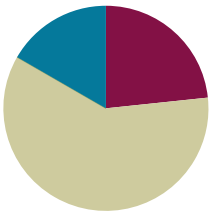
Lesson 29

Objective: Solve a variety of word problems involving area and perimeter using all four operations.

Suggested Lesson Structure



Fluency Practice	(14 minutes)
Concept Development	(36 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**

Fluency Practice (14 minutes)

- Sprint: Divide by 8 **3.OA.7** (10 minutes)
- Find the Perimeter **3.MD.8** (4 minutes)

Sprint: Divide by 8 (10 minutes)

Materials: (S) Divide by 8 Sprint

Note: This Sprint builds fluency with multiplication and division facts using units of 8.

Find the Perimeter (4 minutes)

Materials: (S) Personal white boards

Note: This fluency activity reviews finding perimeter using multiple steps.

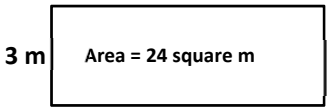
T: (Project rectangle with a width of 3 m. Inside the rectangle, write *Area = 24 square m*.) On your boards, write the length of this rectangle.

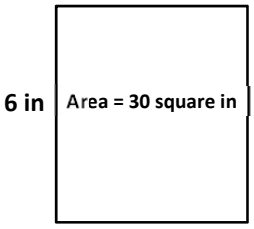
S: (Write 8 m.)

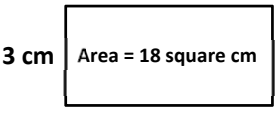
T: (Write 8 m on the length of the rectangle. Below the rectangle write *Perimeter =* ___.) On your boards, write the perimeter of this rectangle. Write a number sentence if you need to.

S: (Write *Perimeter = 22 m*.)

T: On your boards, sketch a rectangle that has an area of 24 square meters, but different side lengths than this rectangle.







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S: (Sketch a rectangle with side lengths of 1 m and 24 m, 4 m and 6 m, or 2 m and 12 m.)

T: (Write *Perimeter =* ___.) Calculate the perimeter of the new rectangle.

S: (Write *Perimeter = 50 m, 20 m,* or *28 m*.)

Repeat the process for the other rectangles.

Concept Development (36 minutes)

Materials: (S) Problem Set

Note: Save this lesson's Problem Set for use in G3–M7–Lesson 30.

MP.1

This is a problem solving lesson in which students work in pairs or independently to solve the four problems on the Problem Set. Consider using the three-step approach outlined in G3–M7–Lesson 23 to guide them through solving (basic steps shown below). Specific information about each problem follows and can be used to further facilitate conversation.

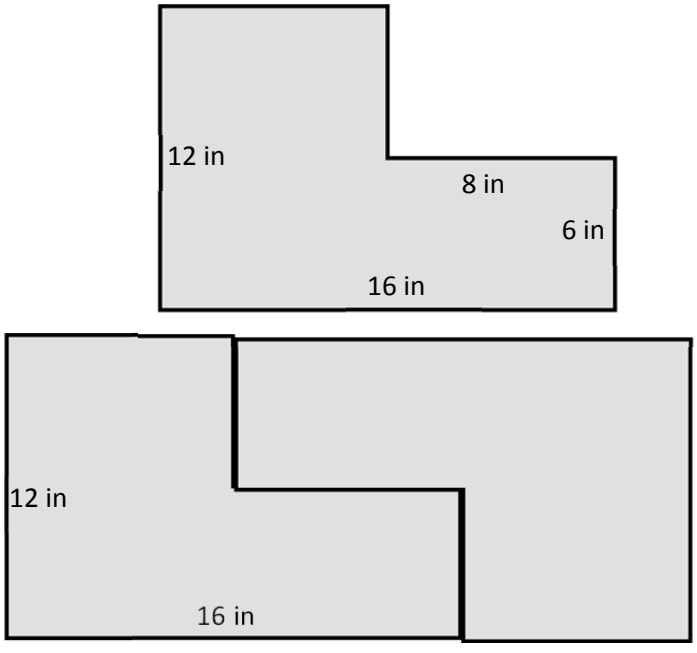
Three-Step Approach to Solving:

1. Read and model (if applicable).
2. Write an equation, calculate to solve, and write a statement.
3. Assess the solution for reasonableness.

NOTES ON MULTIPLE MEANS OF REPRESENTATION:

For the composite figure in Problem 1 (and others like it) you may want to teach students how to draw brackets to clearly match each side length with its measure.

Problem 1: Kyle puts two rectangles together to make the L-shaped figure below. He measures some of the side lengths and records them as shown.



a. **Find the perimeter of Kyle's shape.**

b. **Find the area of Kyle's shape.**

c. **Kyle makes two copies of the L-shaped figure to create the rectangle shown below. Find the perimeter of the rectangle.**

In Part (a), students apply knowledge of rectangles (opposite sides have equal lengths) to find the information necessary to solve. In Part (b), students might estimate to draw lines showing the two distinct rectangles with which Kyle started the problem. From there they can multiply to find the area of each one, then add to find the total.

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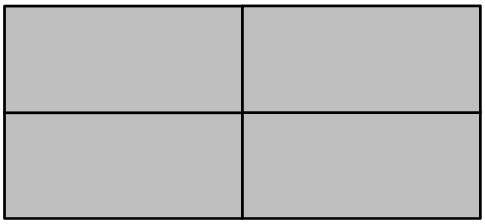
Students will need to use the break apart and distribute strategy to find the area of the larger rectangle. In Part (c), students might start by labeling the sides of the rectangle that are not yet labeled, remembering that it is only the outside lengths that are now important. They will need to use addition (16 in + 8 in) to find the total length on top and bottom, or see that each L has a perimeter of 36 inches and then double it to 72 inches.

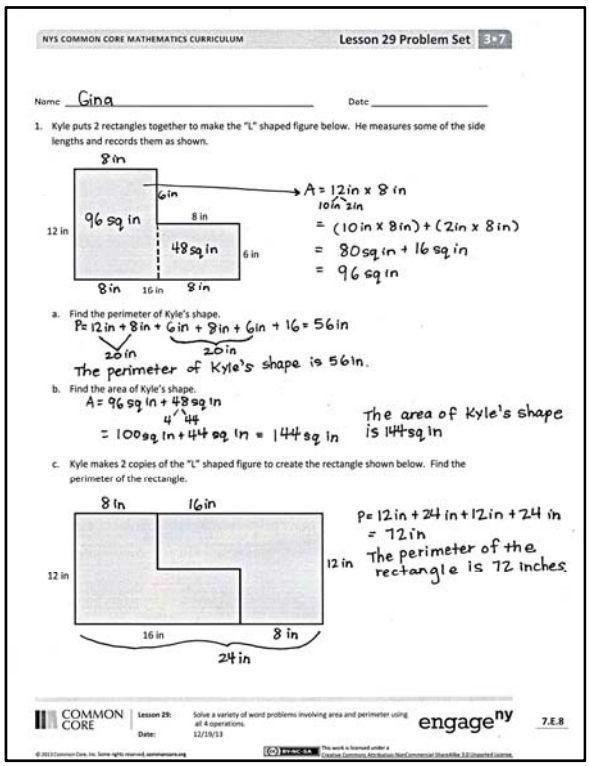
Problem 2: Jeremiah and Hayley use a piece of rope to mark a square space for their booth at the science fair. The area of their space is 49 square feet. What is the length of the rope that Jeremiah and Hayley use if they leave a 3-foot opening so they can get into and out of the space?

Students might begin by finding the side lengths of the square space, remembering that squares have equal side lengths. They might think about which factor multiplied by itself equals 49. After that, they can estimate to draw the square space that Jeremiah and Hayley need. Now that they have the side lengths of the space figured out (7 feet), students will have to add to their drawing to account for the 3-foot opening on one side.
This brings the amount of rope needed on that side from 7 feet down to 4 feet. Finally, students might add or multiply to find the amount of rope needed. (7 + 7 + 7 + 4 or 3 × 7 + 4.) They can also find the total perimeter and subtract three. (4 × 7 – 3.)

Problem 3: Vivienne draws four identical rectangles as shown below to make a new, larger rectangle. The perimeter of one of the small rectangles is 18 centimeters and the width is 6 centimeters. What is the perimeter of the new, larger rectangle?



Knowing that each smaller rectangle has a width of 6 centimeters and a perimeter of 18 centimeters, students may solve by dividing the perimeter by 2 (18 cm ÷ 2 = 9 cm) and then finding the missing side length with the equation, (6 cm + *n* cm = 9 cm. Once they find that



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 29 Problem Set 3•7

Name Gina Date

1. Kyle puts 2 rectangles together to make the "L" shaped figure below. He measures some of the side lengths and records them as shown.

8 in, 6 in, 12 in, 96 sq in, 8 in, 48 sq in, 6 in, 8 in, 16 in, 8 in

A = 12 in × 8 in
= (10 in × 8 in) + (2 in × 8 in)
= 80 sq in + 16 sq in
= 96 sq in

a. Find the perimeter of Kyle's shape.
P = 12 in + 8 in + 6 in + 8 in + 6 in + 16 = 56 in
The perimeter of Kyle's shape is 56 in.

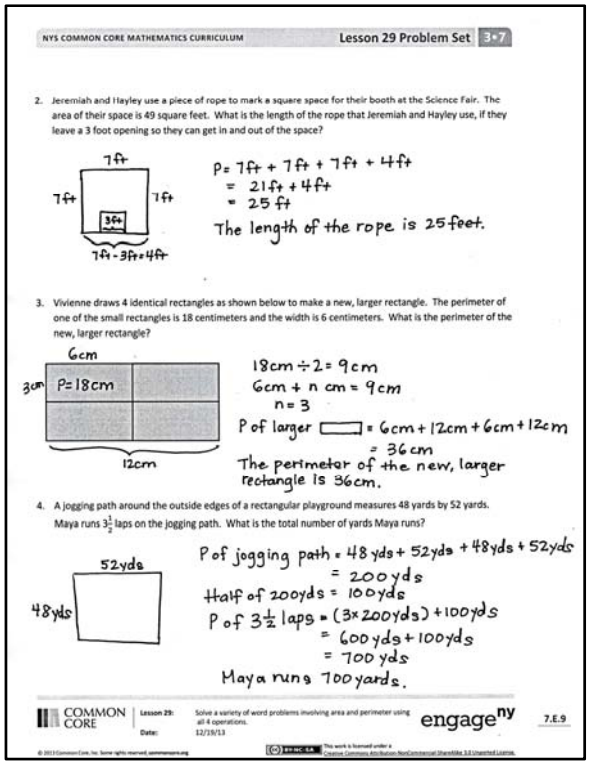
b. Find the area of Kyle's shape.
A = 96 sq in + 48 sq in
= 100 sq in + 44 sq in = 144 sq in
The area of Kyle's shape is 144 sq in

c. Kyle makes 2 copies of the "L" shaped figure to create the rectangle shown below. Find the perimeter of the rectangle.

8 in, 16 in, 12 in, 12 in, 16 in, 8 in, 24 in

P = 12 in + 24 in + 12 in + 24 in
= 72 in
The perimeter of the rectangle is 72 inches.

COMMON CORE Lesson 29: Solve a variety of word problems involving area and perimeter using all 4 operations. Date: 12/19/13 engage^ny 7.E.8



NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 29 Problem Set 3•7

2. Jeremiah and Hayley use a piece of rope to mark a square space for their booth at the Science Fair. The area of their space is 49 square feet. What is the length of the rope that Jeremiah and Hayley use, if they leave a 3 foot opening so they can get in and out of the space?

7 ft, 7 ft, 7 ft, 3 ft, 7 ft - 3 ft = 4 ft

P = 7 ft + 7 ft + 7 ft + 4 ft
= 21 ft + 4 ft
= 25 ft
The length of the rope is 25 feet.

3. Vivienne draws 4 identical rectangles as shown below to make a new, larger rectangle. The perimeter of one of the small rectangles is 18 centimeters and the width is 6 centimeters. What is the perimeter of the new, larger rectangle?

6 cm, 3 cm, P = 18 cm, 12 cm

18 cm ÷ 2 = 9 cm
6 cm + n cm = 9 cm
n = 3
P of larger rectangle = 6 cm + 12 cm + 6 cm + 12 cm
= 36 cm
The perimeter of the new, larger rectangle is 36 cm.

4. A jogging path around the outside edges of a rectangular playground measures 48 yards by 52 yards. Maya runs $3\frac{1}{2}$ laps on the jogging path. What is the total number of yards Maya runs?

52 yds, 48 yds

P of jogging path = 48 yds + 52 yds + 48 yds + 52 yds
= 200 yds
Half of 200 yds = 100 yds
P of $3\frac{1}{2}$ laps = (3 × 200 yds) + 100 yds
= 600 yds + 100 yds
= 700 yds
Maya runs 700 yards.

COMMON CORE Lesson 29: Solve a variety of word problems involving area and perimeter using all 4 operations. Date: 12/19/13 engage^ny 7.E.9

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measurement to be 3 centimeters, they will likely add to find the total length of each set of sides for the large rectangle (3 cm + 3 cm and 6 cm + 6 cm). After that, they can add to find the total perimeter.

Students may initially wonder *which* sides of the small rectangles—the long or short sides – measure 6 centimeters. However, once they find the unknown side length to be 3 centimeters, they can reason that the long sides must measure 6 centimeters and the short sides must measure 3 centimeters.

Problem 4: A jogging path around the outside edges of a rectangular playground measures 48 yards by 52 yards. Maya runs $3\frac{1}{2}$ laps on the jogging path. What is the total number of yards Maya runs?

Students can begin by estimating to draw and label the rectangular park. After that, they find how many total yards are in 1 lap around the track (200 yards). Once they know the perimeter of the park, they can reason to figure out that half of a lap is half of 200 yards, or 100 yards. Students might use a combination of multiplication and addition ((3 × 200) + 100), or addition (200 + 200 + 200 + 100) to solve. Either solution path will bring them to the final answer: Maya runs 700 yards.

NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

To provide scaffolds for students working below grade level, break the word problems into smaller steps as in G3–M7–Lesson 29. For Problem 3, for example, ask, "What is the length of one of the small rectangles? What is the perimeter of one of the small rectangles? What is the perimeter of the new, larger rectangle?"

Student Debrief (10 minutes)

Lesson Objective: Solve a variety of word problems involving area and perimeter using all four operations.

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 questions below to lead the discussion.

- How were you able to figure out the unknown side lengths in Problem 1(a)?
- Problem 1(c) had a rectangle formed from combining two copies of the shape from Problems 1(a) and 1(b). Why was the answer in Problem 1(c) not double the answer of Problem 1(a)?
- How did you figure out the side lengths for the smaller rectangles in Problem 3?
- Describe the steps you took to solve Problem 4.
- How were today's problems similar to yesterday's problems? How were they different?
- What complexity did you notice in each problem of the Problem Set today?

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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.

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B Improvement _____ # Correct _____

Multiply or divide.

1	1 x 8 =		23	__ x 8 = 16	
2	2 x 8 =		24	__ x 8 = 80	
3	3 x 8 =		25	__ x 8 = 24	
4	4 x 8 =		26	16 ÷ 8 =	
5	5 x 8 =		27	8 ÷ 8 =	
6	24 ÷ 8 =		28	80 ÷ 8 =	
7	16 ÷ 8 =		29	40 ÷ 8 =	
8	32 ÷ 8 =		30	24 ÷ 8 =	
9	8 ÷ 8 =		31	__ x 8 = 24	
10	40 ÷ 8 =		32	__ x 8 = 32	
11	10 x 8 =		33	__ x 8 = 72	
12	6 x 8 =		34	__ x 8 = 56	
13	7 x 8 =		35	64 ÷ 8 =	
14	8 x 8 =		36	72 ÷8 =	
15	9 x 8 =		37	48 ÷ 8 =	
16	56 ÷ 8 =		38	56 ÷ 8 =	
17	48 ÷ 8 =		39	11 x 8 =	
18	64 ÷ 8 =		40	88 ÷ 8 =	
19	80 ÷ 8 =		41	12 x 8 =	
20	72 ÷8 =		42	96 ÷ 8 =	
21	__ x 8 = 8		43	13 x 8 =	
22	__ x 8 = 40		44	104 ÷ 8 =	

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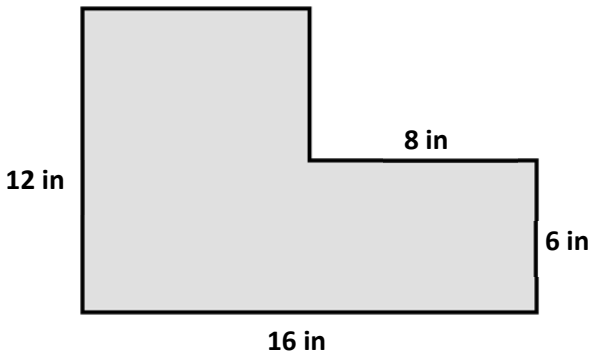
Name _____ Date _____

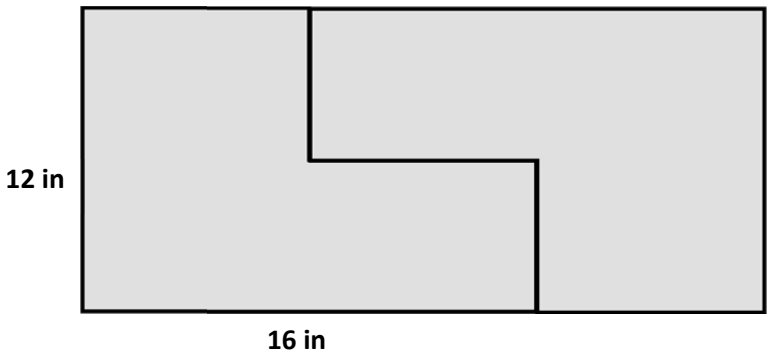
1. Kyle puts two rectangles together to make the L-shaped figure below. He measures some of the side lengths and records them as shown.



a. Find the perimeter of Kyle's shape.

b. Find the area of Kyle's shape.

c. Kyle makes two copies of the L-shaped figure to create the rectangle shown below. Find the perimeter of the rectangle.



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2. Jeremiah and Hayley use a piece of rope to mark a square space for their booth at the science fair. The area of their space is 49 square feet. What is the length of the rope that Jeremiah and Hayley use, if they leave a 3-foot opening so they can get in and out of the space?

3. Vivienne draws four identical rectangles as shown below to make a new, larger rectangle. The perimeter of one of the small rectangles is 18 centimeters and the width is 6 centimeters. What is the perimeter of the new, larger rectangle?

4. A jogging path around the outside edges of a rectangular playground measures 48 yards by 52 yards. Maya runs $3\frac{1}{2}$ laps on the jogging path. What is the total number of yards Maya runs?

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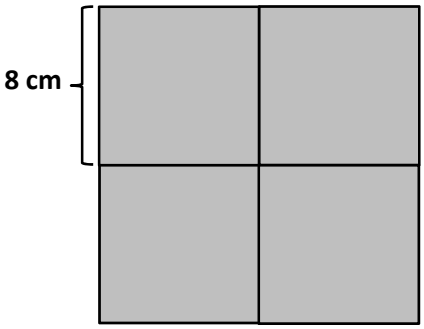
Jeannette draws four identical squares as shown below to make a new, larger square. The length of one of the small square sides is 8 centimeters. What is the perimeter of the new, larger square?



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Name _____ Date _____

1. Katherine puts two squares together to make the rectangle below. The side lengths of the squares measure 8 inches.

a. What is the perimeter of Katherine's rectangle?

b. What is the area of Katherine's rectangle?

c. Katherine decides to draw another rectangle of the same size. What is the area of the new rectangle?

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2. Daryl draws 6 equal size rectangles as shown below to make a new, larger rectangle. The area of one of the small rectangles is 12 square centimeters, and the length of the small rectangle is 4 centimeters.

a. What is the perimeter of Daryl's new rectangle?

b. What is the area of Daryl's new rectangle?

3. The recreation center soccer field measures 35 yards by 65 yards. Chris dribbles the soccer ball around the perimeter of the field 4 times. What is the total number of yards Chris dribbles the ball?

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