

# Bridging the gap to A-Level

## Introduction

Congratulations on choosing to study AS Level Maths. To help you prepare, this booklet will enable you to brush up on some of the skills you have learned at GCSE. You are going to need to use them from day 1, and if you don't have a good grasp of the basics you need to work on them NOW so that you can start with confidence.

**Do the questions in this booklet in pencil, then check your answers. If you get something wrong, revise the topic then try again. The aim is to get EVERYTHING right!**

Studying AS Maths is about learning how to solve problems, and getting stuck is part of the learning process. You should expect to get stuck while working through this booklet but these are all GCSE techniques that you will need to master.

There are loads of great resources on the internet to help you, but if you get stuck we recommend **ExamSolutions.net** which contains video tutorials for all GCSE Higher content. We also recommend using this site throughout the A Level course.

<http://www.examsolutions.net/maths-revision/syllabuses/GCSE/period-1/Higher/module.php>



**There will be a TEST in your first week at college based on the material in this booklet. Please bring the completed booklet with you to your first maths lesson.**

If you want a more comprehensive revision guide, there are several books available from Amazon but please note it is NOT compulsory to buy either of these:

Collins Maths - Bridging GCSE and A Level: Student Book  
Head Start to AS Maths by CGP Books

Finally, there is an interactive online course called 'Step up! To A Level Maths' hosted by the University of Plymouth that is packed with extra resources and examples:

## GCSE Maths

If you're naturally good at maths you can do well without much extra studying

It's the answer that matters most, but you should show working

You have an exercise book to keep all your work together

Nobody minds how you set out your workings so long as you get there in the end

We will not have time to cover these techniques in class next year but you ARE required to know them when you start AS Maths

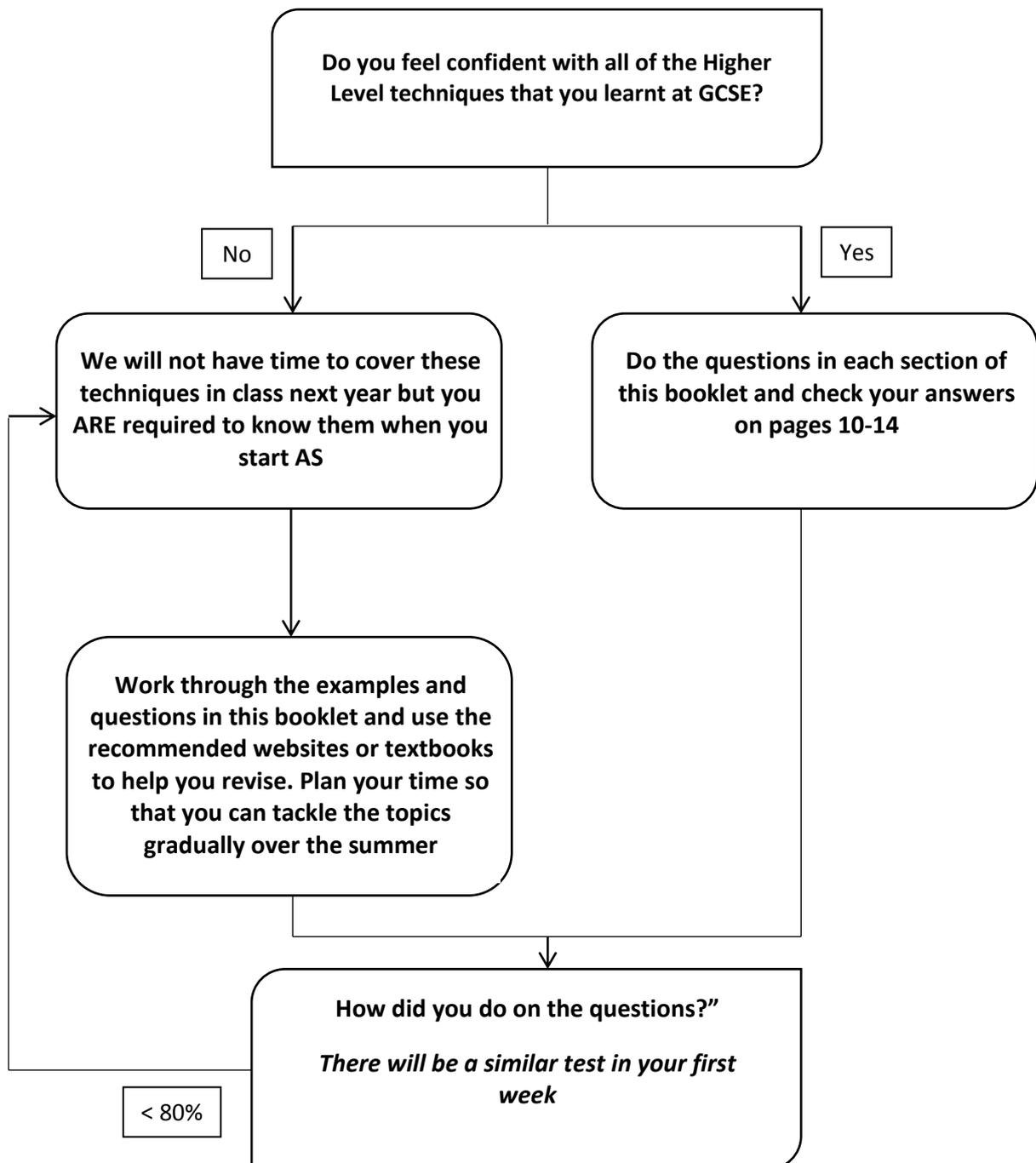
## AS Level Maths

You will do a lot of study outside of class.

It's the method that matters, not the answer. Often you are given the answer but need to show steps in the method.

You will need to keep neat, accurate and well ordered notes.

How you present your work can make a big difference to whether you get the right answer at all and whether anyone can understand your method.



Sparx Maths

# Transition Workbook

GCSE to A-Level



[sparxmaths.com](https://sparxmaths.com)

## Key facts and formulae:

### The Quadratic formula:

The solution of  $ax^2 + bx + c = 0$

where  $a \neq 0$

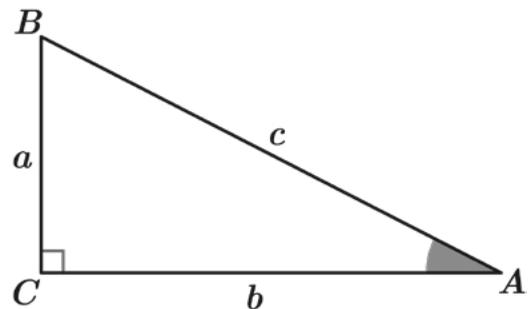
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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### Trigonometry:

In any right-angled triangle  $ABC$  where  $a$ ,  $b$  and  $c$  are the length of the sides and  $c$  is the hypotenuse:

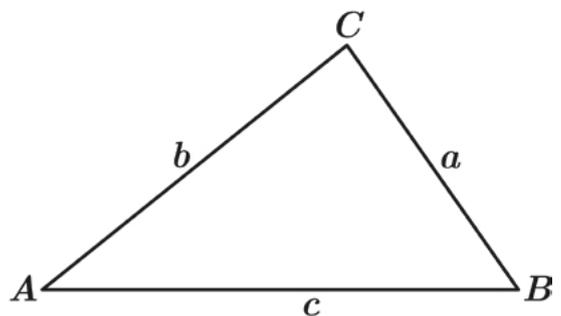
$$\sin A = \frac{a}{c} \quad \cos A = \frac{b}{c} \quad \tan A = \frac{a}{b}$$



In any triangle  $ABC$  where  $a$ ,  $b$  and  $c$  are the length of the sides:

$$\text{sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A$$



Q1

Expand and fully simplify  $(4 + \sqrt{7})^2 - (4 - \sqrt{7})^2$

Answer: .....

Q2

Work out the value of  $x$  in the equation below.

$$x(\sqrt{11} - 2) = 21$$

Give your answer in the form  $a + b\sqrt{11}$ , where  $a$  and  $b$  are integers.

Answer: .....

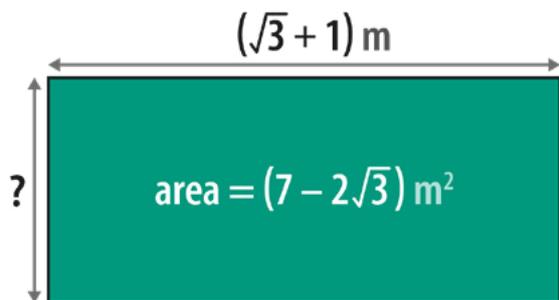
Q3

Given that  $h$  is a prime number, rationalise the denominator of  $\frac{5h - \sqrt{h}}{\sqrt{h}}$   
 Give your answer in its simplest form.

Answer: .....

Q4

Calculate the unknown side length, in metres, of the rectangle below.  
 Give your answer in its simplest form, rationalising the denominator if necessary.



Answer: ..... m

Q1

Expand and fully simplify  $(2x + 5)(4x - 3)(5x - 4)$ 

Answer: .....

Q2

Work out the values of  $a$ ,  $b$  and  $c$  in the identity below.

$$(3x - 1)(x + 2)(ax + b) \equiv 15x^3 + 16x^2 - 25x + c$$

Answer:  $a = \dots\dots\dots$   $b = \dots\dots\dots$   $c = \dots\dots\dots$

Q3

Write the following expression in the form  $\frac{1}{ax^b} + \frac{1}{cy^d}$  where a, b, c, and d are integers.

$$\left(\frac{1}{5x} + \frac{1}{4y}\right)\left(\frac{1}{25x^2} - \frac{1}{20xy} + \frac{1}{16y^2}\right)$$

Answer: .....

Q4

Show that  $(x^2 + 1)(y^2 + 4) \equiv (xy - 2)^2 + (2x + y)^2$

Q1

Fully factorise  $49h^2 - m^2$ 

Answer: .....

Q2

Fully factorise  $7b - b^2 - 10$ 

Answer: .....

Q3

Fully factorise  $4k^2 - 25n^2 - (2k - 5n)^2$ 

Answer: .....

**Q1** Work out the values of  $a$ ,  $b$  and  $c$  in the equality below.

$$\frac{2x^{20}y^4 \times 12x^4y^{26}}{(2xy^2)^3} = ax^by^c$$

Answer:  $a = \dots\dots\dots$   $b = \dots\dots\dots$   $c = \dots\dots\dots$

**Q2** Work out what expression should replace the ? in the equivalent fractions below.

$$\frac{?}{12r^4(t+6)} = \frac{2n}{3r}$$

Answer: ? = .....

**Q3**  $\frac{ax^2 + bx + c}{dx^2 - 25}$  simplifies to give  $\frac{x - 4}{2x - 5}$

Work out the values of  $a$ ,  $b$ ,  $c$  and  $d$  in the original fraction.

Answer:  $a = \dots\dots\dots$   $b = \dots\dots\dots$   $c = \dots\dots\dots$   $d = \dots\dots\dots$

Q1

Fully simplify  $\frac{7}{36 - x^2} - \frac{3}{6 + x}$

Give your answer fully factorised.

Answer: .....

Q2

Write the following as a single fraction in its simplest form:

$$6 - (x + 4) \div \frac{x^2 + 11x + 28}{x - 7}$$

Give your answer fully factorised.

Answer: .....

Q1

Solve  $x(x + 4) - 4(5x + 9) = 0$ 

Answer: .....

Q2

Jessica thinks of a positive number,  $n$ , which is less than 1  
She adds this number to its reciprocal and gets 2.9

Work out the value of  $n$ .

Give your answer as a fraction in its simplest form.

Answer: .....

Q3

Solve  $\frac{4}{y-1} - \frac{5}{y+2} = \frac{3}{y}$

Answer: .....

Q4

$$x = \frac{-3 \pm \sqrt{29}}{2}$$

There is only one equation of the form  $x^2 + bx + c = 0$  that gives these values of  $x$  as solutions.

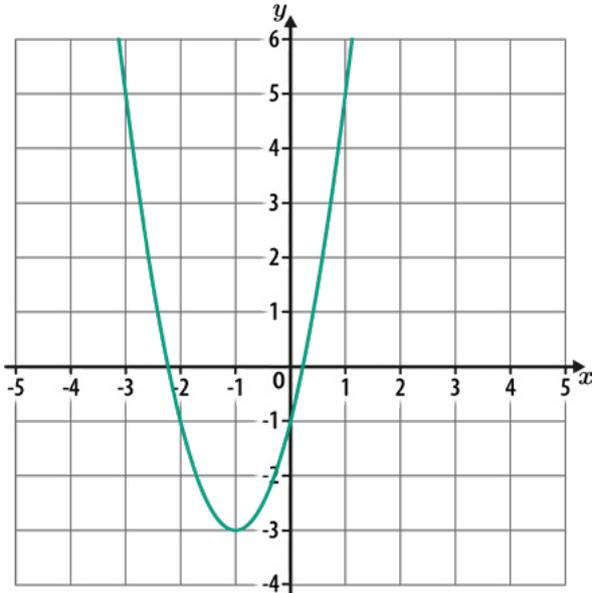
Work out the values of  $b$  and  $c$ .

Answer:  $b =$  .....  $c =$  .....

**Q1**

The diagram below shows the graph of  $y = 2x^2 + 4x - 1$   
 The equation  $2x^2 + 4x - 1 = k$  has solutions at  $x = -3$  and  $x = 1$

What is the value of  $k$ ?



Answer:  $k = \dots\dots\dots$

**Q2**

A curve has the equation  $y = x^2 + ax + b$ , where  $a$  and  $b$  are numbers.  
 The turning point of the curve is  $(5, 4)$

Work out the values of  $a$  and  $b$ .

Answer:  $a = \dots\dots\dots$   $b = \dots\dots\dots$

**Q3**

A curve has the equation  $y = -x^2 + 16x - 65$

- a) Work out the turning point of the curve.

Answer: a) ( ..... , ..... )

- b) By considering the position of the turning point and the shape of the curve, work out how many real roots  $y = -x^2 + 16x - 65$  has.

Answer: b) .....

Q1

Solve the following simultaneous equations:

$$3x = 3 - 4y$$

$$12y + 11 = -5x$$

Answer:  $x = \dots\dots\dots$   $y = \dots\dots\dots$ 

Q2

Find the values of  $x$ ,  $y$  and  $a$  by solving the following simultaneous equations:

$$6x - 7y = -10$$

$$12x - 5y = 16$$

$$2x + ay = 10$$

Answer:  $x = \dots\dots\dots$   $y = \dots\dots\dots$   $a = \dots\dots\dots$

Q3

Solve the following simultaneous equations:

$$\frac{4}{7x-4} = \frac{1}{6y}$$

$$\frac{5x}{3y+2} = 4$$

Answer:  $x = \dots\dots\dots$   $y = \dots\dots\dots$ 

Q4

Solve the following simultaneous equations:

$$2^x = 4^{(7-2y)}$$

$$3^{(5x-13y)} = 81$$

Answer:  $x = \dots\dots\dots$   $y = \dots\dots\dots$

Q1

Write an expression, in terms of  $h$ , for the gradient of a line **perpendicular** to the line segment joining  $(3h, 20)$  to  $(6h, 8)$

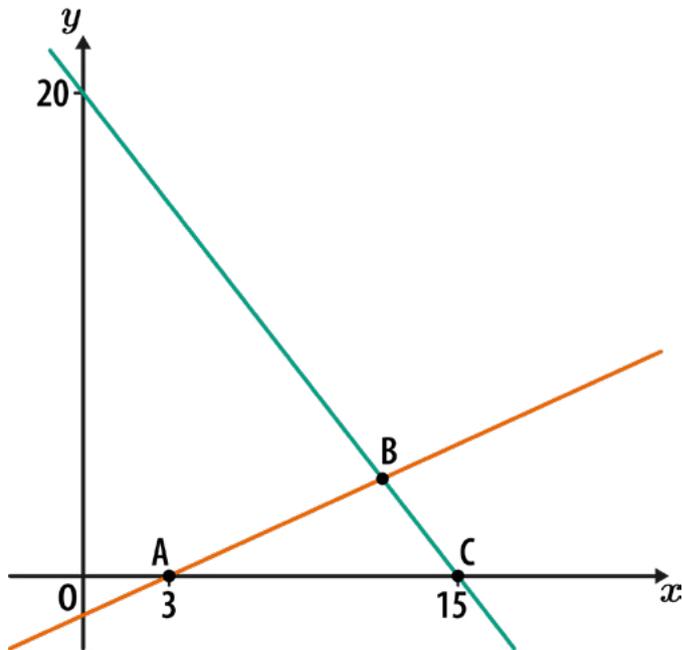
Give your answer as a fully simplified fraction.

Answer: .....

Q2

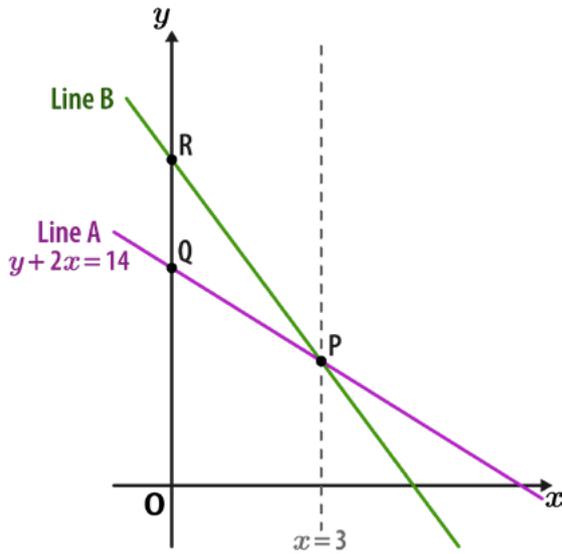
The triangle ABC has an area of 24 square units.

What are the coordinates of point B?



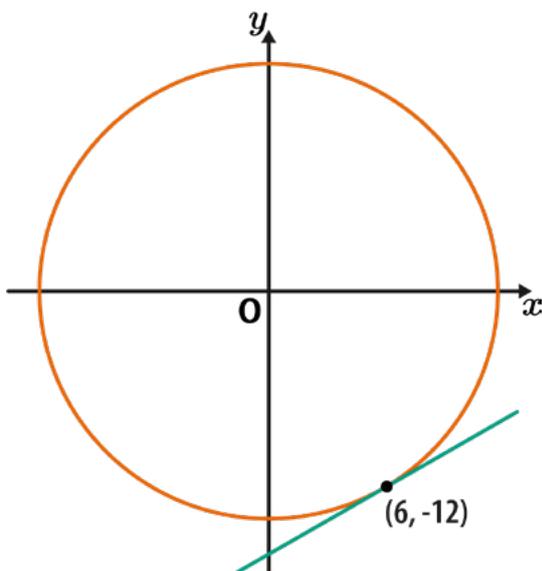
Answer: ( ..... , ..... )

**Q3** Line A has the equation  $y + 2x = 14$   
 The gradient of line B is twice the gradient of line A.  
 Work out the ratio of the length of OQ to the length of OR.  
 Give your answer in its simplest form.



Answer: .....

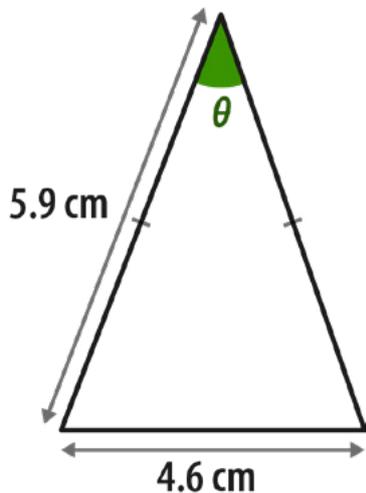
**Q4** A circle, centre O, passes through the point (6, -12), as shown.  
 Work out the equation of the tangent to the circle at this point.  
 Give your answer in the form  $y = mx + c$ , where  $m$  and  $c$  are integers or fractions in their simplest form.



Answer: .....

Q1

Calculate the size of angle  $\theta$ .  
Give your answer to 1 d.p.

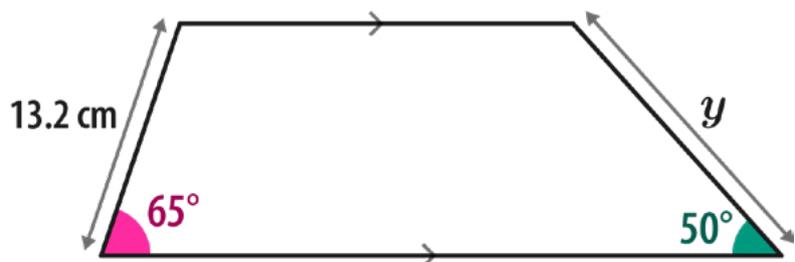


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Answer: .....<sup>o</sup>

Q2

Work out the length  $y$ .  
Give your answer to 2 d.p.

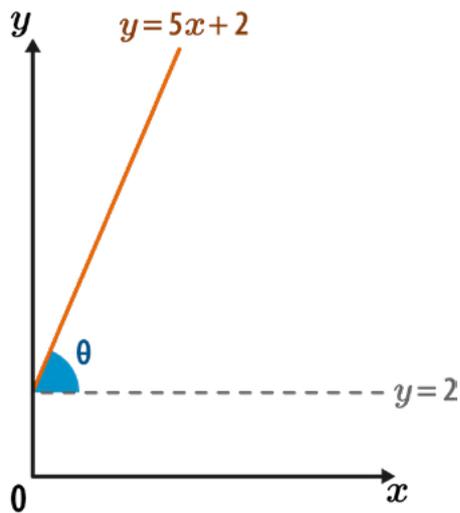


Not drawn accurately

Answer: ..... cm

**Q3** The graph below shows the line with equation  $y = 5x + 2$   
The axes both have the same scale.

Calculate the size of angle  $\theta$ .  
Give your answer in degrees to the nearest integer.

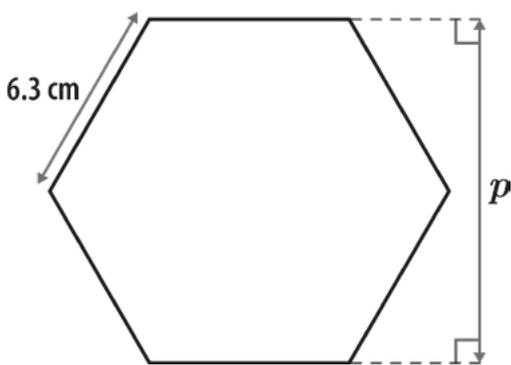


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Answer: ..... °

**Q4** The shape below is a regular hexagon.

Use trigonometry to calculate the distance  $p$ .  
Give your answer in centimetres to 2 d.p.

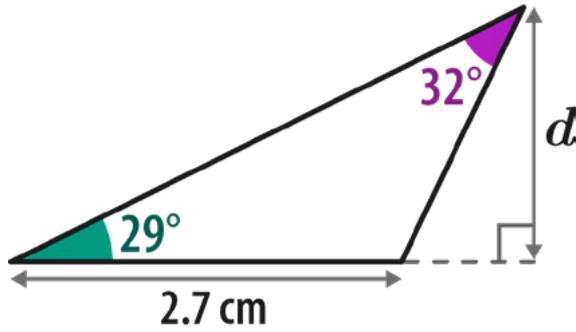


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Answer: ..... cm

Q1

Calculate the length  $d$ .  
Give your answer to 2 s.f.

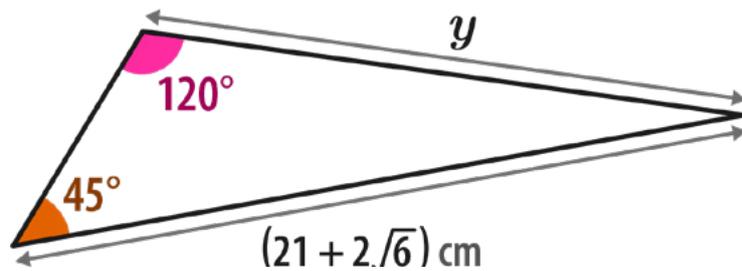


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Answer: ..... cm

Q2

Work out the length  $y$  in the triangle below.  
Give your answer in its simplest form, rationalising the denominator if necessary.

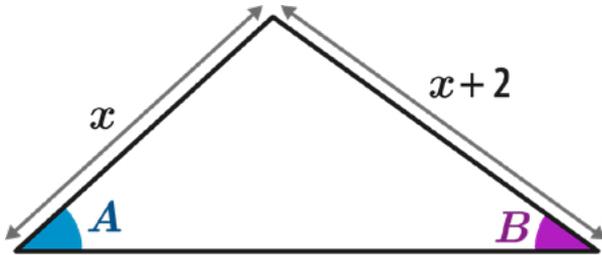


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Answer: ..... cm

**Q3** Using the information below, work out the value of  $x$ .

$$\sin A = \frac{4}{5} \qquad \sin B = \frac{3}{4}$$

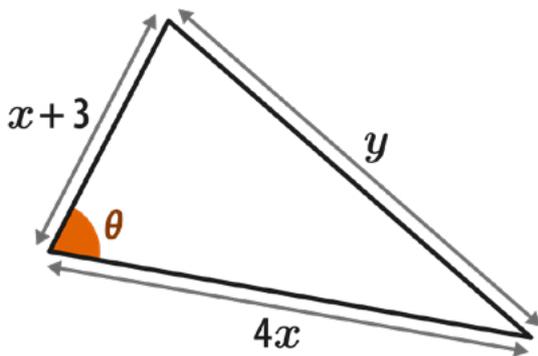


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Answer: .....

**Q4** Given that  $\cos\theta = \frac{1}{8}$  in the triangle below, show that  $y^2 = ax^2 + bx + c$  where  $a$ ,  $b$  and  $c$  are numbers.

What are the values of  $a$ ,  $b$  and  $c$ ?



Not drawn accurately

Answer:  $a = \dots\dots\dots$   $b = \dots\dots\dots$   $c = \dots\dots\dots$