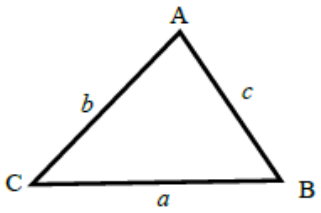
Pearson Edexcel

The cosine rule to find missing angles

A LEVEL LINKS
Scheme of work: 4a. Trigonometric ratios and graphs

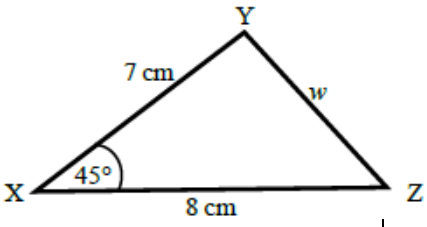
Key points

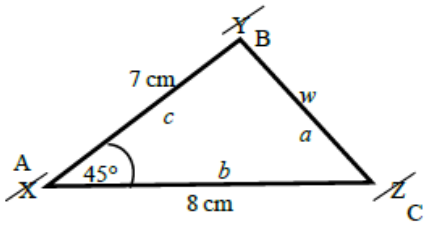
- a is the side opposite angle A.
  b is the side opposite angle B.
  c is the side opposite angle C.



- You can use the cosine rule to find the length of a side when two sides and the included angle are given.
- To calculate an unknown side use the formula $a^2 = b^2 + c^2 - 2bc\cos A$.
- Alternatively, you can use the cosine rule to find an unknown angle if the lengths of all three sides are given.
- To calculate an unknown angle use the formula $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$.

Example 1 Work out the length of side w.
Give your answer correct to 3 significant figures.





$a^2 = b^2 + c^2 - 2bc\cos A$

$w^2 = 8^2 + 7^2 - 2\times 8\times 7\times \cos 45°$

$w^2 = 33.804\,040\,51...$
$w = \sqrt{33.804\,040\,51}$
$w = 5.81$ cm

1 Always start by labelling the angles and sides.

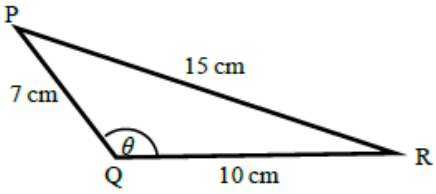
2 Write the cosine rule to find the side.

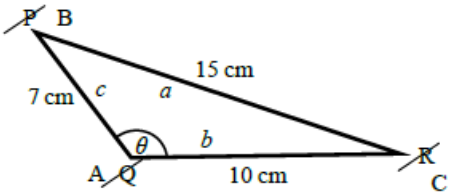
3 Substitute the values a, b and A into the formula.

4 Use a calculator to find w^2 and then w.

5 Round your final answer to 3 significant figures and write the units in your answer.

Example 2 Work out the size of angle θ.
Give your answer correct to 1 decimal place.





$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos\theta = \frac{10^2 + 7^2 - 15^2}{2 \times 10 \times 7}$$

$$\cos\theta = \frac{-76}{140}$$

$\theta = 122.878\,349...$

$\theta = 122.9°$

1 Always start by labelling the angles and sides.

2 Write the cosine rule to find the angle.

3 Substitute the values a, b and c into the formula.

4 Use $\cos^{-1}$ to find the angle.

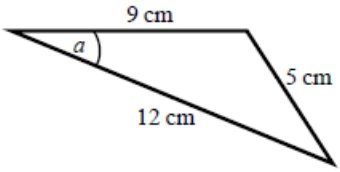
5 Use your calculator to work out $\cos^{-1}(-76 \div 140)$.

6 Round your answer to 1 decimal place and write the units in your answer.

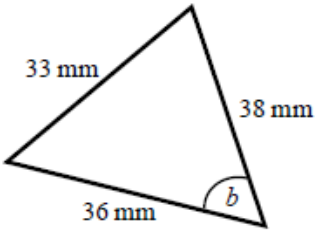
Practice questions

1 Calculate the angles labelled θ in each triangle.
Give your answer correct to 1 decimal place.

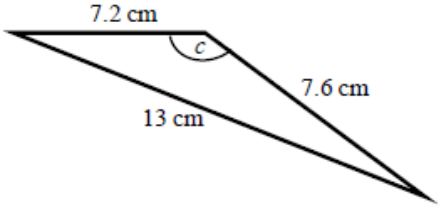
a



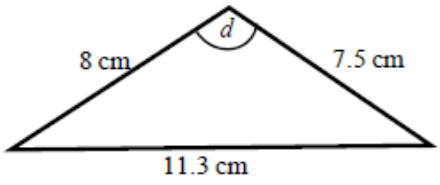
b



c

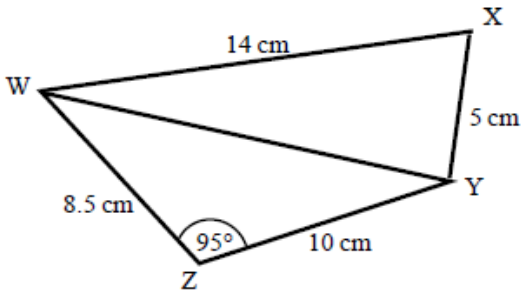


d



2 **a** Work out the length of WY.
Give your answer correct to
3 significant figures.

b Work out the size of angle WXY.
Give your answer correct to
1 decimal place.



Answers

1 **a** 22.2° **b** 52.9° **c** 122.9° **d** 93.6°

2 **a** 13.7 cm **b** 76.0°