems (**3.OA.1**). They apply their skills to word problems using drawings and equations with a symbol to find the unknown factor (**3.OA.3**). This culminates in students using arrays to model the distributive property as they decompose units to multiply (**3.OA.5**).



In Topic D, students model, write, and solve partitive and measurement division problems with 2 and 3 (**3.OA.2**). Consistent skip-counting strategies and the continued use of array models are pathways for students to naturally relate multiplication and division. Modeling advances as students use tape diagrams to represent multiplication and division. A final lesson in this topic solidifies a growing understanding of the relationship between operations (**3.OA.7**).



Topic E shifts students from simple understanding to analyzing the relationship between multiplication and division. Practice of both operations is combined—this time using units of 4—and a lesson is explicitly dedicated to modeling the connection between them (**3.OA.7**). Skip-counting, the distributive property, arrays, number bonds, and tape diagrams are tools for both operations (**3.OA.1, 3.OA.2**). A final lesson invites students to explore their work with arrays and related facts through the lens of the commutative property as it relates to multiplication (**3.OA.5**).

Topic F introduces the factors 5 and 10, familiar from skip-counting in Grade 2. Students apply the multiplication and division strategies they have used to mixed practice with all of the factors included in Mission 1 (**3.OA.1, 3.OA.2, 3.OA.3**). Students model relationships between factors, analyzing the arithmetic patterns that emerge to compose and decompose numbers, as they further explore the relationship between multiplication and division (**3.OA.3, 3.OA.5, 3.OA.7**).

In the final lesson of the mission, students apply the tools, representations, and concepts they have learned to problem solving with multi-step word problems using all four operations (**3.OA.3, 3.OA.8**). They demonstrate the flexibility of their thinking as they assess the reasonableness of their answers for a variety of problem types. The Mid-Mission Assessment follows Topic C. The End-of-Mission Assessment follows Topic F.

Mission 2

Measure It

OVERVIEW

In this mission, students explore measurement using kilograms, grams, liters, milliliters, and intervals of time in minutes. Students begin by learning to tell and write time to the nearest minute using analog and digital clocks in **Topic A** (**3.MD.1**). They understand time as a continuous measurement through exploration with stopwatches, and use the number line, a continuous measurement model, as a tool for counting intervals of minutes within 1 hour (**3.MD.1**). Students see that an analog clock is a portion of the number line shaped into a circle. They use both the number line and clock to represent addition and subtraction problems involving intervals of minutes within 1 hour (**3.MD.1**).

Introduced in **Topic B**, kilograms and grams are measured using digital and spring scales. Students use manipulatives to build a kilogram and then decompose it to explore the relationship between the size and weight of kilograms and grams (**3.MD.2**). An exploratory lesson relates metric weight and liquid volume measured in liters and milliliters, highlighting the coherence of metric measurement. Students practice measuring liquid volume using the vertical number line and a graduated beaker (**3.MD.2**). Building on the estimation skills with metric length gained in Grade 2, students in Grade 3 use kilograms, grams, liters, and milliliters to estimate the weights and liquid volumes of familiar objects. Finally, they use their estimates to reason about solutions to one-step addition, subtraction, multiplication, and division word problems involving metric weight and liquid volume given in the same units (**3.MD.2**).

Now more experienced with measurement and estimation using different units and tools, students further develop their skills by learning to round in **Topic C** (**3.NBT.1**). They measure and then use place value understandings and the number line as tools to round two-, three-, and four-digit measurements to the nearest ten or hundred (**3.NBT.1, 3.MD.1, 3.MD.2**).

Students measure and round to solve problems in **Topics D and E** (**3.NBT.1, 3.MD.1, 3.MD.2**). In these topics, they use estimations to test the reasonableness of sums and differences precisely calculated using standard algorithms. From their work with metric measurement, students have a deeper understanding of the composition and decomposition of units. They demonstrate this understanding in every step of the addition and subtraction algorithms with two- and three-digit numbers, as 10 units are changed for 1 larger unit or 1 larger unit is changed for 10 smaller units (**3.NBT.2**). Both topics end in problem solving involving metric units or intervals of time. Students round to estimate and then calculate precisely using the standard algorithm to add or subtract two- and three-digit measurements given in the same units (**3.NBT.1, 3.NBT.2, 3.MD.1, 3.MD.2**).

Mission 3

Multiply and Divide Tricky Numbers

OVERVIEW

This mission builds directly on students' work with multiplication and division in Mission 1. At this point, Mission 1 instruction coupled with fluency practice in Mission 2 has students well on their way to meeting the Grade 3 fluency expectation for multiplying and dividing within 100 (**3.OA.7**). Mission 3 extends the study of factors from 2, 3, 4, 5, and 10 to include all units from 0 to 10, as well as multiples of 10 within 100. Similar to the organization of Mission 1, the introduction of new factors in Mission 3 spreads across topics. This allows students to build fluency with facts involving a particular unit before moving on. The factors are sequenced to facilitate systematic instruction with increasingly sophisticated strategies and patterns.

Topic A begins by revisiting the commutative property. Students study familiar facts from Mission 1 to identify known facts using units of 6, 7, 8, and 9 (**3.OA.5, 3.OA.7**). They realize that they already know more than half of their facts by recognizing, for example, that if they know 2×8, they also know 8×2 through commutativity. This begins a study of arithmetic patterns that becomes an increasingly prominent theme in the mission (**3.OA.9**). The subsequent lesson carries this study a step further; students apply the commutative property to relate 5×8 and 8×5 and then add one more group of 8 to solve 6×8 and, by extension, 8×6. The final lesson in this topic builds fluency with familiar multiplication and division facts, preparing students for the work ahead by introducing the use of a letter to represent the unknown in various positions (**3.OA.3, 3.OA.4**).

Topic B introduces units of 6 and 7, factors that are well suited to Level 2 skip-counting strategies and to the Level 3 distributive property strategy, already familiar from Mission 1. Students learn to compose up to and then over the next ten. For example, to solve a fact using units of 7, they might count 7, 14, and then mentally add $14 + 6 + 1$ to make 21. This strategy previews the associative property using addition and illuminates patterns as students apply count-bys to solve problems. In the next lesson, students apply the distributive property (familiar from Mission 1) as a strategy to multiply and divide. They decompose larger unknown facts into smaller known facts to solve. For example, $48 \div 6$ becomes $(30 \div 6) + (18 \div 6)$, or $5 + 3$ (**3.OA.5, 3.OA.7**). Topic B's final lesson emphasizes word problems, providing opportunities to analyze and model. Students apply the skill of using a letter to represent the unknown in various positions within multiplication and division problems (**3.OA.3, 3.OA.4, 3.OA.7**).

Topic C anticipates the formal introduction of the associative property with a lesson focused on making use of structure to problem solve. Students learn the conventional order for performing operations when parentheses are and are not present in an equation (**3.OA.8**). With this student knowledge in place, the associative property emerges in the next lessons as a strategy to multiply using units up to 8 (**3.OA.5**). Units of 6 and 8 are particularly useful for presenting this Level 3 strategy. Rewriting 6 as 2×3 or 8 as 2×4 makes shifts in grouping

readily apparent (see example on next page) and also utilizes the familiar factors 2, 3, and 4 as students learn the new material. The following strategy may be used to solve a problem like 8 × 5:

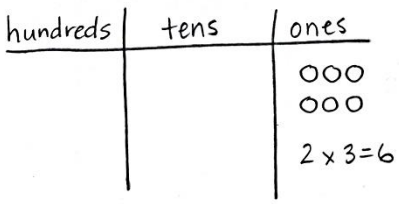
$$8 \times 5 = (4 \times 2) \times 5$$
$$8 \times 5 = 4 \times (2 \times 5)$$
$$8 \times 5 = 4 \times 10$$

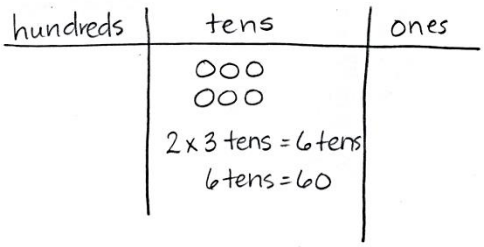
In the final lesson of Topic C, students relate division to multiplication using units up to 8. They understand division as both a quantity divided into equal groups and an unknown factor problem for which—given the large size of units—skip-counting to solve can be more efficient than dividing (**3.OA.3, 3.OA.4, 3.OA.7**).

Topic D introduces units of 9 over three days, with students exploring a variety of arithmetic patterns that become engaging strategies for quickly learning facts with automaticity (**3.OA.3, 3.OA.7, 3.OA.9**). Nines are placed late in the mission so that students have enough experience with multiplication and division to recognize, analyze, and apply the rich patterns found in the manipulation of units of 9. As with other topics, the sequence ends with interpreting the unknown factor to solve multiplication and division problems (**3.OA.3, 3.OA.4, 3.OA.5, 3.OA.7**).

In Topic E, students begin by working with facts using units of 0 and 1. From a procedural standpoint, these are simple facts that require little time for students to master; however, understanding the concept of nothing (zero) is more complex, particularly as it relates to division. This unique combination of simple and complex explains the late introduction of 0 and 1 in the sequence of factors. Students study the results of multiplying and dividing with units of 0 and 1 to identify relationships and patterns (**3.OA.7, 3.OA.9**). The topic closes with a lesson devoted to two-step problems involving all four operations (**3.OA.8**). In this lesson, students work with equations involving unknown quantities and apply the rounding skills learned in Mission 2 to make estimations that help them assess the reasonableness of their solutions (**3.OA.8**).

In Topic F, students multiply by multiples of 10 (**3.NBT.3**). To solve a fact like 2 × 30, they first model the basic fact 2 × 3 on the place value chart. Place value understanding helps them to notice that the product shifts one place value to the left when multiplied by 10: 2 × 3 tens can be found by simply locating the same basic fact in the tens column.





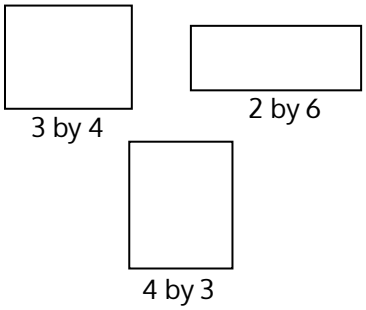
In the subsequent lesson, place value understanding becomes more abstract as students model place value strategies using the associative property (**3.NBT.3, 3.OA.5**).
2 × 30 = 2 × (3 × 10) = (2 × 3) × 10. The final lesson focuses on solving two-step word problems involving multiples of 10 and equations with unknown quantities (**3.OA.8**). As in the final lesson of Topic E, students estimate to assess the reasonableness of their solutions (**3.OA.8**).

Mission 4

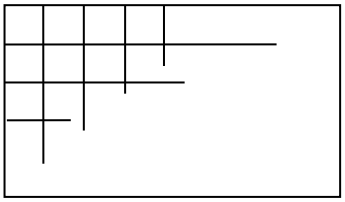
Find the Area

OVERVIEW

In this mission, students explore area as an attribute of two-dimensional figures and relate it to their prior understandings of multiplication. In Grade 2, students partitioned a rectangle into rows and columns of same-sized squares and found the total number by both counting and adding equal addends represented by the rows or columns (**2.G.2, 2.OA.4**).

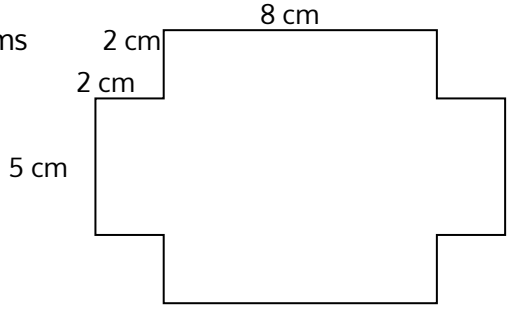


In Topic A, students begin to conceptualize area as the amount of two-dimensional surface that is contained within a plane figure. They come to understand that the space can be tiled with unit squares without gaps or overlaps (**3.MD.5**). Students decompose paper strips into square inches and square centimeters, which they use to tile 3 by 4, 4 by 3, and 2 by 6 rectangles. They compare rectangles tiled with like units and notice different side lengths but equal areas. Topic A provides students' first experience with tiling from which they learn to distinguish between length and area by placing a ruler with the same size units (inches or centimeters) next to a tiled array. They discover that the number of tiles along a side corresponds to the length of the side (**3.MD.6**).



In Topic B, students progress from using square tile manipulatives to drawing their own area models. Anticipating the final structure of an array, they complete rows and columns in figures such as the example shown to the right. Students connect their extensive work with rectangular arrays and multiplication to eventually discover the area formula for a rectangle, which is formally introduced in Grade 4 (**3.MD.7a**).

In Topic C, students manipulate rectangular arrays to concretely demonstrate the arithmetic properties in anticipation of the lessons that follow. They do this by cutting rectangular grids and rearranging the parts into new wholes using the properties to validate that area stays the same, despite the new dimensions. They apply tiling and multiplication skills to determine all whole number possibilities for the side lengths of rectangles given their areas (**3.MD.7b**).



Topic D creates an opportunity for students to solve problems involving area (**3.MD.7b**). Students decompose or compose composite regions, such as the one shown to the right—into non-overlapping rectangles, find the area of each region, and then add or subtract to determine the total area of the original shape. This leads students to find the areas of rooms in a given floor plan (**3.MD.7d**).

Mission 5

Fractions as Numbers

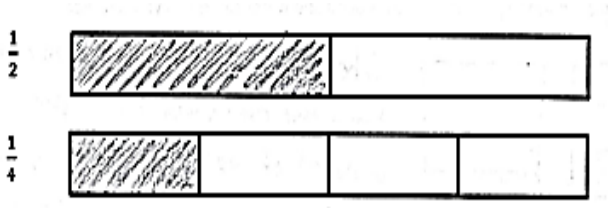
OVERVIEW

In this mission, students extend and deepen Grade 2 practice with equal shares to understanding fractions as equal partitions of a whole (**2.G.3**). Their knowledge becomes more formal as they work with area models and the number line. Throughout the mission, students have multiple experiences working with the Grade 3 specified fractional units of halves, thirds, fourths, sixths, and eighths. To build flexible thinking about fractions, students are exposed to additional fractional units such as fifths, ninths, and tenths.

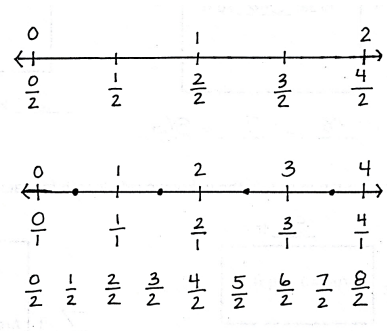
Topic A opens Mission 5 with students actively partitioning different models of wholes into equal parts (e.g., concrete models and drawn pictorial area models on paper). They identify and count unit fractions as 1 half, 1 fourth, 1 third, 1 sixth, and 1 eighth in unit form.

In Topic B, students are introduced to the fraction form $\frac{1}{b}$ (**3.NF.1**) and understand that fractions are numbers. Just like any number, they can be written in different forms.

Students compare and make copies of unit fractions to build non-unit fractions. They understand unit fractions as the basic building blocks that compose other fractions (**3.NF.3d**), which parallels the understanding that the number 1 is the basic building block of whole numbers (e.g., 1 and 1 and 1 make 3 just as 1 third and 1 third and 1 third make 1). **In Topic C**, students practice comparing unit fractions using fraction strips. They specify the whole and label fractions in relation to the number of equal parts in that whole (**3.NF.3d**).



Compare unit fractions using fraction strips.



Students transfer their work to the number line **in Topic D**. They begin by using the interval from 0 to 1 as the whole. Continuing beyond the first interval, they partition, place, count, and compare fractions on the number line (**3.NF.2a, 3.NF.2b, 3.NF.3d**). In Topic E, they notice that some fractions with different units are placed at the exact same point on the number line, and therefore, are equal (**3.NF.3a**). For example, $\frac{1}{2}$, $\frac{2}{4}$, $\frac{3}{6}$, and $\frac{4}{8}$ are equivalent fractions (**3.NF.3b**); they are different ways of naming the same number. Students recognize that whole numbers can be written as fractions, as exemplified on the number lines to the left (**3.NF.3c**).

Topic F concludes the mission with comparing fractions that have the same numerator. As students compare fractions by reasoning about their size, they understand that fractions with the same numerator and a larger denominator are actually smaller pieces of the whole

(**3.NF.3d**). Topic F leaves students with a new method for precisely partitioning a number line into unit fractions of any size without using a ruler.

Mission 6

Display Data

OVERVIEW

This mission builds on Grade 2 concepts about data, graphing, and line plots.

Topic A's Small Group Lessons begin with a lesson in which students generate categorical data, organize it, and then represent it in a variety of forms. Drawing on Grade 2 knowledge, students might initially use tally marks, tables, or graphs with one-to-one correspondence. By the end of the lesson, they show data in tape diagrams where units are equal groups with a value greater than 1. In the next two lessons, students rotate the tape diagrams vertically so that the tapes become the units or bars of scaled graphs (**3.MD.3**). Students understand picture and bar graphs as vertical representations of tape diagrams and apply well-practiced skip-counting and multiplication strategies to analyze them. In Lesson 4, students synthesize and apply learning from Topic A to solve one- and two-step problems. Through problem solving, opportunities naturally surface for students to make observations, analyze, and answer questions such as, "How many more?" or "How many less?" (**3.MD.3**). Topic A's Independent Digital Lessons complement this progression with a focus on organizing and analyzing data in pictures and bar graphs.

In Topic B, students learn that intervals do not have to be whole numbers but can have fractional values that facilitate recording measurement data with greater precision. In Lesson 5, they generate a six-inch ruler marked in whole-inch, half-inch, and quarter-inch increments, using the Mission 5 concept of partitioning a whole into parts. This creates a conceptual link between measurement and recent learning about fractions. Students then use the rulers to measure the lengths of precut straws and record their findings to generate measurement data (**3.MD.4**).

Lesson 6 reintroduces line plots as a tool for displaying measurement data. Although familiar from Grade 2, line plots in Grade 3 have the added complexity of including fractions on the number line (**2.MD.9, 3.MD.4**). In this lesson, students interpret scales involving whole, half, and quarter units in order to analyze data. This experience lays the foundation for them to create their own line plots in Lessons 7 and 8. To draw line plots, students learn to choose appropriate intervals within which to display a particular set of data. For example, to show measurements of classmates' heights, students might notice that their data fall within the range of 45 to 55 inches and then construct a line plot with the corresponding interval.

Students end the mission by applying learning from Lessons 1–8 to problem solving. They work with a mixture of scaled picture graphs, bar graphs, and line plots to problem solve using both categorical and measurement data (**3.MD.3, 3.MD.4**).

Mission 7

Shapes and Measurement

OVERVIEW

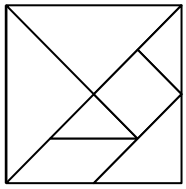
The final mission of the year offers students intensive practice with word problems, as well as hands-on investigation experiences with geometry and perimeter.

Topic A begins with solving one- and two-step word problems based on a variety of topics studied throughout the year and including all four operations (**3.OA.8**). The lessons emphasize modeling and reasoning to develop solution paths. They incorporate teacher-facilitated problem solving, opportunities for students to independently make sense of problems and persevere in solving them, and time for students to share solutions and critique peer strategies.

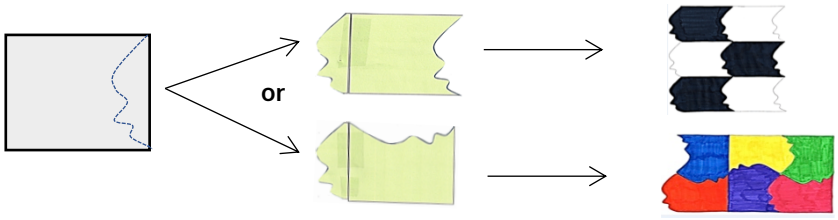
Topic B introduces an exploration of geometry. Students build on Grade 2 ideas about polygons and their properties, specifically developing and expanding their knowledge of quadrilaterals. They explore the attributes of quadrilaterals and classify examples into various categories, including recognizing the characteristics of polygons (**3.G.1**). Students draw polygons based on their attributes, producing sketches from descriptions like, "This shape has two long sides that are parallel, two short sides, and no right angles."

Students next use tangrams (see example to the right) to compose and decompose shapes. They reason about the relationships between shapes and between attributes. For example, students understand that quadrilaterals can be decomposed into triangles and recognize that the two smallest triangles in a tangram puzzle can be put together to form a parallelogram, a square, or a medium triangle.

Tangram Puzzle



Students tessellate to bridge geometry experience with the study of perimeter in **Topic C**. They first decompose a quadrilateral and then rearrange the parts. They use the new shape to tile. Students then define perimeter in two distinct ways: (1) as the boundary of a planar region and (2) as the length of the boundary curve. Students see varied examples from the tiles used to tessellate.



Cut on the line. Then, slide the piece to the opposite side or rotate it to an adjacent side to make a new shape. Then, tile with the new shape.

As they learn about perimeter as an attribute of plane figures, students apply their knowledge to real-world situations through problem solving (**3.MD.8**). They measure side lengths of shapes in whole number units to determine perimeter and solve problems where side lengths are given. They use string and rulers to measure the length around circles of different sizes. This variation prompts students to think more flexibly about perimeter, understanding that it can be the boundary of any shape and that its measurements are not limited to whole numbers. The topic ends with problems in which some measurements around the perimeter of a polygon are unknown but can be determined by reasoning. Students consider the efficiency of their strategies and identify tools for solving; for example, they use multiplication as a tool when measurements are repeated.

Topic D utilizes the line plot, familiar from Mission 6, to help students draw conclusions about perimeter and area measurements (**3.MD.4**). Early in the topic, students find different possible perimeters or areas for rectangles based on information given about the rectangles. For example, using knowledge of factors from experience with multiplication, students find the following:

- Different perimeters of rectangles composed of a given number of unit squares (**3.MD.8**). For example, given a rectangle composed of 24 unit squares, students find four possible perimeters: 50, 28, 22, and 20 length units.
- Different areas of rectangles with a given perimeter and composed of unit squares. For example, students use unit squares to build rectangles with a perimeter of 12 units and determine that they can do so using 5, 8, or 9 unit squares.

(Forming rectangles with unit squares results in whole number side lengths.)

Students use line plots to show the number of rectangles they were able to construct for each set of given information. The line plots are tools that students use to help them analyze and draw conclusions about their data. Students draw their rectangles on grid paper and reason about their findings. They notice, for example, that for rectangles of a given area, those with side lengths that are equal or almost equal (more square-like) have smaller perimeters than those whose side lengths are very different (a long and narrow shape).

By the end of the topic, students are able to conclude that there is no direct relationship between area and perimeter. If an area is given, there is no way of knowing a shape's corresponding perimeter without more information about the side lengths.

In Topic E, students solve problems involving area and perimeter. After an initial lesson of problem solving with perimeter, students create a robot composed of rectangles. Given specific perimeter measurements for the rectangles, they reason about the different possible side lengths. Students compare and analyze their work, discussing how different choices for side lengths can affect area while conforming to the criteria for perimeter. Students synthesize their learning in the final lessons through solving word problems involving area and perimeter using all four operations (**3.OA.8**).

Topic F concludes the school year with a set of engaging lessons that briefly review the fundamental Grade 3 concepts of fractions, multiplication, and division. This topic comes after the End-of-Mission Assessment. It begins with a pair of lessons on fractions, engaging students in analyzing and creating unusual representations of one-half, such as those shown to the right. Students analyze and discuss these representations, using their knowledge of fractions to justify their constructions and critique the work of others. The final lessons in this topic are fluency based and engage students in games that provide practice to solidify their automaticity with Grade 3 skills. Using simple origami techniques, students create booklets of these games. The booklets go home and become resources for summer practice.