Study Guide: 5.8a– Area and Perimeter

5.8

a) find perimeter, area, and volume in standard units of measure;

b) differentiate among perimeter, area, and volume and identify whether the application of the concept of perimeter, area, [or volume (done at a later time)] is appropriate for a given situation;

Essential Questions:

How are perimeter and area different?

Why is area expressed in square units?

Where would you use area and perimeter in your everyday life?

What you need to know: *Given a problem situation, you will need to decide if the problem requires perimeter and area, and estimate and then measure, using appropriate units, to solve the problem.*

PERIMETER

Perimeter is the distance ***around*** a shape. It is a measure of ***length***.

Since it only measures one "dimension", **length**, it is considered *one-dimensional* (1D) and only needs to be labeled with the appropriate unit of length (in, cm, ft, yd, km, etc.)

Real-life examples of perimeter: length of fence *around* a yard, *length* of bulletin board *border*, *length* of molding *around* windows, *length* of gate to go *around* the *edge* of a garden.

Notice the key words: length, around, border, edge.

HANDS ON!

Take a Wikki Stix string or piece of yarn and wrap it around the edge of the rectangle below, starting at one corner and ending at the same corner after wrapping it all the way around the shape. Then, mark where the string ends and cut it. Lay it out in one long line.

How long is the string?

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It should be 8 inches in length total.

Now, if we measure the length of each side of the rectangle separately with a ruler, we find the following measurements:

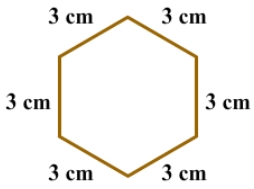
If we add up all of the sides together, we get… 8 inches!
The exact same length as the piece of string you wrapped around the rectangle.
1 + 1 + 3 + 3 = 8 inches

When we talk about PERIMETER, we are talking about how long a line drawn around the outside of a shape would be.

For a rectangle, the formula is:

Length + Length + Width + Width = A ***or*** ***L x 2 + W x 2 = A***

Here are some more examples:



When we add up all of the sides of this hexagon, we get:

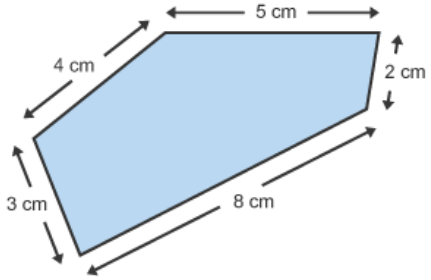
3 + 3 + 3 + 3 + 3 + 3 = 18 cm

The line around the border of the shape is 18 cm long.

We can even do irregular shapes, like this one:

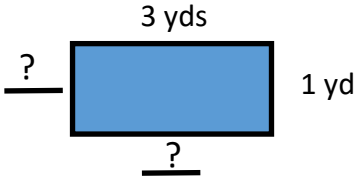
Just add up all the sides:

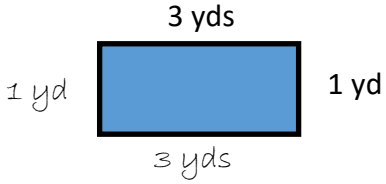
3 + 4 + 5 + 2 + 8 = 22 cm



What happens if you have a rectangle and only 2 sides are listed?

We know that each set of parallel sides has the same measurement, so we fill in the blanks and add!





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So to find the **PERIMETER** of ANY shape, **ADD UP ALL OF THE SIDES!**

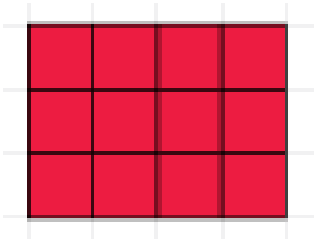
AREA

Area is the measure of the space inside a shape. It tells us the number of **square units** needed to **cover** a surface, like a multiplication array.

Some real-life area examples are: the size of the floor space a room, how much carpet we need to *cover* a floor, how much dirt or seeds we need to *cover* a garden, or how much wallpaper, tile, or paint we need to *cover* a wall.

Notice the key word: cover

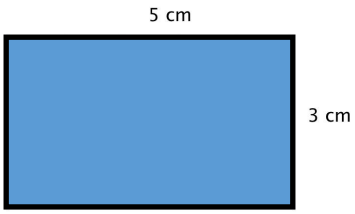
Hands On!



If you go into a room that has square tiles in it, count the number of square tiles the room has. Here is an example:

This room has 12 *square* tiles in it. Each square tile is 1 foot long and 1 foot wide which means it is a 1 foot square. This room has a total area of 12 square feet (12 ft^2) because there are 12 tiles in it that are each one foot square.

Now, we could count all of the squares in a shape if we are given a drawing like this one, but what happens if we are given a shape like this and asked to calculate the area?



The great thing about area is that we can figure it out without seeing the actual squares!

Turn the page to find out how!

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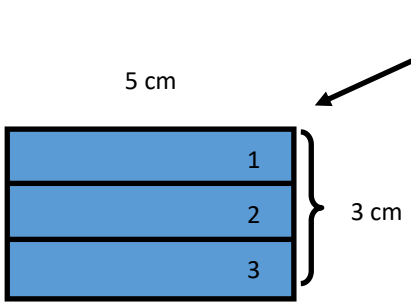
Finding area is just like using an array in multiplication. An array tells us how many rows there are and how many objects are in each row.

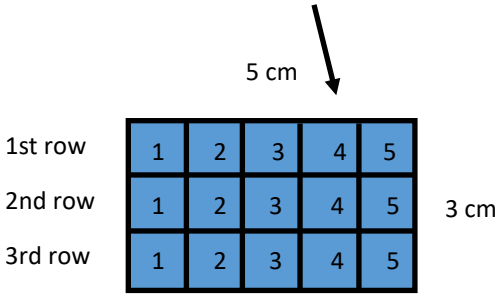
For example:

Each of these arrays have 12 things in them. We can multiply the number of rows by how many items are in each row to find the total. EX) 1 x 12= 12, 2 x 6=12, 3 x 4=12, etc.

Area models are very much like arrays. The numbers on the sides are telling us the number of rows and items in each row. Since we know the rectangle has a **width** of 3cm, that means that there are 3 rows and each row is a centimeter wide in our shape below. We can imagine those lines.



Now that we have our rows in place, we need to insert the number of squares in each row it tells us to. Since the **length** on top of the rectangle tells us each row has 5 squares in it, we need to divide each row into 5 squares, 1 cm long each.



So we have 3 rows of 5 squares each, for a total of 15 squares… 3 x 5 = 15 cm.

Instead of drawing all of those squares, we could have just multiplied the length (5) times the width (3) and found our answer– 15!

However...WE ARE NOT DONE! We are not just talking about the length of the rectangle (which would be expressed as cm), we are ALSO talking about its width.

Because we are talking about 2 dimensions, this is a 2D figure and we must include the little 2 at top of the unit, like this: 15 $cm^{2.}$ That little 2 lets us know there are TWO dimensions: length AND width.

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Let's try another!

Instead of drawing all of those squares, let's make it easy on ourselves and just use the formula!

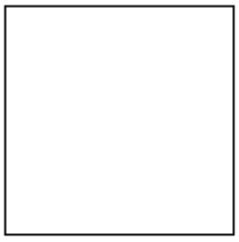
5 x 4 = 20 in^2

When calculating the AREA of a **rectangle**, multiply LENGTH TIMES WIDTH!

Area = Length X Width

AREA AND PERIMETER OF SQUARES

There is a special type of rectangle (a polygon with four straight lines with four right angles) that has all 4 sides that are the same length.



How would you calculate the area of this shape? Well, knowing it is a square, we have a big clue. Since the length of one side is 5 cm, and each side is the same length, we could easily figure out the area and perimeter of this square.

Since a square is a type of rectangle, we could use the same formula to calculate the area: A= L x W

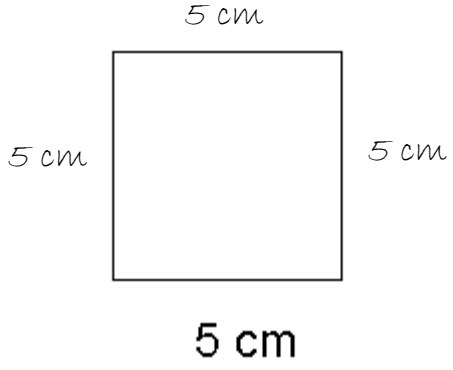
Write in the "missing" side lengths. Now, we know to find PERIMETER, we just add up all the sides:

5 + 5 + 5 + 5 = 20 cm

To find the area, we multiply the length times the width, which are the same measurement:

5 x 5 = 25 cm^2

Even though both the length and width are the same, we still include the little 2 after the cm label to indicate we are talking about area.



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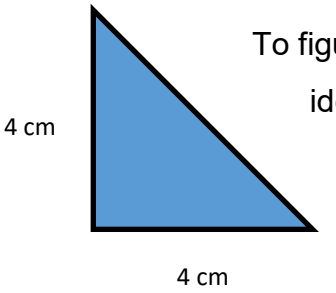
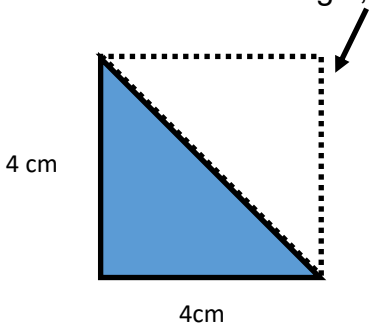
AREA OF RIGHT TRIANGLES

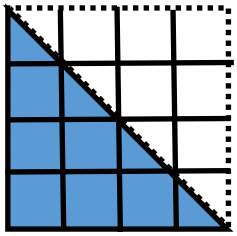
A right triangle is defined as a triangle with a 90 degree angle.



To figure out the area of this right triangle, first imagine that you drew another identical triangle upside on top of it to make a rectangle, like this.



Now that you have a rectangle, you can draw the squares in so we can see how many can fit in the right triangle.



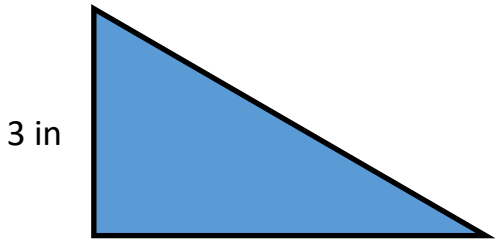
If we count up only the squares in the shaded right triangle, we will find that there are 8 total (6 whole squares and 4 half-squares, which put together make 2 whole squares). This means that the area of the right triangle is 8 cm^2.

If we counted ALL of the squares in the entire rectangle, we'd find that the area was 16 cm^2. The right triangle's area is half of the entire rectangle's area. This makes sense if you cut a rectangle in half, you get two identical right triangles.

Since a right triangle is half of a rectangle, to find the area of a right triangle, we find the area of a rectangle made with two of the triangles and then divide it by 2.

Area of Right Triangle = 1/2 x (L x W) or Area of Right Triangle = (L x W) ÷ 2

Let's try one more.



Area= (l x w) ÷ 2

= (3 x 4) ÷ 2

= 12 ÷ 2

= 6 in^2

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How you may see the question presented on the SOL test:

HINT: Write the formulas for area and perimeter at the top of your test scratch paper after you are allowed to begin your test!

1. Marsha's dad put a brick border around their house. Their house is 75 feet long and 36 feet wide. What is the perimeter of their house? (HINT: Draw a picture to help you!)

A 222 feet

B 200 feet

C 333 feet

D 105 feet

2. The perimeter of a square is 52 inches. What is the length of one side of the square? (HINT: Draw a picture to help you!)

A 13 inches

B 18 inches

C 9 inches

D 16 inches

3. Keith wanted to make a design around his picture frame he made. If the frame was 10 inches long and 6 inches wide, what was the perimeter? (HINT: Draw a picture to help you!)

A 30 inches

B 24 inches

C 32 inches

D 16 inches

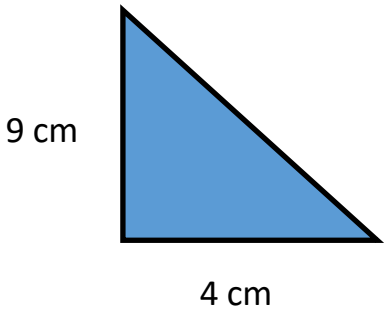
4. What is the area of this triangle?

A 81 cm2

B 13 cm2

C 36 cm2

D 18 cm2



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5. Mrs. Beamon wanted her class to form a triangle. If each side was 7 feet, what was the perimeter of the triangle?

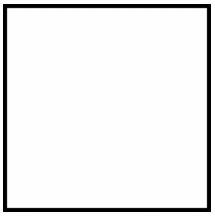
A 14 feet

B 21 feet

C 28 feet

D 7 feet

6. What is the area of this square?



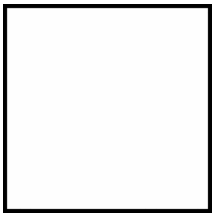
A 16 in2

B 28 in2

C 14 in2

D 49 in2

7. What is the perimeter of this square?



A 27 feet

B 81 feet

C 18 feet

D 36 feet

8. The perimeter of a rectangle is 40 inches. If the length of the rectangle is 12 inches, what is the measure of the width of the rectangle?
(HINT: Draw the rectangle and label the sides you know and put a question mark for the sides you don't know. Then, write the formula for the perimeter of a rectangle and fill in the parts you know. What could go in the question marks?)

A 16 inches

B 8 inches

C 6 inches

D 14 inches

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9. Which of the following are the dimensions of a rectangle with a perimeter of 26 inches and an area of 42 square inches?

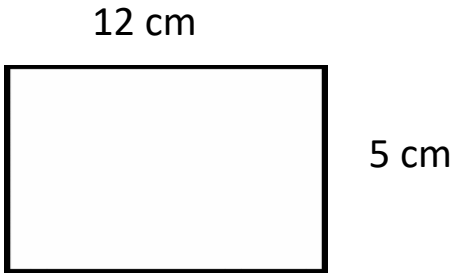
A Length — 2 inches; width — 13 inches

B Length — 1 inch; width — 26 inches

C Length — 6 inches; width — 7 inches

D Length — 2 inches; width — 21 inches

10. What is the area of this rectangle?



A 30 cm2

B 144 cm2

C 34 cm2

D 60 cm2

11. James must purchase enough grass seed to cover the field in the front of his home. Which measure could be calculated to determine the amount of grass seed he needs?

A Circumference

B Area

C Volume

D Perimeter

12. Which of the following would require finding the area?

A Building a patio with bricks

B Putting a frame around a picture

C Collecting aluminum cans

D Filling a bucket of water

13 Which of the following requires finding the perimeter?

A Buying enough paint to paint a wall

B Buying enough sand to fill a sand box

C Buying enough fence to go around a garden

D Buying enough material to make a tent

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14. Anita wants to cover her bulletin board with blue paper. Which measure can Anita calculate to determine the amount of blue paper she needs?

A Perimeter

B Circumference

C Volume

D Area

15. Highlight or circle all of the situations where calculating area would be needed to complete the task.

A baseball player running around a baseball field

Building a wooden patio deck

The amount of lawn that needs to be mowed

Filling a bucket with water to mop the floor

Putting a new roof on a house

16. Which of the following situations require finding the perimeter?

A How much paint is needed to paint a blue border around the edge of the bedroom floor?

B How much water is needed to fill the swimming pool?

C How much paper is needed to wrap all the birthday presents?

D How much carpet is needed to cover the floors of three bedrooms in the house?