

Area and Perimeter: math lesson, Grade 3 – download the PDF

Every flat shape takes up some space, and every flat shape has an edge. **Area** tells you how much surface a shape covers. **Perimeter** tells you how far it is around the outside. In this chapter you will cover shapes with squares, discover a fast multiplication shortcut, break big rectangles into easy pieces, walk around polygons, and find out why two shapes can cover the same space but have different distances around.

1. What is area?

Imagine you are covering the top of a table with sticky notes. You cannot leave gaps, and you cannot stack one note on top of another. The amount of table the notes cover is the **area**. To measure it, we need a standard piece to count with. That piece is a square.

D Area and unit squares

The **area** of a flat shape is the amount of surface inside it. A **unit square** is a square whose sides are all 1 unit long. If a shape is covered by n unit squares, with no gaps and no overlaps, its area is n square units.

Area is measured in **square units**. A square with sides 1 centimeter long has an area of 1 square centimeter (written 1 sq cm). In the same way we use square inches (sq in), square feet (sq ft), and square meters (sq m). Use small units for small things, such as a stamp, and larger units for big things, such as a classroom floor.

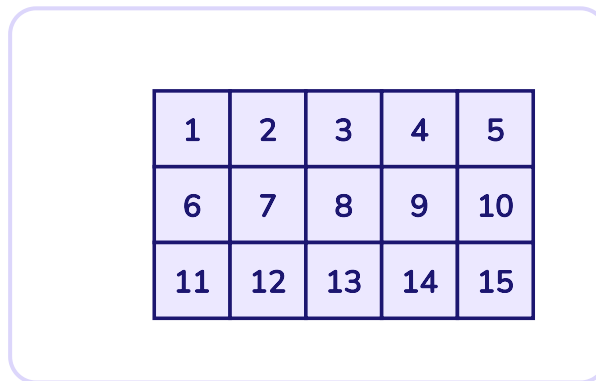


Careful with units

A length like 12 cm tells you how long something is. An area like 12 sq cm tells you how much surface is covered. They are different kinds of measurements, so never write an area with a plain length unit.

2. Counting unit squares

The simplest way to find an area is to count the unit squares. You can count them one by one, but that is slow and easy to mess up. It is much better to count by rows: each row has the same number of squares, so you can skip count.



In this figure there are 3 rows with 5 squares in each row. Counting by fives gives 5, 10, 15. So the area is 15 square units.



Example 1: tiles on a floor

A small entryway floor is covered by 1-foot square tiles. There are 4 rows, and each row has 6 tiles.

Skip count by 6: 6, 12, 18, 24. Or add: $6 + 6 + 6 + 6 = 24$.

The area is 24 square feet.

3. Area of a rectangle

When a rectangle is covered by unit squares, the squares form rows and columns. The number of squares in one row is the length, and the number of rows is the width. Adding the same number again and again is multiplication, so we do not have to draw every square.

P Area of a rectangle

The area of a rectangle is its length times its width:

$$A = \ell \times w$$

The area of a square with side length s is $A = s \times s$.

M How to find the area of a rectangle

1. Check that the length and the width use the *same* unit.
2. Multiply the length by the width.
3. Write the answer in square units.

E Example 2: a garden bed

A garden bed is 9 feet long and 4 feet wide.

$$A = 9 \times 4 = 36$$

The area is 36 square feet.

4. Area and multiplication

A rectangle covered by unit squares is just a picture of a multiplication fact. An array with 7 rows of 8 squares shows $7 \times 8 = 56$. Turn the picture sideways and you see 8 rows of 7 squares, which is $8 \times 7 = 56$. The area does not change, because the order of the factors does not change the product.

This also helps when a side is missing. If you know the area and one side, ask yourself: what number times this side gives the area? That is a multiplication fact with a missing factor, and you can solve it with division.

E Example 3: a missing side

A rug has an area of 42 square feet. It is 7 feet long. How wide is it?

$$7 \times ? = 42, \text{ so } 42 \div 7 = 6.$$

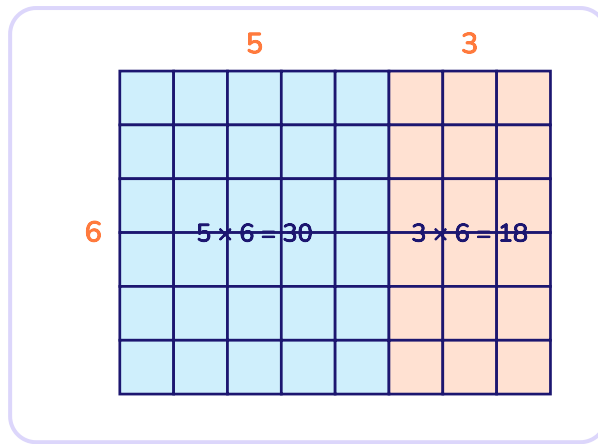
The rug is 6 feet wide. Check: $7 \times 6 = 42$.

! Zyro's tip

On my planet we say that a multiplication fact and a rectangle are twins. If you forget 6×8 , picture a rectangle with 6 rows of 8 squares and count it in friendly chunks!

5. Splitting rectangles: the distributive property

Some multiplication facts are hard to remember, such as 6×8 . A rectangle can help. Split the 8 into $5 + 3$. Now the big rectangle becomes two smaller rectangles, and each one is an easy fact.



P

Distributive property

Multiplying a number by a sum gives the same result as multiplying by each part and adding:

$$a \times (b + c) = a \times b + a \times c$$

For the figure: $6 \times 8 = 6 \times (5 + 3) = 6 \times 5 + 6 \times 3 = 30 + 18 = 48$.

E

Example 4: a long banner

A banner is 11 feet long and 6 feet tall. Split 11 into $10 + 1$.

$$6 \times 11 = 6 \times 10 + 6 \times 1 = 60 + 6 = 66$$

The area is 66 square feet.

The same idea works for shapes that are not rectangles. An L-shaped room is not one rectangle, but you can cut it into two rectangles, find each area, and add.

M**Area of an L-shape**

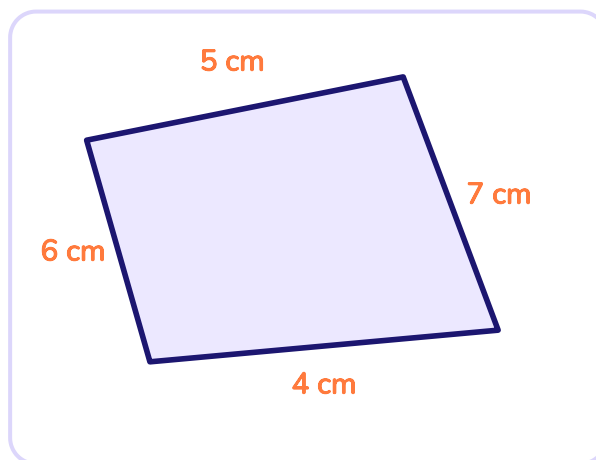
1. Draw a line that cuts the shape into two rectangles.
2. Find the length and width of each rectangle. Use subtraction if a side is not given.
3. Multiply to get each area.
4. Add the two areas.

6. What is perimeter?

Suppose an ant walks all the way around the edge of a rectangle and ends up where it started. The distance it walks is the perimeter. A **polygon** is a closed shape made only of straight sides, such as a triangle, a rectangle, or a pentagon.

D**Perimeter**

The **perimeter** of a polygon is the total distance around it. To find it, add the lengths of *all* its sides. Perimeter is measured in ordinary length units such as centimeters, inches, feet, and meters.



The sides of this polygon are 5 cm, 7 cm, 4 cm, and 6 cm, so $5 + 7 + 4 + 6 = 22$. Its perimeter is 22 cm. The picture is not drawn to scale, so trust the numbers and not your eyes.

A rectangle has two sides of the same length and two sides of the same width, so $P = \ell + w + \ell + w$, which is the same as $P = 2 \times (\ell + w)$.

E

Example 5: a poster

A poster is 12 inches long and 8 inches wide.

$$P = 12 + 8 + 12 + 8 = 40 \text{ or } P = 2 \times (12 + 8) = 2 \times 20 = 40.$$

The perimeter is 40 inches.

A

Common mistake

Do not add only the two sides you can see. A rectangle has four sides, and a pentagon has five. Touch each side once as you add, and do not forget any.

7. Unknown side lengths

Sometimes you know the perimeter but one side is missing. Add the sides you know, then subtract that sum from the perimeter. The answer is the missing side.

M

Finding a missing side

1. Add the side lengths you already know.
2. Subtract that sum from the perimeter.
3. For a rectangle, remember that opposite sides are equal, so halve what is left.

E**Example 6: two unknowns**

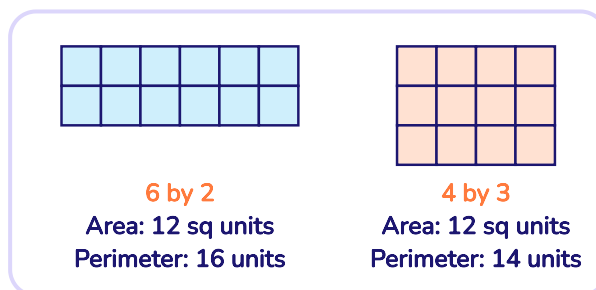
(a) A triangle has a perimeter of 25 inches. Two sides are 9 inches and 7 inches. Then $9 + 7 = 16$ and $25 - 16 = 9$. The third side is 9 inches.

(b) A rectangle has a perimeter of 30 meters and a length of 11 meters. The two lengths make $11 + 11 = 22$, and $30 - 22 = 8$ is left for the two widths. So each width is $8 \div 2 = 4$. The width is 4 meters.

In shapes with right-angle corners, you can also find missing sides by comparing opposite edges. If the top of an L-shape is 10 units long and one part of the bottom is 6 units, the other part must be $10 - 6 = 4$ units.

8. Same area, different perimeter

Here are two shapes made from 12 unit squares each. Both cover the same amount of surface, but look at the distance around them.



The long, thin rectangle has a longer perimeter than the one that is closer to a square. The reverse can happen too: shapes with the same perimeter can have different areas. For example, a 1 by 5 rectangle and a 3 by 3 square both have a perimeter of 12 units, but their areas are 5 and 9 square units.



Area and perimeter are different

Two shapes with the same area can have different perimeters. Two shapes with the same perimeter can have different areas. Among rectangles with the same area, the one closest to a square has the smallest perimeter.



Do not mix them up

Never assume that a longer perimeter means a larger area. Always calculate each measurement on its own, and always check the unit: square units for area, plain units for perimeter.

Key takeaways

- Area is the amount of surface inside a shape, measured in square units such as sq cm, sq in, sq ft, and sq m.
- A rectangle covered by unit squares shows multiplication: $A = \ell \times w$.
- If the area and one side are known, use a missing-factor fact or division to find the other side.
- Split a rectangle or an L-shape into smaller rectangles, find each area, and add:
$$a \times (b + c) = a \times b + a \times c$$
- Perimeter is the distance around a polygon: add all of its side lengths, in plain length units.
- To find a missing side, subtract the known sides from the perimeter.
- Different shapes can have the same area but different perimeters, or the same perimeter but different areas.



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