

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4353/02



W15-4353-02

**MATHEMATICS (UNITISED SCHEME)
UNIT 3: Calculator-Allowed Mathematics
HIGHER TIER**

A.M. MONDAY, 19 January 2015

1 hour 45 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3.14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

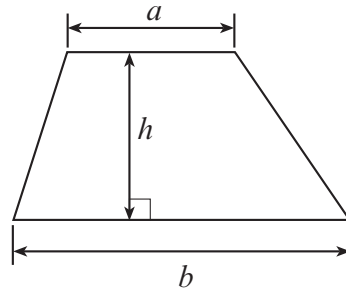
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question 8.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	3	
2.	2	
3.	7	
4.	3	
5.	4	
6.	3	
7.	6	
8.	6	
9.	8	
10.	3	
11.	5	
12.	3	
13.	3	
14.	7	
15.	4	
16.	6	
17.	3	
18.	4	
19.	3	
20.	7	
Total	90	

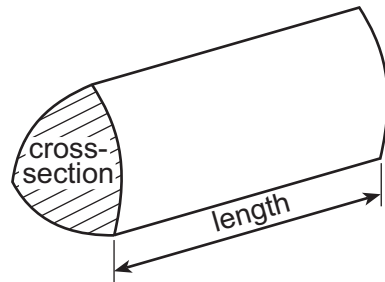
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Formula List

Area of trapezium = $\frac{1}{2}(a + b)h$

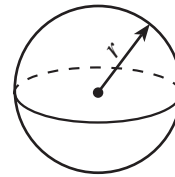


Volume of prism = area of cross-section \times length



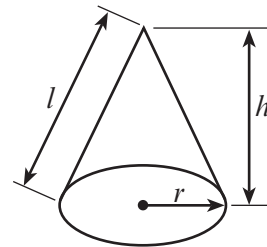
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

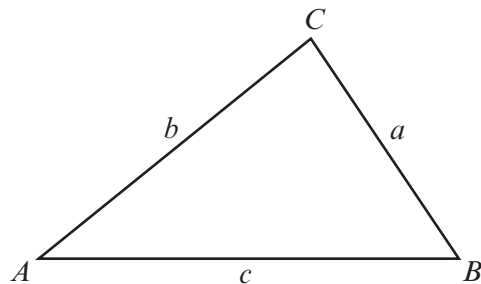


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

Area of triangle = $\frac{1}{2}ab \sin C$



The Quadratic Equation

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

where $a \neq 0$ are given by

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

1. Evaluate $\frac{x^3}{5y+z}$ when $x = 3$, $y = 1.8$ and $z = 9$.

Write your answer as a decimal.

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2. Share 252 kg in the ratio 5 : 1.

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3. (a) Factorise the expression $x^2 - 9x$.

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- (b) Solve the equation $3(x - 7) = 21$.

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- (c) Solve the equation $9y - 2 = 5y + 12$.

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4. Ifan is sitting in his parents' car as they travel on the motorway.
The car is travelling at a steady speed of 90 km/h.
Using his watch, Ifan measures the time it takes to travel between two bridges.
The time taken is 10 seconds.

How far apart are the two bridges?
Give your answer in metres.

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6. Calculate the length x in the triangle below.

[3]

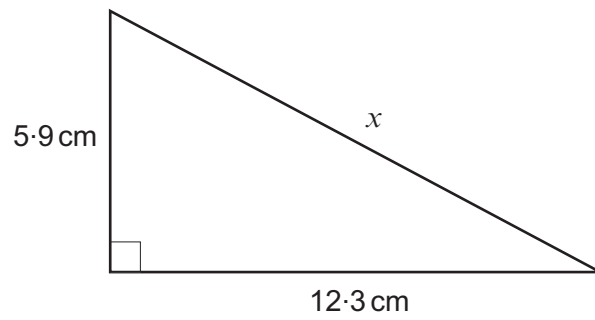


Diagram not drawn to scale

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7. Four grey regular polygons join together as shown in the diagram.

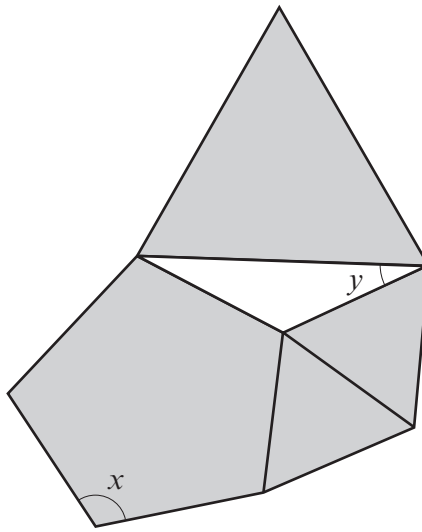


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- (a) Calculate the size of angle x .

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- (b) Calculate the size of angle y .

[4]

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8. *You will be assessed on the quality of your written communication in this question.*

A company has a large semicircle as part of its logo.
The company plans to paint the logo onto one of the walls of its headquarters.
One tin of paint covers 15 m^2 .

Calculate the number of tins of paint that the company needs to buy to paint a semicircle of radius 6.3 m onto the wall. [6]

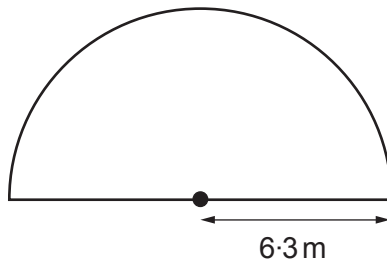


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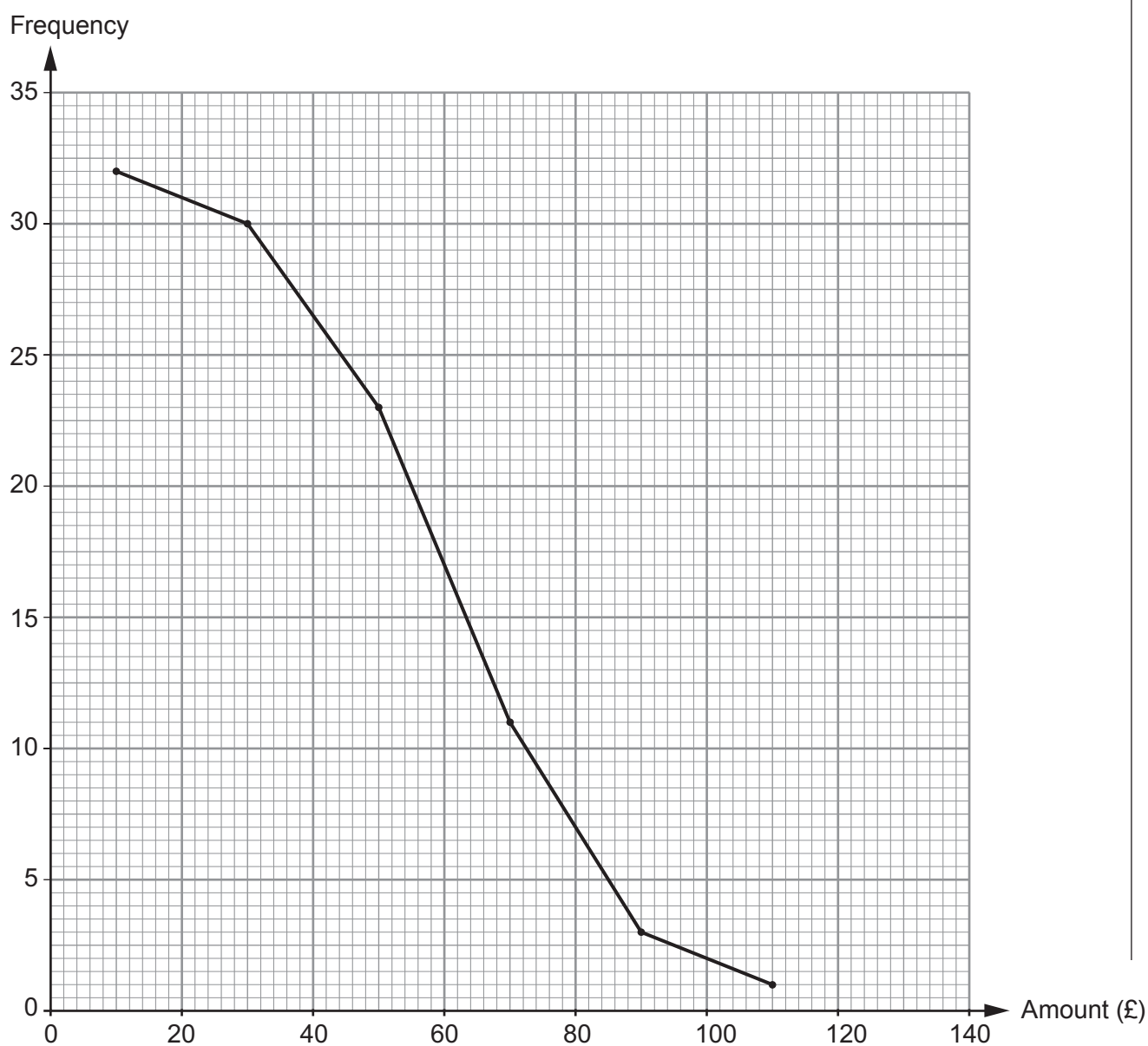
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9. The frequency polygon below shows the amount of money that 100 customers spent in a supermarket on a Monday morning.



- (a) For the Monday morning, complete the following table, and hence calculate an estimate of the mean amount spent per customer. [5]

Amount, s (£)	Mid-point	Frequency
$0 < s \leq 20$		
$20 < s \leq 40$		
$40 < s \leq 60$		
$60 < s \leq 80$		
$80 < s \leq 100$		
$100 < s \leq 120$		

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(b) The amount of money that **another 100 customers** spent in the same supermarket on a **Saturday afternoon** is shown below.

Amount, s (£)	Frequency
$0 < s \leq 20$	5
$20 < s \leq 40$	19
$40 < s \leq 60$	34
$60 < s \leq 80$	12
$80 < s \leq 100$	12
$100 < s \leq 120$	10
$120 < s \leq 140$	8

On the **same graph paper**, draw a frequency polygon to show the amount of money that the customers spent on the Saturday afternoon. [2]

(c) Use the two frequency polygons to make one comparison between the amount spent on Monday morning and the amount spent on Saturday afternoon. [1]

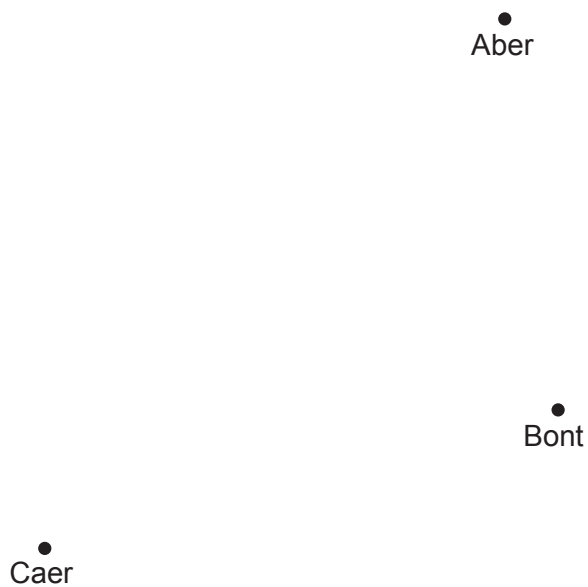
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10. Leah is drawing a map of her local area. She has accurately plotted the positions of the villages of Caer, Aber and Bont on the map below. Leah now wants to plot the position of her house. Her house is the same distance from Aber as it is from Bont. According to the scale she is using, it needs to be plotted 6 cm from Caer. Find the two possible positions of Leah's house, and mark each with a cross. [3]



11. (a) Find the value of $\frac{3.6 \times 10^7}{6 \times 10^4}$.

Give your answer in standard form.

[2]

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- (b) The mass of an atom of hydrogen is 1.66×10^{-24} g.
The mass of an atom of oxygen is 2.66×10^{-23} g.
A molecule of water consists of two atoms of hydrogen and one atom of oxygen.

Calculate the mass of a molecule of water.

Give your answer in standard form, correct to 3 significant figures.

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12. Factorise $x^2 + 12x - 45$, and hence solve the equation $x^2 + 12x - 45 = 0$.

[3]

Examiner
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13. The diagram shows a square-based pyramid.
The length of each side of the base is 5 cm and the perpendicular height is 9 cm.

Calculate the volume of this pyramid.
State the units of your answer.

[3]

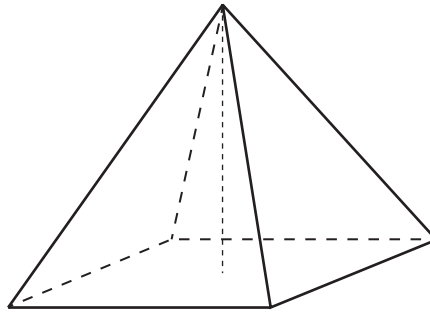


Diagram not drawn to scale

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14. Mrs Loydon teaches a primary school class.
During one school week, her maths lessons are based on learning the '2 times table'.
She decides to measure the time taken for pupils in her class to say the '2 times table' at the start and at the end of the school week.

The grouped frequency table below shows her results at the start of the week.

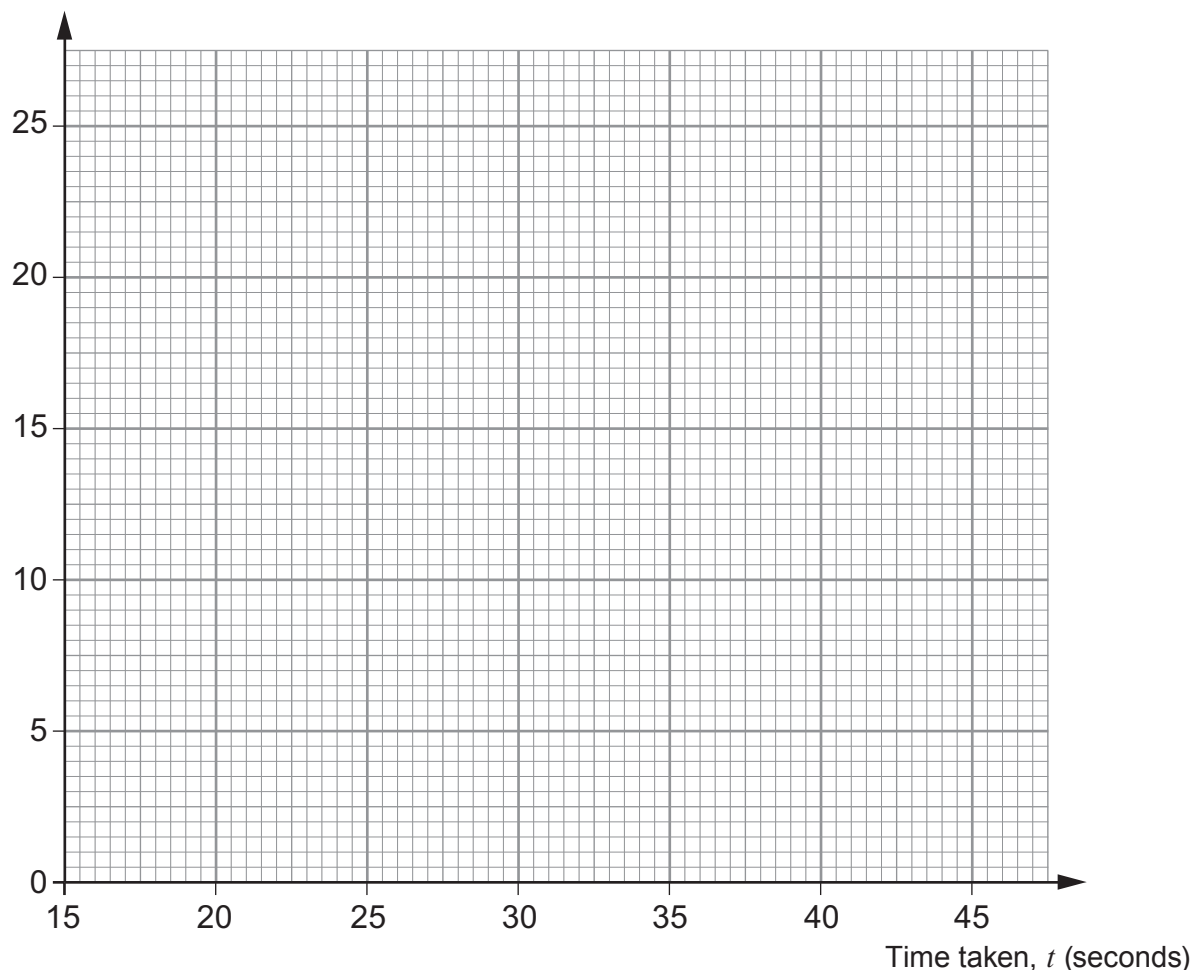
Time taken, t (seconds)	$15 < t \leq 20$	$20 < t \leq 25$	$25 < t \leq 30$	$30 < t \leq 35$	$35 < t \leq 40$	$40 < t \leq 45$
Frequency	3	4	8	6	2	1

- (a) Complete the table below. [1]

Time taken, t (seconds)	≤ 15	≤ 20	≤ 25	≤ 30	≤ 35	≤ 40	≤ 45
Cumulative frequency	0						

- (b) Draw a cumulative frequency graph of the times taken. [3]

Cumulative frequency



- (c) Use your cumulative frequency graph to estimate the median time taken at the start of the week. [1]

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- (d) At the end of the week, the lower quartile of the class was 18 seconds, and the upper quartile was 26 seconds.
Mrs Loydon compares these results with those from the start of the week.
Explain, with reasons, what conclusions she can make. [2]

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15. In the diagram below, point B lies on the line AC , and point E lies on the line AD . $AB = 10$ cm, $BC = 2$ cm and the area of triangle $ABE = 24$ cm². Calculate the area of trapezium $BCDE$.

[4]

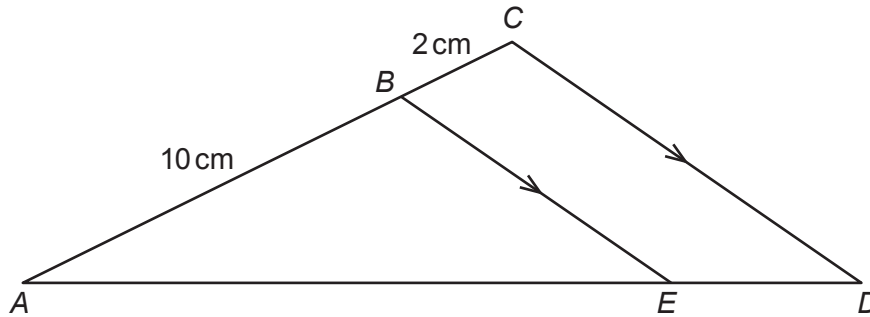


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16. It is known that c is directly proportional to the square of d , and $c = 18$ when $d = 1.5$.

(a) Find an expression for c in terms of d .

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(b) Calculate c when $d = 2.3$.

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(c) Calculate the possible values of d when $c = 98$.

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20. (a) In the triangle below, show that x satisfies the equation $3x^2 - 6x - 2 = 0$.

[3]

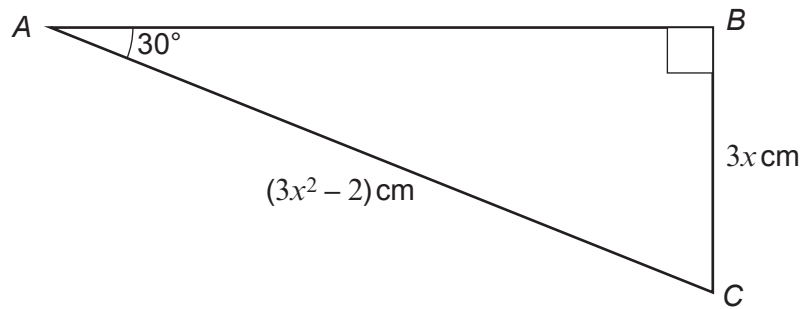


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- (b) Solve the equation $3x^2 - 6x - 2 = 0$ and hence find the length of BC , correct to 1 decimal place.

[4]

END OF PAPER