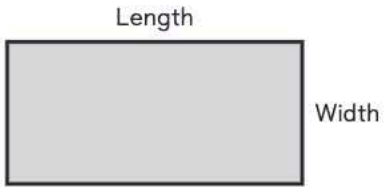
Chapter

8 AREA AND PERIMETER

Chapter Overview

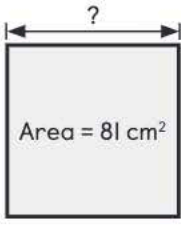
In this chapter, your student's knowledge of finding area and perimeter from previous grades will be extended to understanding area and perimeter of squares and rectangles by using formulas. Your student will use this knowledge to find missing side lengths and to explore composite figures.
Your student will:

- find the **area of rectangles and squares** by multiplying the length and width.



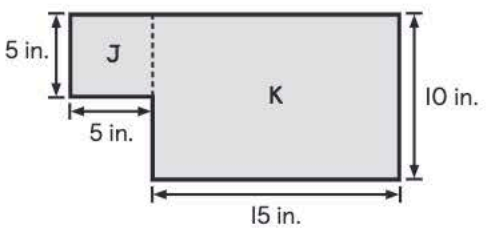
Area of a rectangle
= Length × Width
Perimeter of rectangle
= 2 × (Length + Width)

- find the **missing side length of rectangles and squares** using the given area and perimeter.



Area = Side × Side
81 = 9 × 9
Side = 9 cm

- use properties of squares and rectangles to find the **area and perimeter of composite figures**.



Area of cardboard = Area of J + Area of K

Area of J = 5 × 5
= 25 in²

Area of K = 15 × 10
= 150 in²

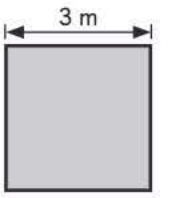
Area of cardboard = 25 + 150
= 175 in²

Teaching Tip

Use grid paper to help your student draw squares and rectangles that have opposite sides that are parallel and equal. Use color pencils when your student is working with composite figures to identify the squares and rectangles.

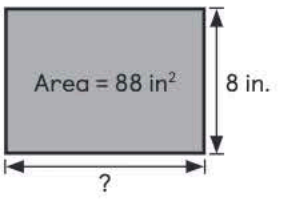
Key Ideas

- We can use formulas to find the area and perimeter of squares and rectangles.



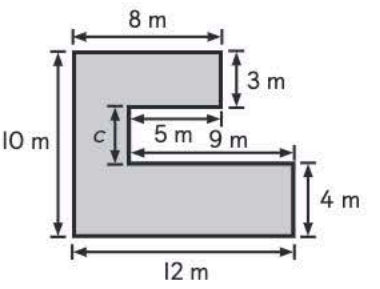
Area of square = Side × Side
Perimeter of square = 4 × Side

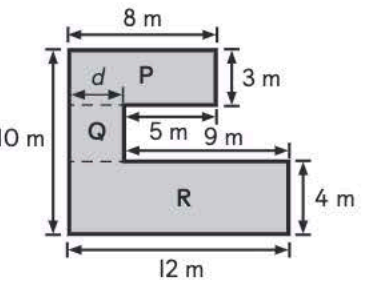
- We can find the missing side length of a square or rectangle using what we know about area and perimeter.



Area = Length × Width
Length = Area ÷ Width
= 88 ÷ 8
= 11 in.
Its length is 11 inches.

- We can compose or decompose composite figures into squares and rectangles to find the area and perimeter.





Materials You Will Need

- 2 rubber bands
- plastic square tiles
- toothpicks
- 2 geoboards
- 17 copies of Grid Paper 2 (TRI9)

Day 2 of 13

8A Rectangles and Squares (1)

Learning Objective(s)
- Find the perimeter of a rectangle or square.
- Find the area of a rectangle or square.

Material(s)
- 2 rubber bands
- 2 geoboards
- plastic square tiles
- 4 copies of Grid Paper 2 (TRI9)

AREAS AND PERIMETERS OF RECTANGLES AND SQUARES
(Student Book, pages 53 to 58)

Lesson Opener

Task (Student Book, page 53)

Show your student the **Lesson Opener** and cover the rest of the page. Discuss the question with your student. Do not show your student how to do the task and allow him/her to explore the concept using Grid Paper 2 (TRI9) to draw a model of the swimming pool.

Refer your student to **Learn** and **Learn Together** in the Student Book for reflection after your student has explored the concepts. Use questions to build understanding and direct instruction to refine understanding.

Lesson Development

Learn (Student Book, pages 53 and 54)

Invite your student to use a rectangle to represent the swimming pool and label the sides of the pool with the correct length and width. Encourage your student to consider how the area and perimeter would be represented in the model. You may wish to ask these questions:

- **What do you know about the pool?** *It measures 20 feet long and 10 feet wide.* **How would this look in a model?** *It would be a rectangle with the length two times as long as its width.* **How do you find the area of the pool?** *multiply the length and width* **How do you find the perimeter of the pool?** *Add each of the sides of the pool; add the length and the width, then multiply by 2.*

Point out the formulas for both the area and perimeter of a rectangle. Note that when finding the perimeter of the rectangle, the length and width should be added first, then multiplied by 2.

Focus Question

- **How are the side lengths used to find the area and perimeter of squares and rectangles?**

Invite your student to ponder this question as you go through the lesson. Revisit this question when you reach the end of the lesson to check his/her understanding.

Teaching Tip

The goal of this lesson is for your student to begin using formulas to find the area and perimeter of squares and rectangles. If needed, review the concept of area and perimeter using a geoboard and rubber bands. Remind your student that the area is the space inside of the rectangle or square represented with square units. The perimeter is the total length of all the sides of the rectangle or square. Encourage your student to trace along the sides of each shape using his/her finger.

- **What's the difference between the area and the perimeter of a figure?**

Learn Answer

(Student Book, pages 53 and 54)

200; 200; 60; 60

Learn Together (Student Book, pages 54 and 55)

Invite your student to find the area and perimeter to solve the problems in **Learn Together**. Encourage your student to first sketch a model on Grid Paper 2 (TRI9) to identify the length and width to see how these measures can be calculated to find the area and perimeter.

Through questioning, lead your student to find the area and perimeter in **Learn Together**. As you go through the problems with your student, you may wish to ask the following questions:

- **How does a square differ from a rectangle?** *A square has 4 equal sides while a rectangle only has equal opposite sides.* **How does that change the area formula?** *The same number is multiplied twice for the square.* **How does that change the perimeter formula?** *The length of the sides can be multiplied by 4.*

After your student has explored the concepts in the **Lesson Opener**, **Learn**, and **Learn Together**, you may wish to ask these questions to encourage further reflection:

- **How do area and perimeter differ? How do the strategies to find area or perimeter differ when working with a square or a rectangle?**

You may wish to have your student summarize his/her learning in a math journal. Invite your student to explain the difference between finding the area and perimeter using an example of a square or rectangle.

- **QUESTION 1** requires your student to find the area and perimeter of a square and deduce the respective formula.
- Prompt your student to consider how the formula would differ when working with a square. Point out that the length and width are the same and can just be referred to as the "side" of the square.
- **QUESTION 2** requires your student to find the area and perimeter of a rectangle by applying the appropriate formula.
- **QUESTION 3** requires your student to find the area and perimeter of a square by applying the appropriate formula.

Activity! (Student Book, page 56)

During the activity, invite your student to use geoboards and rubber bands to create a rectangle with length 9 units and width 4 units. Encourage your student to make another square with side length of 6 units. Invite your student to compare the areas and perimeters of each shape.

- **What do you notice about the areas of both the square and the rectangle?** *They both have an area of 36 square units.* **What do you notice about the perimeters of both shapes?** *The perimeter of the rectangle is greater.* **Why?** *The rectangle has a length that is 3 units longer than the side of the square.* **What other rectangles and squares can you make that have the same perimeter? What other rectangles and squares can you make that have the same area?**

Learn Together Answers

(Student Book, pages 54 and 55)

1. 3; 3; 9; 9;
4; 3; 12; 12

2. 14 × 5; 70;
14; 5; 2 × 19; 38

3. 11 × 11; 121;
4 × 11; 44

Digging Deeper

Invite your student to consider the way the units change when finding the area and perimeter. Note that the area is always represented in square units. The perimeter is in the same units as the side measurement. Encourage your student to compare each unit.

- **Why are the units for area different than the units for perimeter?** *Perimeter measures the total length of the sides. It is measured in the same way. The area of a shape is finding the number of squares that take up the shape. It is a square unit of that specific measure (centimeters, meters, etc.).*

Activity! Answers (Student Book, page 56)

Answers vary. Example:
My rectangle:
Area of rectangle = 9 × 4
= 36 units^2
Perimeter of rectangle = 2 × (9 + 4)
= 2 × 13
= 26 units
My square:
Area of square = 6 × 6
= 36 units^2
Perimeter of square = 4 × 6
= 24 units
The rectangle and square have the same area but different perimeters.

Day 6 of 13

Project Work (Student Book, Chapter 8, page 76)

- At the end of **Chapter 8**, your student should be able to complete **Parts 1** and **2**.
- **Part 1** requires your student to research about dams and how Hoover Dam was built.
- **Part 2** requires your student to build a model of a dam based on his/her research.

Day 7–8 of 13

Chapter Practice (Student Book, pages 77 to 80)

- Have your student work on **Chapter Practice** in the Student Book independently to help him/her consolidate and extend understanding of the chapter.
- You may find a summary of the chapter learning objectives and the difficulty level of the questions below.
- Teaching prompts are provided for Levels 2 and 3 questions.
- When your student is ready, have him/her work on **Additional Practice 4B**, **Chapter Practice**.

Chapter Practice Answers

(Student Book, pages 77 to 80)

1. Option C

2. Options B and D

3. **(a)** Area = $6 \times 6 = 36$ cm^2
Perimeter = $4 \times 6 = 24$ cm
(b) Area = $12 \times 7 = 84$ yd^2
Perimeter = $2 \times (12 + 7) = 38$ yd

Question	Level	Chapter 8 Learning Objective(s)	Section(s)	Day(s)
1	1	Find the perimeter of a rectangle or square. Find the area of a rectangle or square.	8A	2
2	1	Find the area of a composite figure.	8B	4
3	1	Find the perimeter of a rectangle or square. Find the area of a rectangle or square.	8A	2
4	1	Find the perimeter of a composite figure. Find the area of a composite figure.	8B	4
5	1	Find an unknown side of a rectangle or square given its perimeter Find an unknown side of a rectangle or square given its area.	8A	3
6	2	Find the unknown side of a composite figure. Find the perimeter of a composite figure. Find the area of a composite figure.	8B	4
7	3	Find an unknown side of a rectangle or square given its perimeter Find an unknown side of a rectangle or square given its area.	8A	3

- **QUESTION 6** requires your student to study the measurements given about a piece of folded paper to determine the perimeter of the unfolded piece of paper and the area after folding the corners.
  - **For (a) what do you know about the way the paper is folded? How will this help you find the perimeter of the unfolded paper? For (b), what do you know about the area of the unfolded paper? How did the paper change when Sanjay folded two triangles? How can you use the two triangles to find the area of the folded portion of the paper? What should you do next?**
- **QUESTION 7** requires your student to guess and check combinations of lengths and widths that satisfies the given area and perimeter.
  - **What do you know about the problem? What should you determine first? How will you find the side length from the perimeter and the area?**

Day 9–12 of 13

Chapter Test/Cumulative Assessment

- Assign **Chapter Test 8** in **Assessment Guide Teacher Edition** to assess your student's understanding of the chapter.
- Assign **Cumulative Assessment 4** in **Assessment Guide Teacher Edition** to allow your student to consolidate his/her learning and assess his/her understanding of Chapters 7 and 8.

Chapter Practice Answers

(Continued)

4. Length of large rectangle = 9 + 5 + 5
= 19 in.
Width of large rectangle = 18 + 6 + 6
= 30 in.
Area of large rectangle = 19 × 30
= 570 in^2
Area of small rectangle = 9 × 18
= 162 in^2
Area of shaded figure = 570 − 162
= 408 in^2

5. **(a)** 100 = 10 × 10
Side = 10 in.
(b) Length + Height = 150 ÷ 2 = 75 yd
Length = 75 − 30 = 45 yd

6. **(a)** Length of the paper = 3 + 2 + 3 = 8 cm
Width of the paper = 3 + 3 = 6 cm
Perimeter of the paper = 2 × (8 + 6)
= 2 × 14
= 28 cm
The perimeter of the unfolded piece of paper was 28 centimeters.
(b) The two folded corners make a 3-centimeter square.
Area of the figure = Area of the rectangle − Area of the square
Area of the rectangle = 8 × 6
= 48 cm^2
Area of the square = 3 × 3
= 9 cm^2
Area of the figure = 48 − 9
= 39 cm^2
The area of the figure after Sanjay folded the corners was 39 square centimeters.

7.

Length (m)	Width (m)	Area (m^2)	Perimeter (m)
14	10	14 × 10 = 140	2 × (14 + 10) = 48

Solve! Heuristics (Student Book, pages 81 and 82)

Heuristic: Make a Supposition

Invite your student to make a supposition to solve the problem using the four-step problem-solving method.

Step 1 Understand

Read the problem to your student.

- **What do you know about the problem?** *There is a combination of 60 motorbikes and cars in a junk yard. There is a total of 144 wheels.* **What do you know about each type of vehicle that will help you solve the problem?** *A motorbike has 2 wheels and a car has 4 wheels.*

Step 2 Plan

Invite your student to make a supposition about the number of motorbikes or cars in the junk yard to begin to solve the problem.

- **How could you consider the problem to begin solving?** *I could consider that all the vehicles are motorbikes and have 2 wheels. This could help me determine how many additional wheels are needed.* **What possible combinations could you suppose about the problem?** *If I know that there are 2 wheels for each motorbike and 4 wheels for each car, I can use possible multiples of 2 and 4 to make a combination of 144.*

Step 3 Do

Encourage your student to reason through the problem based on his/her supposition of the number of motorbikes.

- **How would you find the number of wheels if there were 60 motorbikes?** *I would multiply 60 by 2 to get 120 wheels.* **Can all the vehicles be only motorbikes? Why?** *No, there are only 144 wheels. There would need to be 24 more wheels.* **How could you use the 24 extra wheels to change the combination of vehicles?** *A car has 2 more wheels than a motorbike. I can divide 24 by 2 to find the number of cars.* **How would knowing the number of cars help you find the number of motorbikes?** *60 − 12 = 48*

Step 4 Look Back

Encourage your student to work backwards to check the answer.

- **How can you check that your answer makes sense?** *Multiply the number of wheels by the number of each vehicle. See if it makes 144 wheels.*

Teaching Tip

Invite your student to make another supposition that all the vehicles are cars. Encourage him/her to solve the problem and his/her work.

Solve! Heuristics Answers

(Student Book, page 81)

120; 120
120; 24; 24
24; 12; 12

Alternative Strategy

Heuristic: Make a Table

Encourage your student to share alternative strategies to solve the problem, such as using guess and check. Invite him/her to make sensible guesses such as starting with an equal number of cars and motorbikes or having more cars to increase the total number of wheels.