SIMILAR SHAPES

Two shapes are similar if they are exactly the same shape, but different in size. This means that one is an enlargement of the other.

Check that you can:

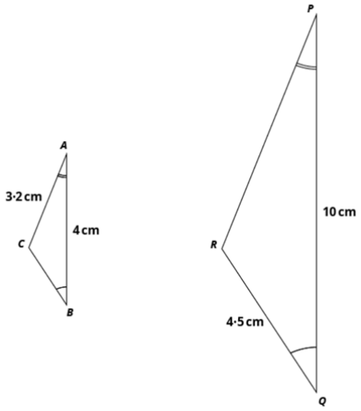
- *recognise and work with ratios*
- *perform division with whole numbers and decimal numbers*
- *rearrange equations to find missing values.*

Calculating missing lengths

Using the scale factor for the enlargement gives a method for calculating missing lengths.

Example

Triangles ABC and PQR are similar.
Calculate the lengths of PR and BC.



Answer
We are given the lengths of the **corresponding sides** AB and PQ. This means that the scale factor for the enlargement is $\frac{10}{4} = 2{\cdot}5$.

To calculate the length PR, we need to multiply the corresponding side by $2{\cdot}5$, as triangle PQR is the larger triangle.

Length of $PR = 3{\cdot}2 \times 2{\cdot}5 = 8$ cm.

To calculate the length BC, we need to divide the corresponding side by $2{\cdot}5$, as triangle ABC is the smaller triangle.

Length of $BC = 4{\cdot}5 \div 2{\cdot}5 = 1{\cdot}8$ cm

Another method is to use the **ratios** between the corresponding sides.

This can be written as:

$$\frac{PQ}{AB} = \frac{PR}{AC} = \frac{QR}{BC} \text{ or } \frac{AB}{PQ} = \frac{AC}{PR} = \frac{BC}{QR}$$

Fill in the values you know and rearrange this to find the missing value. It is easiest to use fractions where the value you are asked to find is in the numerator (top) of the fraction.

In this example, we have:

$$\frac{10}{4} = \frac{PR}{3{\cdot}2} \text{ and } \frac{4}{10} = \frac{BC}{4{\cdot}5}$$

Although the two methods described here are the ones most often used to calculate missing lengths in similar shapes, other ratios could be used.

For example:

$$\frac{3{\cdot}2}{4} = \frac{PR}{10}$$

Length of $PR = \frac{3{\cdot}2}{4} \times 10$

$= 8$ cm

We have used three different calculations to find the length of PR, but each calculation simplifies to $10 \times 3{\cdot}2 \div 4$, but with the order of operation changed.

Length of $PR = \frac{10}{4} \times 3{\cdot}2$

$= 8$ cm

Length of $BC = 4{\cdot}5 \times \frac{4}{10}$

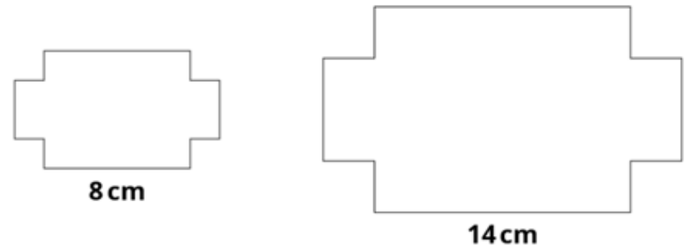
$= 1{\cdot}8$ cm

Using similar shapes to find the perimeter

Example

The two shapes below are similar. The perimeter of the smaller shape is 36 cm. Calculate the perimeter of the larger shape.

Answer



We do not need to know all the dimensions of the small shape since the two shapes are similar.

The scale factor for the enlargement is $\frac{14}{8} = 1{\cdot}75$.

Perimeter of large shape $= 36 \times 1{\cdot}75$

$= 63$ cm.

Or we could use:

$$\frac{\text{Perimeter of large shape}}{36} = \frac{14}{8}$$

Perimeter of large shape $= 36 \times \frac{14}{8}$

$= 63$ cm

REMEMBER!
Use the information you know about the shapes' measurements to determine the scale factor between them. You can always find the scale factor between similar shapes if you are given the lengths of two corresponding sides.