Area

What do you need to know?

Area is the amount of space taken up by a flat or 2D shape. We measure area using **square units**, and we write them using a small ^{2} next to the units, e.g. cm^2 or m^2.

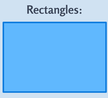
We work out the area of different shapes using different methods.

Parallelograms

To work out the area of **squares and rectangles**, we use the same formula:

Area = Length x Width

Rectangles:



The length of this rectangle is 5 cm, and the width is 4 cm.

$5 \times 4 = 20$

Therefore the area of the rectangle is $20cm^2$.

Squares:

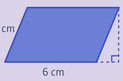
The sides of a square are all equal in length, so the length and width are always **the same**! Therefore the length and width of this square are both 3 cm.

$3 \times 3 = 9$

Therefore the area of the square is $9cm^2$.

Parallelograms:

A parallelogram is any 4-sided shape with 2 pairs of parallel sides – squares and rectangles are both technically parallelograms! But they can also look like this:



No matter what a parallelogram looks like, you work out the area with the same formula:

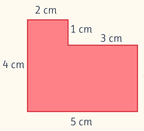
Area = Base x Perpendicular Height

Perpendicular means that the height is at a **right angle** with the base of the parallelogram, as seen in the diagram.

So to work out the area of this shape we multiply the base by the perpendicular height:

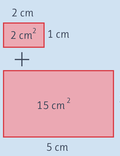
$6 \text{ cm} \times 3 \text{ cm} = 18 \text{ cm}^2$ ✔

We can use this knowledge to work out the total area of compound shapes like this one:



To work this one out we need to **split** this compound shape into smaller squares or rectangles, and add the areas of these smaller shapes together. We will try two different ways:

1)



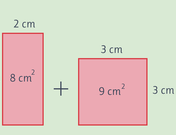
$2 \times 1 = 2$

$5 \times 3 = 15$

$2 + 15 = 17$

Therefore our total area is $17cm^2$ ✔

2)



$4 \times 2 = 8$

$3 \times 3 = 9$

$8 + 9 = 17$

Therefore our total area is $17cm^2$ ✔

Remember!

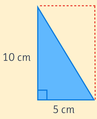
Whichever way you split up a compound shape, you will always get the **same area** in the end!

Triangles

To work out the formula of a triangle we use the formula:

Area = Base x Perpendicular Height ÷ 2

To help us understand why, let's take a look at an example with right-angle triangle:



From what we've learned about finding the area of a rectangle, we know that if we multiply the base of this triangle by its perpendicular height, we will get the area of the rectangle shown in the dotted line.

$5 \times 10 = 50$

Therefore to get the area of the triangle, we need to divide this by 2.

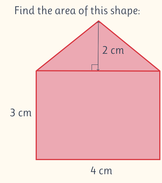
$50 \div 2 = 25$

So our final answer is 25 cm^2 ✔

This same formula works for **ALL** triangles, whether they are right-angle, isosceles or scalene, as the triangles are always half the area of their respective rectangles:

Let's take a look at a more complicated example!

Find the area of this shape:

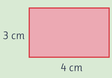


To find the area of this shape, we first need to work out which formulas to use!

We can split this shape into a rectangle and a triangle, which means that we need to use:

Area of rectangle = Length x Width

Area of triangle = Base x Perp. Height ÷ 2



Area of rectangle = 4 x 3

= 12 cm^2

Area of triangle = (4 x 2) ÷ 2

= 8 ÷ 2

= 4 cm^2

Now we just need to add these areas together to get the total area of our shape:

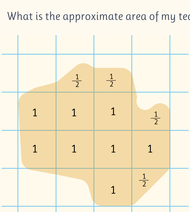
$12 \text{ cm}^2 + 4 \text{ cm}^2 = 16 \text{ cm}^2$ ✔

Irregular Shapes

You also might have to work out the area of irregular shapes... For this we can use a grid, and count the squares to estimate the total area!

For example, imagine that I have spilled some tea on my Maths notebook. Every square on my notebook has an area of 1 square centimetre.

What is the approximate area of my tea stain?



1) We can start off by counting the squares that are completely or almost completely covered by the shape: **8 squares**

2) We then look for squares that are about half covered by the shape: there are 4 squares half-covered, so we can count this as **2 whole squares**

3) As we are estimating, we can ignore squares which are under half full.

$8 + 2 = 10$

So our final estimate is 10 cm^2 ✔

Recap of key formulas:

- Squares and Rectangles: Area = Length x Width.
- Parallelograms: Area = Base x Perpendicular Height.
- Triangles: Area = Base x Perpendicular Height ÷ 2.
- Compound shapes: Split it into simpler shapes and add the areas together.