

Candidate Name	Centre Number	Candidate Number
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GCSE

185/10

MATHEMATICS

HIGHER TIER

PAPER 2

A.M. FRIDAY, 12 November 2010

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

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 especially when a calculator is used.

Unless stated, diagrams are not drawn to scale.

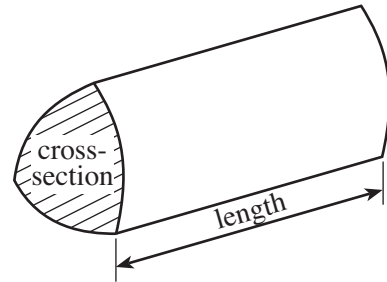
Scale drawing solutions will not be acceptable where you are asked to calculate.

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

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	7	
2	6	
3	5	
4	8	
5	3	
6	5	
7	6	
8	4	
9	4	
10	4	
11	8	
12	7	
13	8	
14	4	
15	6	
16	8	
17	7	
TOTAL MARK		

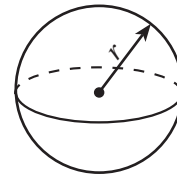
Formula List

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



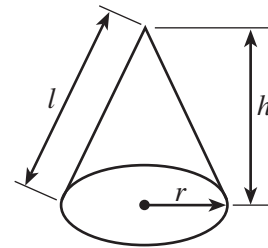
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

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

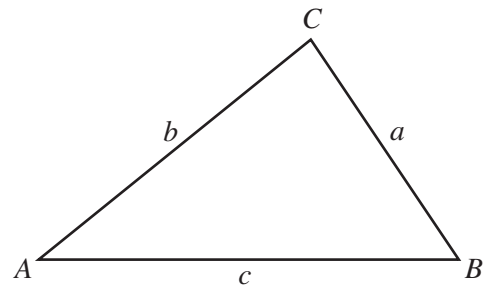


In any triangle ABC

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

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

Standard Deviation

Standard deviation for a set of numbers

x_1, x_2, \dots, x_n , having a mean of \bar{x} is given by

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \quad \text{or} \quad s = \sqrt{\frac{\sum x^2}{n} - \left\{ \frac{\sum x}{n} \right\}^2}$$

1. (a) A ring is bought for £354.
It is then sold for a profit of 24%.
Calculate the selling price of the ring.

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- (b) What percentage is £146.32 of £236?

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- (c) Which of the following fractions is nearest to 0.5?
Show your working.

$\frac{2}{3}$	$\frac{3}{5}$	$\frac{9}{20}$
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[2]

2. (a) Solve $\frac{x}{4} = 20$.

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(b) Factorise $14y + 35$.

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(c) Solve $4(3x + 7) = 64$.

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(d) Find the value of $3a^2$ when $a = -2$.

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- Before travelling to Germany, Nicky filled the fuel tank of her car with 40 litres of petrol which cost £44.
Nicky also bought some euros for her trip. The exchange rate was £1 = 1.15 euros.
In Germany, she needed to buy another 40 litres of petrol which cost 0.98 euros per litre.
How much less did the 40 litres of petrol cost in Germany? Give your answer in euros.

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4. (a) Complete the table.

$3x$	33
x	11
$2c - 3$	17
c	
$c - a$	3
a	
$a + b$	12
b	
$c + b$	

[4]

(b) The n th term of a sequence is $n^2 + 3$.
Write down the first three terms of the sequence.

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(c) Write down the n th term of the sequence 8, 15, 22, 29, 36, ...

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5. Two fair £1 coins are thrown.
Jane says that the probability of two heads is equal to the probability of a head and a tail.
Is this true?
Justify your answer by finding the probabilities of these outcomes.

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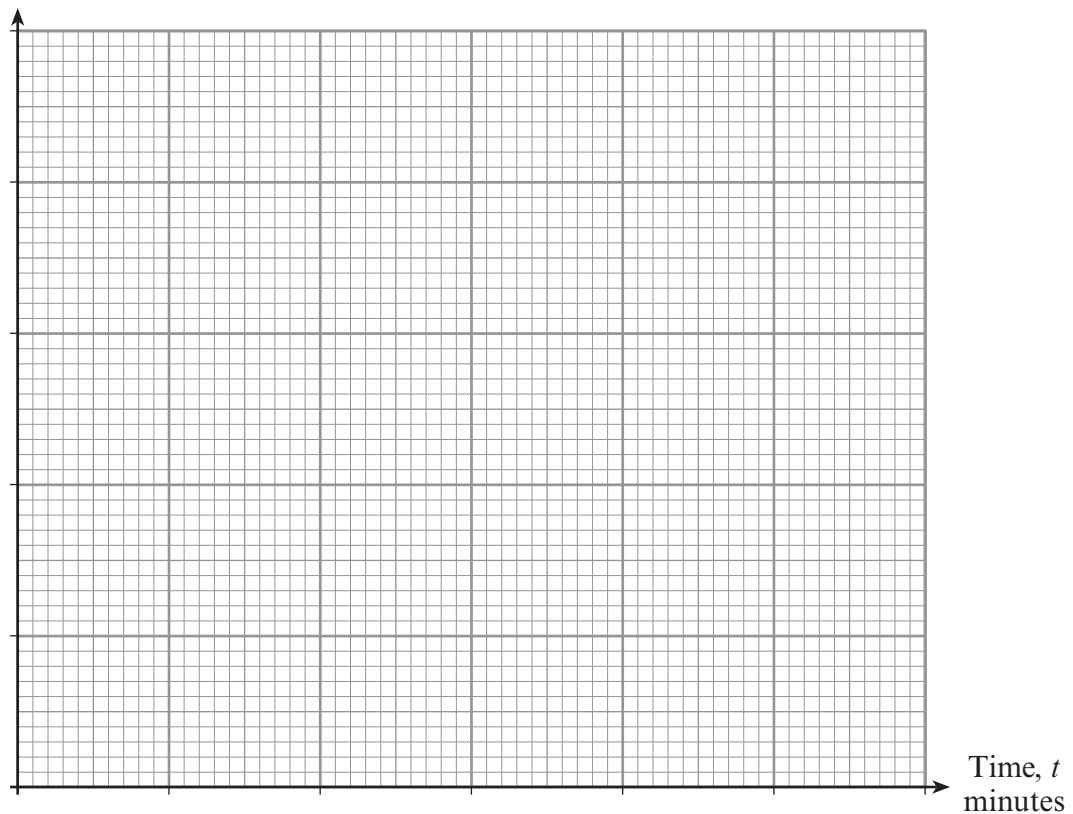
6. (a) One Saturday an internet café owner recorded the time each of 100 customers spent answering e-mails. The table below shows a summary of the results.

Time, t minutes	Frequency
$0 < t \leq 10$	23
$10 < t \leq 20$	27
$20 < t \leq 30$	32
$30 < t \leq 40$	16
$40 < t \leq 50$	2

On the graph paper below draw a frequency polygon for this data.

[3]

Frequency



- (b) Complete the cumulative frequency table for the times spent answering e-mails.

Time, t minutes	$t = 0$	$t \leq 10$	$t \leq 20$	$t \leq 30$	$t \leq 40$	$t \leq 50$
Cumulative frequency	0					

[1]

- (c) Write down an estimate for the median time that customers spent answering e-mails.

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7. (a) Simplify $5(2x + 5) - 2(3x - 4)$.

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(b) Expand $2y(y^2 + 3)$.

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(c) Write down the n th term of the sequence 1, 4, 9, 16, 25, ...

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(d) Solve $\frac{240}{x} = 30$.

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8. The number of days taken by each of 60 seeds to germinate was recorded. The table shows a grouped frequency distribution of this information.

Time, d days	Number of seeds
$1 \leq d \leq 7$	15
$8 \leq d \leq 14$	33
$15 \leq d \leq 21$	12

Find an estimate for the mean time taken for a seed to germinate.

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9. A solution to the equation $x^3 + x - 1 = 0$ lies between 0 and 1.
Use the method of trial and improvement to find this solution correct to 1 decimal place.

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10. The table shows values of $y = 2x^2 - 5x - 7$ for values of x from -2 to 4 .

x	-2	-1	0	1	2	3	4
$y = 2x^2 - 5x - 7$	11	0	-7	-10	-9		5

- (a) Complete the table above.

[1]

- (b) On the graph paper below draw the graph of $y = 2x^2 - 5x - 7$ for the values of x from -2 to 4 .

[2]

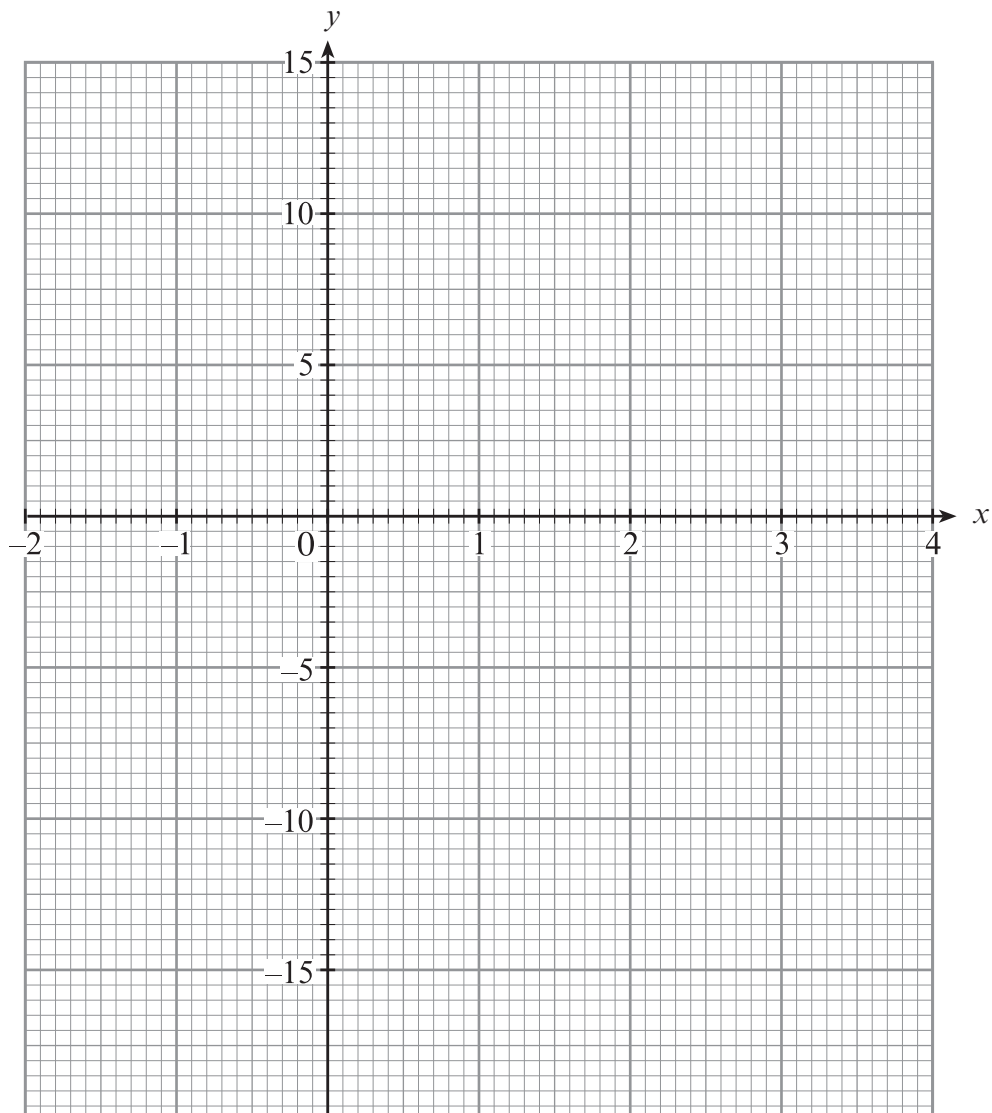
- (c) Write down the x -coordinates of the points where the curve $y = 2x^2 - 5x - 7$ intersects the x -axis.

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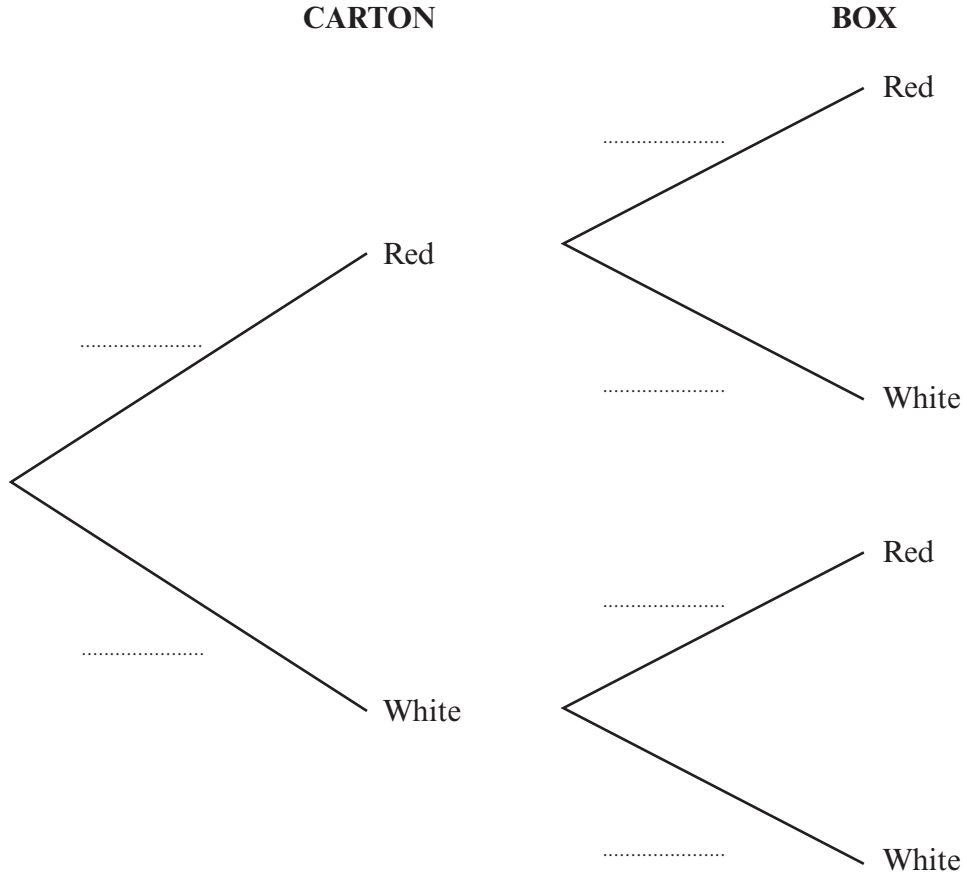
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11. A carton contains three red tins and two white tins of paint.
 A box contains seven red tins and three white tins of paint.
 One tin of paint is selected at random from the carton and another tin is selected at random from the box.

(a) Complete the following tree diagram.



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(b) Calculate the probability that the tins of paint selected are both white.

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(c) Calculate the probability that the tins of paint selected are different colours.

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12.

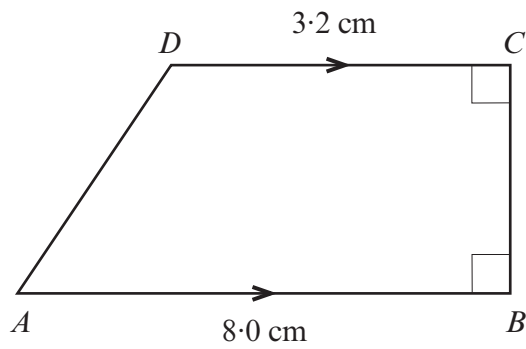


Diagram not drawn to scale

Given that the area of the trapezium $ABCD$ is 30.8 cm^2 , find the length of AD .

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13. (a) From a harbour a yacht sails 4.1 km North.
It then sails 7.7 km East before dropping the anchor.
Calculate the bearing of the yacht from the harbour.

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(b)

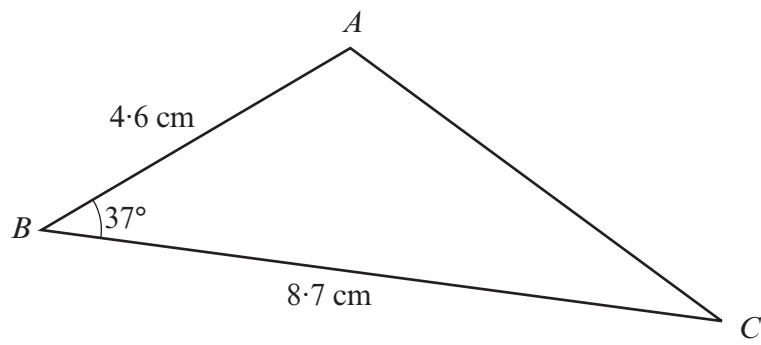


Diagram not drawn to scale

Find the length of AC .

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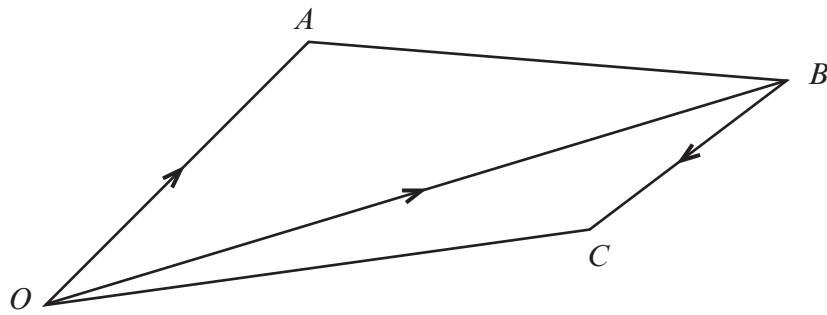
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14.

*Diagram not drawn to scale*

The vectors **OA**, **OB** and **BC** are given by
OA = $8\mathbf{x}$, **OB** = $5\mathbf{x} + 2\mathbf{y}$ and **BC** = $-(2\mathbf{x} + \mathbf{y})$.

Express each of the following in terms of \mathbf{x} and \mathbf{y} in their simplest form.

(a) **AB**

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(b) **OC**

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15.

Wall tiles for sale

Length 30 cm Width 15 cm

All measurements to the nearest centimetre



- (a) Is it always possible to tile an area of up to 8500cm^2 using 20 of these tiles?
You must give a reason and show your working.

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- (b) Write down the maximum area that could be covered using 20 of these tiles.

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16. For the first x seconds of a journey the average speed of a cyclist is 3 m/s. For the next $(3x + 2)$ seconds the average speed is $7x$ m/s. The total distance travelled is 250 metres.

(a) Show that x satisfies the equation $21x^2 + 17x - 250 = 0$.

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(b) Use the formula method to solve the equation $21x^2 + 17x - 250 = 0$, giving solutions correct to two decimal places.

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(c) Hence find the total time for the journey.

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17.

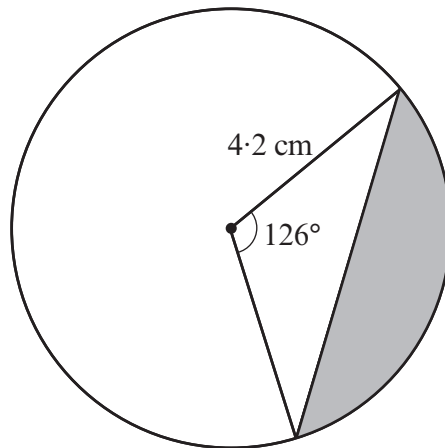


Diagram not drawn to scale

Calculate the shaded area.

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