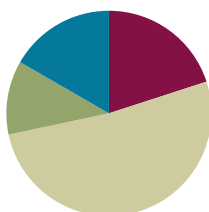


## Lesson 4

Objective: Compare and classify quadrilaterals.

### Suggested Lesson Structure

■ Fluency Practice	(12 minutes)
■ Application Problem	(7 minutes)
■ Concept Development	(31 minutes)
■ Student Debrief	(10 minutes)
<b>Total Time</b>	<b>(60 minutes)</b>



### Fluency Practice (12 minutes)

- Multiply by 4 **3.OA.7** (8 minutes)
- Equivalent Counting with Units of 5 **3.OA.7** (4 minutes)

### Multiply by 4 (8 minutes)

Materials: (S) Multiply by 4 Pattern Sheet (6–10)

Note: This activity builds fluency with multiplication facts using units of 4. It works toward students knowing from memory all products of two one-digit numbers. See G3–M7–Lesson 1 for the directions for administration of a *Multiply By* pattern sheet.

T: (Write  $7 \times 4 = \underline{\quad}$ .) Let's skip-count up by fours. I'll raise a finger for each four. (Count with fingers to 7 as students count.)

S: 4, 8, 12, 16, 20, 24, 28.

T: Let's skip-count by fours starting at 20. Why is 20 a good place to start?

S: It's a fact we already know, so we can use it to figure out a fact we don't know.

T: (Count up with fingers as students say numbers.)

S: 20 (5 fingers), 24 (6 fingers), 28 (7 fingers).

T: Let's see how we can skip-count down to find the answer, too. Start at 40 with 10 fingers, 1 for each four. (Count down with fingers as students say numbers.)

S: 40 (10 fingers), 36 (9 fingers), 32 (8 fingers), 28 (7 fingers).

Continue with the following suggested sequence:  $9 \times 4$ ,  $6 \times 4$ , and  $8 \times 4$ .

T: (Distribute Multiply by 4 Pattern Sheet.) Let's practice multiplying by 4. Be sure to work left to right across the page.

## Equivalent Counting with Units of 5 (4 minutes)

Note: This activity builds fluency with multiplication facts using units of 5. The progression builds in complexity. Work the students up to the highest level of complexity in which they can confidently participate.

T: Count to 10. (Write as students count. See chart below.)

S: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

1	2	3	4	5	6	7	8	9	10
1 five	2 fives	3 fives	4 fives	5 fives	6 fives	7 fives	8 fives	9 fives	10 fives
5	10	15	20	25	30	35	40	45	50
1 five	10	3 fives	20	5 fives	30	7 fives	40	9 fives	50
5	2 fives	15	4 fives	25	6 fives	35	8 fives	45	10 fives

T: (Write 1 five beneath the 1.) Count to 10 fives. (Write as students count.)

S: 1 five, 2 fives, 3 fives, 4 fives, 5 fives, 6 fives, 7 fives, 8 fives, 9 fives, 10 fives.

T: Count by fives to 50. (Write as students count.)

S: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50.

T: (Write 1 five beneath the 5. Write 10 beneath the 10.) I'm going to give you a challenge. Let's alternate between saying the units of five and the number. (Write as students count.)

S: 1 five, 10, 3 fives, 20, 5 fives, 30, 7 fives, 40, 9 fives, 50.

T: (Write 5 beneath 1 five and 2 fives beneath the 10.) Let's alternate again. (Write as students count.)

S: 5, 2 fives, 15, 4 fives, 25, 6 fives, 35, 8 fives, 45, 10 fives.

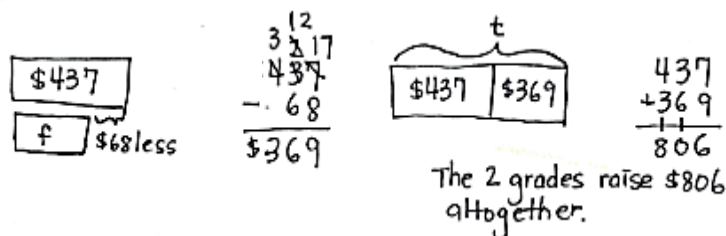
## Application Problem (7 minutes)

The third-graders raised \$437 in a fundraiser. The fourth-graders raised \$68 less than the third-graders. How much money did the two grade levels raise altogether?



### NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Modeling a tape diagram for the money fourth-graders raise, as well as the total money raised, will help English language learners and students working below grade level better grasp the meaning of the phrase *\$68 less than the third-graders*. Ask, "Who raised less money? Did the fourth-graders raise \$68? Use the model to estimate about how much the fourth-graders raised."



Note: This problem reviews two-step word problems from G3–M7–Topic A.

## Concept Development (31 minutes)

Materials: (T) 2 rulers (S) Index card for use as right angle tool, Polygons (A–L) template, ruler, Problem Set, scissors

### Part 1: Group polygons by attributes.

Pass out index cards and polygon templates.

- T: We'll use these cards as tools. Put a finger on each corner.
- S: (Touch each corner.)
- T: Remember from second grade that we call the point where sides meet to make a corner an *angle*. These are **right angles** because they have square corners. We'll use our cards as right angle tools to help us find other shapes that have right angles. (Save right angle tools for the entire module.)
- T: Now cut out shapes A–L on your template.
- S: (Cut.)
- T: Look at your shapes. Discuss with a partner: What are some different ways we can group these shapes together?
- S: We can group them by name, like all the squares together. → We can group them by the number of sides. → We can also group them by the number of angles.
- T: Remember from second grade that closed shapes like these that have no gaps or overlaps between the straight sides are called **polygons**. Polygons with four straight sides are called **quadrilaterals**. Tell your partner what a quadrilateral is, and then find and group the quadrilaterals.
- S: A quadrilateral is a polygon with four sides. (Group quadrilaterals.)
- T: What do you notice about the polygons you grouped?
- S: They don't look the same. → Some are slanted and some are boxy. → Some are squares and rectangles, but others are strange looking. → One polygon even looks like a boomerang. → They have four angles.
- T: The polygons look different, but they share the attribute of having four sides and four angles. Complete the first row of the chart on the Problem Set. Make sure to sketch one polygon from the group.



#### NOTES ON VOCABULARY:

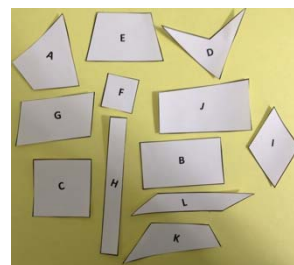
All of the bold-type terms in this lesson were introduced in G2–Module 8. However, given the specificity of the words and the time that has passed since students' work in G2–M8, it may be best to approach teaching the vocabulary as if it were new.



#### NOTES ON MULTIPLE MEANS OF REPRESENTATION:

Clarify for English language learners and others the term *group*. In past modules, we've *grouped* like units, such as 10 tens to make 100 or 3 fives to make 15. Here *grouping* does not mean bundling units that are exactly the same but rather sorting polygons by one or more shared attribute.

#### 4-sided:



At least 1 set of parallel sides: all above except A, D, and K.

- T: Next we'll find and group **trapezoids**. These are quadrilaterals that have at least one set of **parallel** sides. Think of parallel sides like the two side lines of a capital *H*, or a slanted *H*, since not all parallel sides stand vertical. (Demonstrate using two rulers.) Imagine these two lines go on forever. Do you think they will ever cross? Why or why not?
- S: I don't think they will cross. → No, they won't cross because they're straight and going in the same direction all the time.
- T: (Slant the rulers so they are not parallel anymore but are still not touching.) These lines are not touching. Are they parallel? Why or why not?
- S: No, the sides don't look like an *H* anymore. → If we imagine the lines keep going, they will eventually cross!
- T: If trapezoids must have *at least* one set of parallel sides, can they have more than one set?
- S: Yeah, *at least* means one or more.
- T: Group the trapezoids. Complete the second row of the chart on the Problem Set. Make sure to sketch one polygon from the group.
- S: (Group and sketch.)
- T: What do you notice about the polygons you grouped?
- S: I found a bunch! → No, there's only one shape that has only one set of parallel sides. Polygon E! → Remember though, a trapezoid has *at least* one set! That's almost all of them!
- T: Now we'll find and group **parallelograms**. These are four-sided polygons that have two sets of parallel sides.
- T: Group the parallelograms. Then complete the next row of the chart on your Problem Set.
- S: (Group polygons and complete chart.)
- T: Now, use your right angle tool to measure and group all the polygons that have four right angles. Then complete the chart.
- S: (Measure, group, and complete chart.)
- T: Next, find and group all the squares. Which attributes make squares special?
- S: It has four equal sides and four right angles.
- T: Use your ruler and right angle tool to confirm that with these polygons. Then complete the chart.
- S: (Measure, group, and complete the chart.)



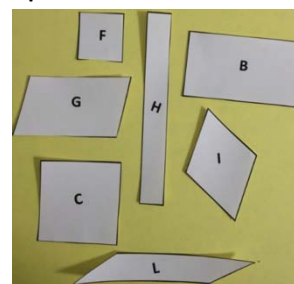
### NOTES ON TRAPEZOIDS:

According to the K–6 Geometry Progressions, the term *trapezoid* can have two different meanings:

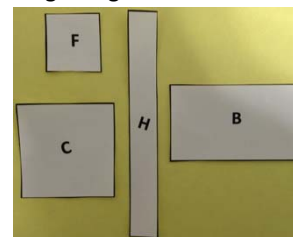
- **Exclusive Definition:** A trapezoid is a quadrilateral with exactly one pair of parallel sides.
- **Inclusive Definition:** A trapezoid is a quadrilateral with at least one pair of parallel sides.

*A Story of Units* uses the inclusive definition. Therefore, a parallelogram is also considered a trapezoid.

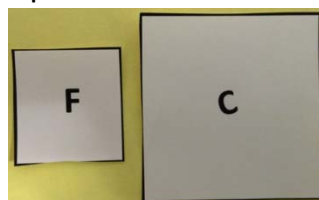
#### 2 parallel sides:



#### 4 right angles:



#### Squares:



**Part 2: Analyze quadrilaterals.**

T: In our set of polygons A–L, did the number of polygons get smaller or larger as we added attributes?

S: It got smaller.

T: Discuss with your partner why you think the number of polygons in each group got smaller as we added attributes.

S: I think it's because the attributes in our chart become more special. The last category only includes the most special polygon, a square, because it has to have four right angles *and* four equal sides. → Each time we added a new attribute, fewer polygons belonged to the group.

T: As the attributes become more specific, fewer shapes in our set share all of the attributes. Look at Polygons C and F. They are included in every group. Why do you think that is?

**MP.3**

S: The squares fit all the categories in our chart. They have four sides, two sets of parallel lines, and four right angles.

T: Why aren't Polygons B and H included in the last category? These specific rectangles have four sides, two sets of parallel lines, and four right angles.

S: Polygons B and H don't have all equal sides.

T: Look at Polygon I. It has four equal sides and two sets of parallel lines. What isn't it included in the last category?

S: It doesn't have four right angles. → It needs to have both, not just one attribute.

T: Comparing and grouping quadrilaterals helps us see how these polygons share some attributes, but also what makes them different.

**Part 3: Decompose quadrilaterals into two triangles.**

T: Problem 4 asks you to use a straightedge to draw a line between opposite corners in each quadrilateral you drew in the chart. This kind of line is called a **diagonal** line. Do that now.

S: (Draw diagonals in each polygon.)

T: Which new polygons did you make by drawing the diagonal line?

S: Triangles.

T: Complete Problem 4 on your Problem Set.

T: Pick other polygons we used that you did not draw on your chart. Draw diagonal lines inside the polygons. Do you still get two triangles? (Allow time for students to draw.)

S: Yes!

T: Most quadrilaterals are made up of two triangles.

Students should now go back and finish Problems 2 and 3.

## Student Debrief (10 minutes)

**Lesson Objective:** Compare and classify quadrilaterals.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the ideas below to lead the discussion.

- How does grouping quadrilaterals by attributes, like you did in Problem 1, help us see the similarities and differences between the **polygons**?
- Share sketches of parallelograms from Problem 3. Have students describe **parallel** lines through their color-coded tracing.
- Share drawings of different quadrilaterals in Problem 4(b) to reinforce how every quadrilateral can be decomposed into two triangles.
- What math vocabulary did we use today to name polygons with four sides? (**Quadrilateral.**) At least one set of parallel sides? (**Trapezoid.**) Two sets of parallel sides? (**Parallelogram.**) Angle that makes square corners? (**Right angle.**) The line between opposite corners in each quadrilateral? (**Diagonal.**)

## Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 4 Problem Set 3•7

Name: Gina Date: \_\_\_\_\_

1. Cut out all the polygons (A-L) in the template. Then use the polygons to complete the following chart.

Attribute	Write the letters of the polygons in this group.	Sketch 1 polygon from the group.
Example: 3 Sides	Polygons: Y, Z	
4 Sides	Polygons: A, B, C, D, E, F, G, H, I, J, K, L All of them!	
1 Set of Parallel Sides	Polygons: B, C, E, F, G, H, I, J, L	
2 Sets of Parallel Sides	Polygons: B, C, F, G, H, I, L	
4 Right Angles	Polygons: B, C, F, H	
4 Right Angles and 4 Equal Sides	Polygons: C, F	

COMMON CORE Lesson 4: Compare and classify quadrilaterals. Date: 11/21/13 engage<sup>ny</sup> 7.B.8

© 2013 Common Core, Inc. Some rights reserved. commoncore.org This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 4 Problem Set 3•7

2. Write the letters of the polygons that are quadrilaterals. Explain how you know these polygons are quadrilaterals.

All of the polygons A-L are quadrilaterals because they all have 4 sides.

3. Sketch a polygon from the group that has 2 sets of parallel sides below. Trace 1 pair of parallel sides red. Trace the other pair of parallel sides blue. What makes parallel sides different from sides that are not parallel?

The parallel sides look like the 2 sides of a big H. They'll never touch or cross, even if we make them longer and longer.

4. Draw a diagonal line from one corner to the opposite corner of each polygon you drew in the chart using a straight edge. What new polygon(s) did you make by drawing the diagonal lines?

I made 2 triangles in each shape!

COMMON CORE Lesson 4: Compare and classify quadrilaterals. Date: 11/21/13 engage<sup>ny</sup> 7.B.8

© 2013 Common Core, Inc. Some rights reserved. commoncore.org This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

Multiply.

$4 \times 1 = \underline{\quad}$      $4 \times 2 = \underline{\quad}$      $4 \times 3 = \underline{\quad}$      $4 \times 4 = \underline{\quad}$

$4 \times 5 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$      $4 \times 8 = \underline{\quad}$

$4 \times 9 = \underline{\quad}$      $4 \times 10 = \underline{\quad}$      $4 \times 5 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$

$4 \times 5 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$      $4 \times 5 = \underline{\quad}$      $4 \times 8 = \underline{\quad}$

$4 \times 5 = \underline{\quad}$      $4 \times 9 = \underline{\quad}$      $4 \times 5 = \underline{\quad}$      $4 \times 10 = \underline{\quad}$

$4 \times 6 = \underline{\quad}$      $4 \times 5 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$

$4 \times 6 = \underline{\quad}$      $4 \times 8 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$      $4 \times 9 = \underline{\quad}$

$4 \times 6 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$

$4 \times 8 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$      $4 \times 9 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$

$4 \times 8 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$      $4 \times 8 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$

$4 \times 8 = \underline{\quad}$      $4 \times 9 = \underline{\quad}$      $4 \times 9 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$

$4 \times 9 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$      $4 \times 9 = \underline{\quad}$      $4 \times 8 = \underline{\quad}$

$4 \times 9 = \underline{\quad}$      $4 \times 8 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$      $4 \times 9 = \underline{\quad}$

$4 \times 7 = \underline{\quad}$      $4 \times 9 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$      $4 \times 8 = \underline{\quad}$

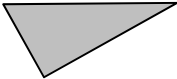
$4 \times 9 = \underline{\quad}$      $4 \times 7 = \underline{\quad}$      $4 \times 6 = \underline{\quad}$      $4 \times 8 = \underline{\quad}$



Name \_\_\_\_\_

Date \_\_\_\_\_

1. Cut out all the polygons (A–L) in the template. Then use the polygons to complete the following chart.

Attribute	Write the letters of the polygons in this group.	Sketch 1 polygon from the group.
<i>Example:</i> <b>3 Sides</b>	Polygons: Y, Z	
<b>4 Sides</b>	Polygons:	
<b>1 Set of Parallel Sides</b>	Polygons:	
<b>2 Sets of Parallel Sides</b>	Polygons:	
<b>4 Right Angles</b>	Polygons:	
<b>4 Right Angles and 4 Equal Sides</b>	Polygons:	

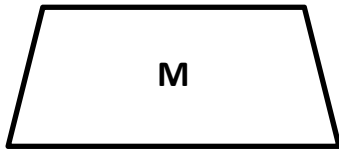
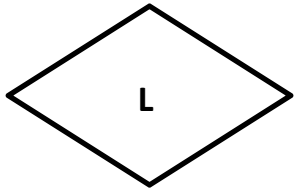




Name \_\_\_\_\_

Date \_\_\_\_\_

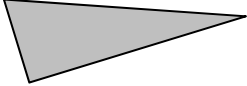
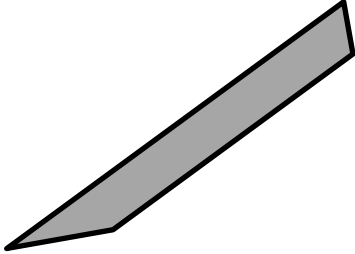

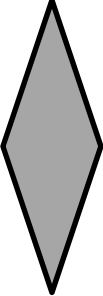
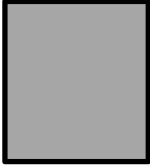
List as many attributes as you can to describe each polygon below.



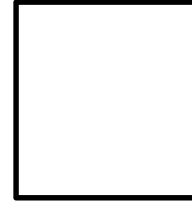
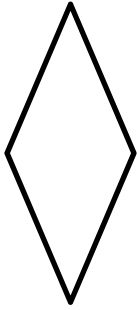
Name \_\_\_\_\_

Date \_\_\_\_\_

1. Complete the chart by answering true or false.

Attribute	Polygon	True or False
Example: 3 Sides		True
4 Sides		
2 Sets of Parallel Sides		
4 Right Angles		
Quadrilateral		

- 2.
- a. Each quadrilateral below has at least 1 set of parallel sides. Trace each set of parallel sides with a colored pencil.



- b. Using a straightedge, sketch a different quadrilateral with at least 1 set of parallel sides.

