CCEA GCSE MATHEMATICS

MATHS



EXAM QUESTION PACK

UNIT T6 PAPER 2 (CALCULATOR) HIGHER TIER GMT62 PAPERS

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
January 2016

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier



[GMT62]

GMT62

WEDNESDAY 13 JANUARY, 10.45 am–12 noon

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page, on blank pages or tracing paper.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all eleven** questions.
All working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

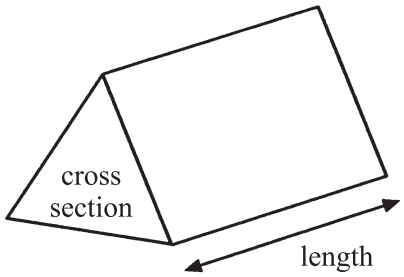
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in Question **1**.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on page 2.

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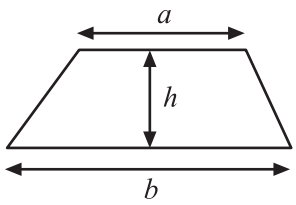
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Formula Sheet

Volume of prism = area of cross section × length

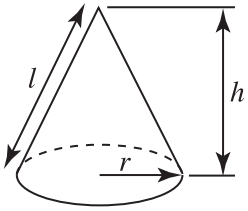


Area of trapezium = $\frac{1}{2}(a+b)h$



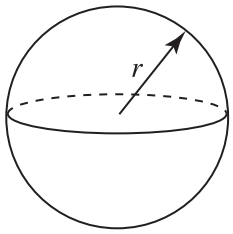
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

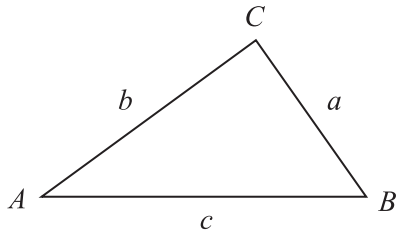


Volume of sphere = $\frac{4}{3}\pi r^3$

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



In any triangle *ABC*



Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

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

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 = $\frac{1}{2}ab\sin C$

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Quality of written communication will be assessed in this question.

1 Zoe's annual salary is £27 000

Her tax free allowance is £9000

She pays 24% of the remaining salary in tax.

How much of her salary is left after tax has been deducted?

Show your working clearly.

Answer £ _____ [3]

[Turn over

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2 A bag contains only red, blue, yellow and white counters.

The table shows the probability of taking some of these colours from the bag at random.

Colour	red	blue	yellow	white
Probability	0.2	0.35		0.3

(a) Work out the probability of taking a yellow counter from the bag.

Answer _____ [2]

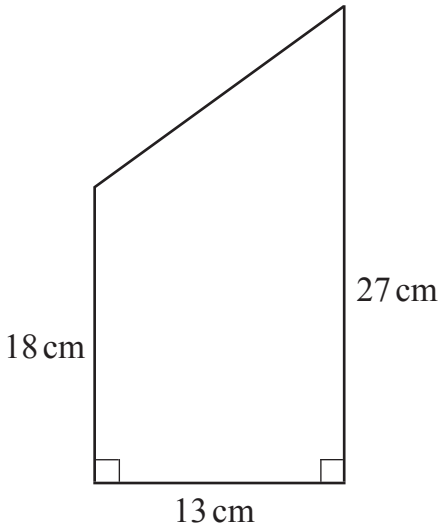
(b) The bag contains a total of 1500 counters.

How many blue counters would you expect the bag to contain?

Answer _____ [2]

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3 Find the area of this trapezium.



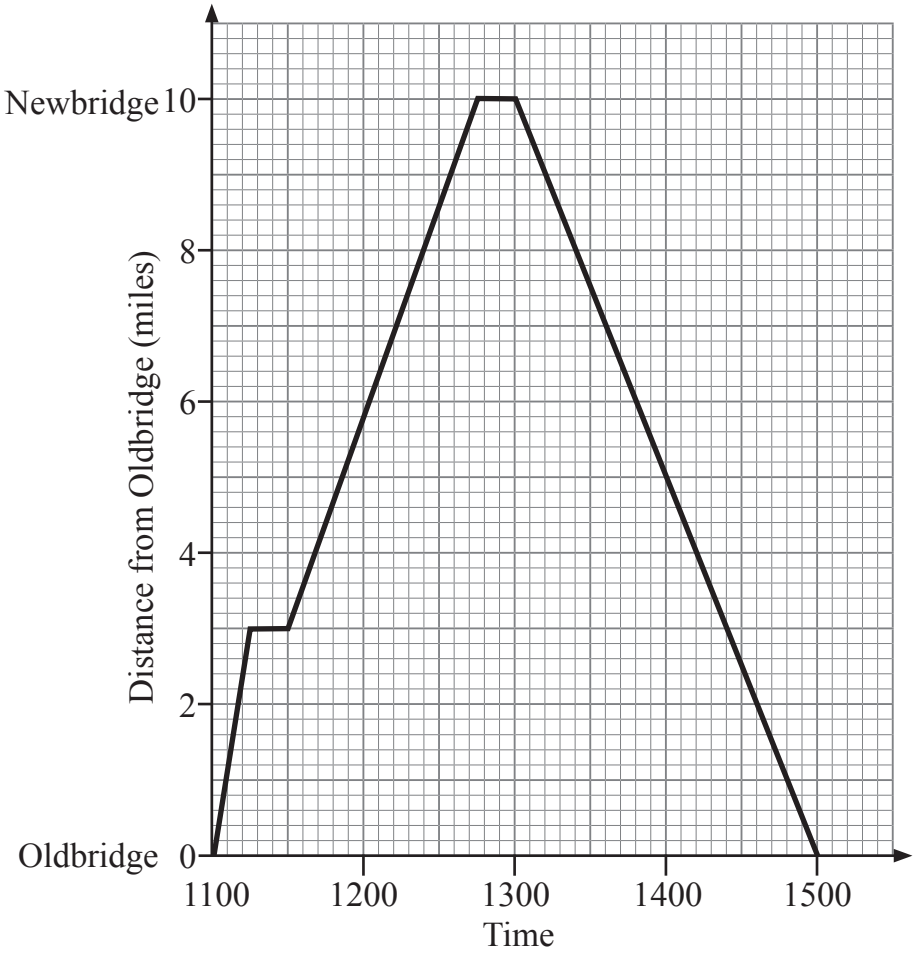
Answer _____ cm^2 [2]

[Turn over

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4 Harry goes for a run from Oldbridge to Newbridge and back.

His journey is shown on the graph below.



(a) What is Harry's average speed on the return journey from Newbridge to Oldbridge?

Answer _____ mph [2]

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(b) Between which times is Harry running at his fastest average speed?

Answer _____ [1]

(c) Richard leaves Newbridge at 1130 and cycles to Oldbridge, at an average speed of 18 mph.

Show Richard's journey on the graph opposite and hence find the time when Harry and Richard pass each other.

Answer _____ [4]

[Turn over

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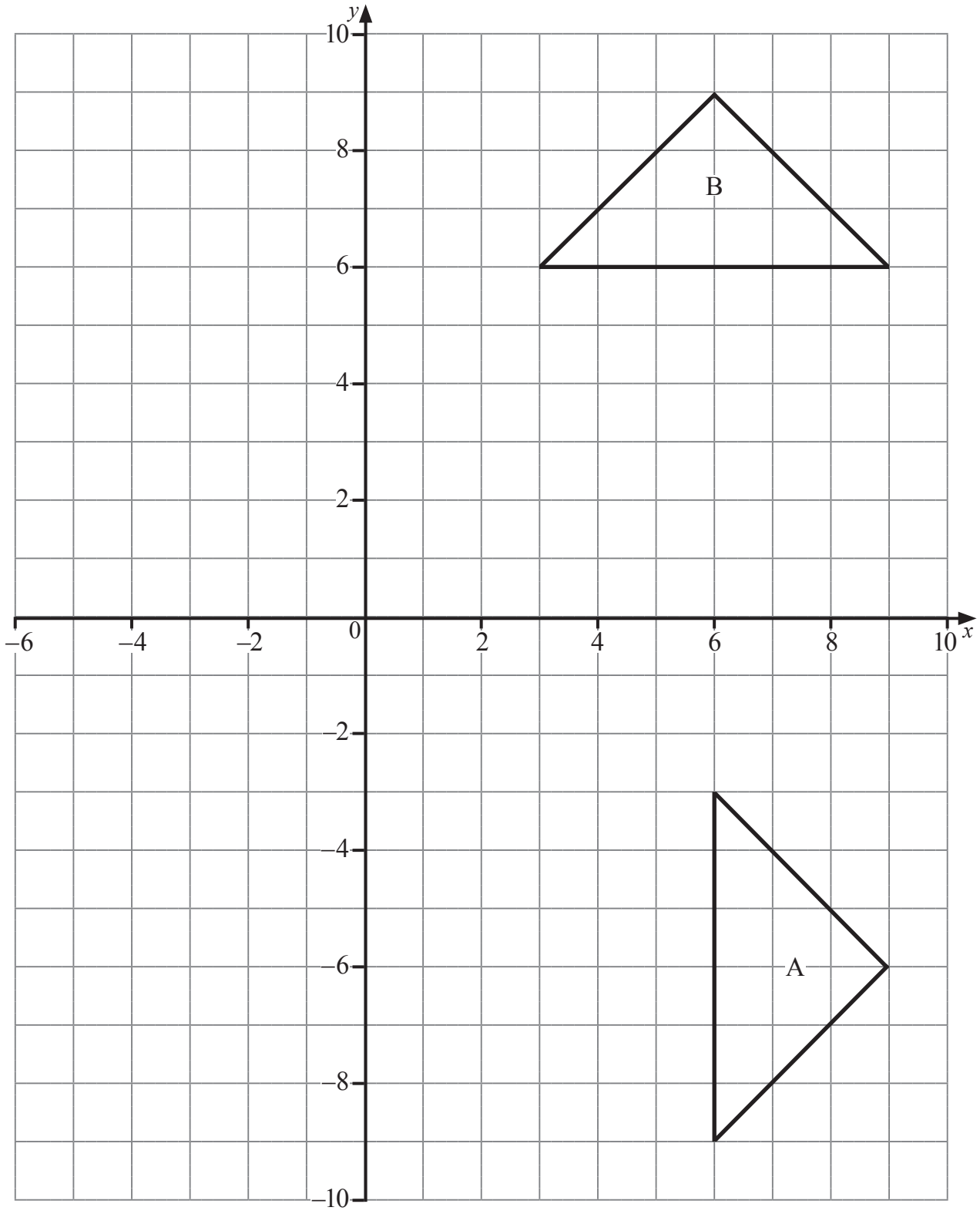
5 **(a)** Describe fully the single transformation which moves triangle A to triangle B.

Answer _____ [3]

(b) Enlarge triangle A by a scale factor of $\frac{1}{3}$, using the origin as the centre of enlargement.

[2]

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[Turn over

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6 **(a)** Complete the table for $y = 2x^2 - 4x - 5$

x	–2	–1	0	1	2	3	4
y		1	–5	–7		1	

[2]

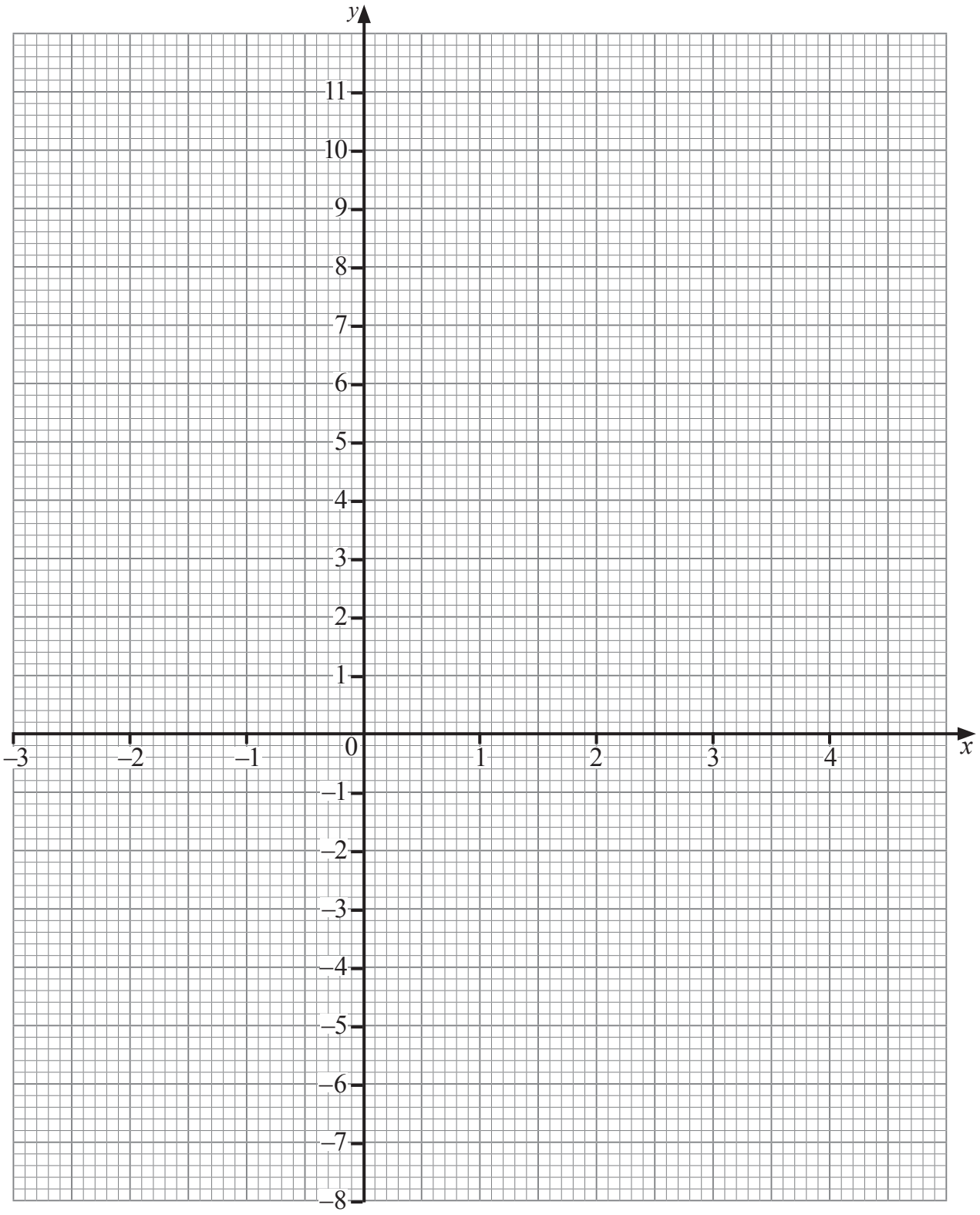
(b) Draw the graph of $y = 2x^2 - 4x - 5$ for $x = -2$ to $x = 4$ on the opposite page. [2]

(c) Draw the line $y = -2$ and find the x values of the points of intersection.

Answer _____ [2]



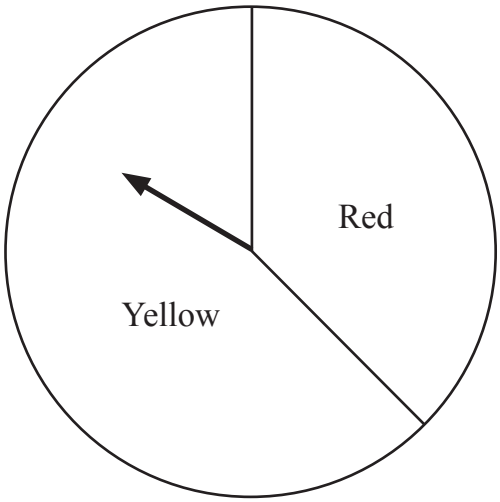
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[Turn over

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7 A spinner has a red sector and a yellow sector as shown.



The arrow is spun 1000 times.

The table shows the relative frequency of the arrow landing on red after different numbers of spins.

Number of spins	Relative frequency of red
50	0.44
100	0.37
200	0.34
500	0.31
1000	0.32

(a) In the first 200 spins, how many times had the arrow landed on red?

Answer _____ [2]

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(b) Which relative frequency gives the best estimate of the probability of obtaining a red?

Explain your answer.

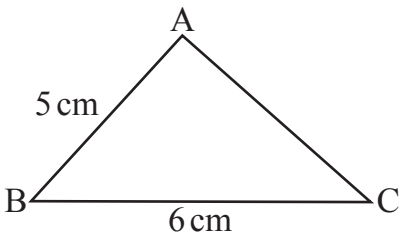
Answer _____ because_____

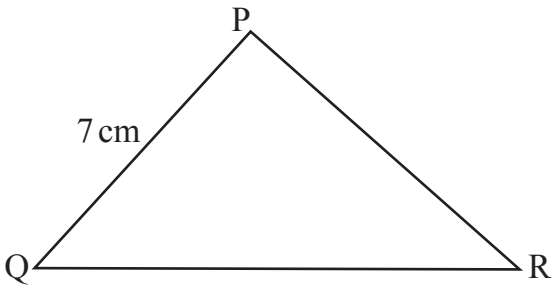
_____ [2]

[Turn over

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8





Triangle ABC is similar to triangle PQR.

Find the length of the side QR.

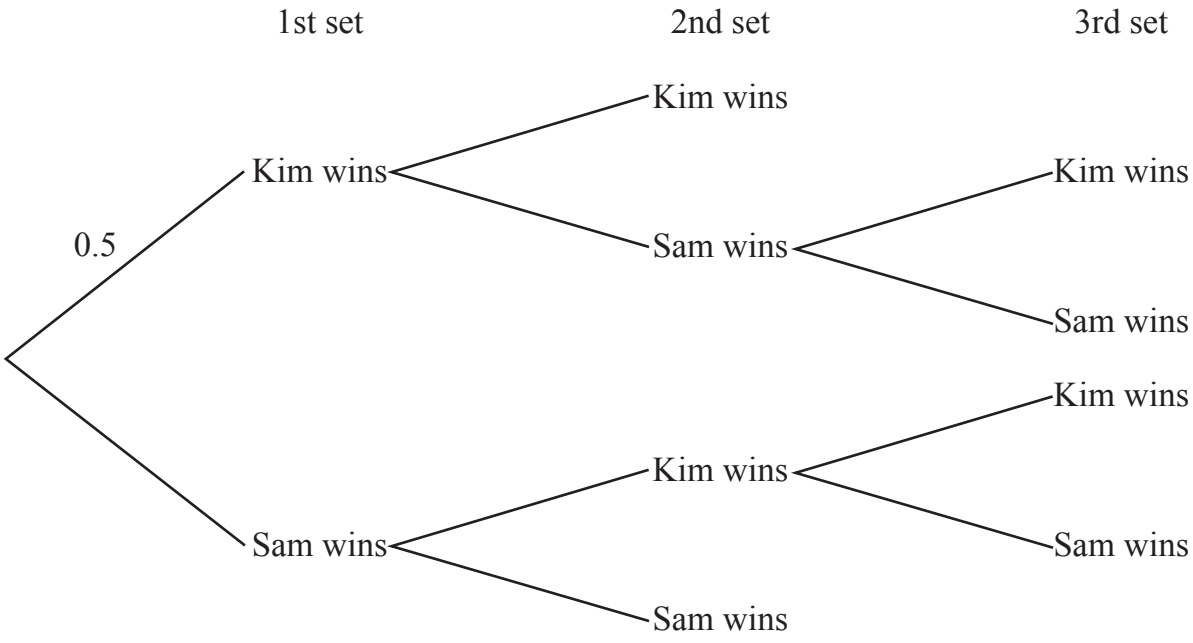
Answer _____ cm [3]

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9 Kim and Sam play each other in a tennis match.

The winner of the match is the first player to win two sets.

The tree diagram shows all the possible outcomes.



The probability that Kim wins the first set is 0.5

Whenever Kim wins a set the probability that she wins the next set is 0.6

Whenever Sam wins a set the probability that Kim wins the next set is 0.7

(a) Complete the tree diagram above by writing the missing probabilities. [2]

(b) Calculate the probability that Kim wins the tennis match.

Answer _____ [4]

[Turn over

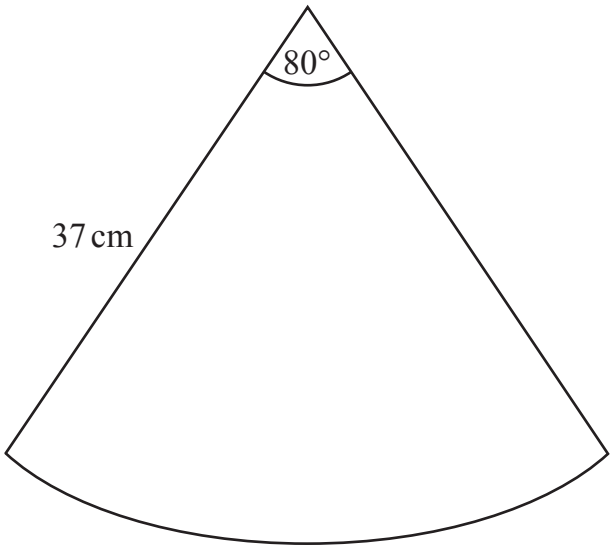
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10 Rearrange $8(xy - 5) = 3y - 7x$ to make x the subject.

Answer $x =$ _____ [4]

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11



The net of a cone is a sector of a circle with a radius of 37 cm.

The angle in the sector is 80°

Find the volume of the cone.

Answer _____ cm^3 [6]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
January 2016

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier

[GMT62]

WEDNESDAY 13 JANUARY
10.45 am–12.00 noon

MARK SCHEME

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Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The solution to a question gains marks for correct method and marks for accurate working based on this method. The marks awarded for each question are shown in the right-hand column and they are prefixed by the letters **M, A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.
A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers. Accuracy marks may depend on preceding **M** (method) marks, hence **M**0 **A**1 cannot be awarded i.e. where the method is not correct no marks can be given.
MA indicates marks for combined method and accurate working.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier, only a proportion of the marks will be available (based on the professional judgement of the examiner).

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General Marking Advice

(i) If the correct answer is seen in the body of the script and the answer given in the answer line is clearly a transcription error, full marks should be awarded.

(ii) If the answer is missing, but the correct answer is seen in the body of the script, full marks should be awarded.

(iii) If the correct answer is seen in working but a completely different answer is seen in the answer space, then some marks will be awarded depending on the severity of the error.

(iv) Work crossed out but not replaced should be marked.

(v) In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.

(vi) For methods not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work.

(vii) Where a follow through mark is indicated on the mark scheme for a particular part question, the marker must ensure that you refer back to the answer of the previous part of the question.

(viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen. E.g. the answer in the mark scheme is 4.65 and the candidate then correctly rounds to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.

(ix) Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.

(x) For any question, the range of answers given in the mark scheme is inclusive.

Quality of written communication

In GCSE Mathematics, particular questions are identified where candidates must demonstrate the quality of their written communication.

In particular, candidates must:

(i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear (i.e. comprehension and meaning is clear by using the correct notation and labelling conventions);

(ii) select and use a form and style of writing appropriate to their purpose and to complex subject matter (i.e. reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning); and

(iii) organise information clearly and coherently, using specialist vocabulary where appropriate (i.e. the mathematical methods and processes used are coherently and clearly organised and appropriate mathematical vocabulary used).

This assessment may be through, for example, an explanation of the geometrical properties of a given shape or, for example, through concise mathematical argument in a multi-step problem.

			AVAILABLE MARKS
1	$27000 - 9000 = 18000$	C1	
	$\frac{24}{100} \times 18000 = 4320$	C1	
	$27000 - 4320 = 22680$	C1	3
2	**(a)** $1 - (0.2 + 0.35 + 0.3)$	M1	
	0.15	A1	
	(b) 1500×0.35	M1	
	525	A1	4
3	$\frac{1}{2}(18 + 27) \times 13$ **or** $(18 \times 13) + (\frac{1}{2} \times 13 \times 9)$	M1	
	292.5	A1	2
4	**(a)** $10 \div 2 = 5$ **or** $10 \div 120$	M1 A1	
	(b) 1100 to 1115	A1	
	(c) (1130, 10) plotted	A1	
	Line through (1200, 1)	A1	
	Line complete	A1	
	Correct reading at intersection, 1148	A1	7
5	**(a)** Rotation, 90° anti-clockwise, about the origin	A1 A1 A1	
	(b) Correct enlargement (A1 for 2 vertices correct)	A2	5
6	**(a)** 11, –5, 11 (A1 for 2 values correct)	A2	
	(b) correct points	A1	
	smooth curve	A1	
	(c) –0.6 and 2.6 (follow candidate's graph)	A2	6
7	**(a)** 0.34×200	M1	
	68	A1	
	(b) 0.32	A1	
	Because more spins means that it is more reliable	A1	4
8	Ratio of sides is 5:7 or 7:5 or 5:6 or 6:5	MA1	
	$\frac{QR}{6} = \frac{7}{5}$	M1	
	8.4	A1	3

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				AVAILABLE MARKS
9	**(a)**	0.6 0.7 0.4 0.3 0.7 0.6	A1	
		0.5 0.3 0.4	A1	
	(b)	$(0.5 \times 0.6) + (0.5 \times 0.4 \times 0.7) + (0.5 \times 0.7 \times 0.6)$	MA1 A1 A1	
		$0.3 + 0.14 + 0.21$		
		0.65	A1	6
10		$8xy - 40 = 3y - 7x$	MA1	
		$8xy + 7x = 3y + 40$	MA1	
		$x(8y + 7) = 3y + 40$	MA1	
		$x = \frac{3y + 40}{8y + 7}$	A1	4
11		Arc $= \frac{2}{9} \times 2\pi \times 37 = \frac{148\pi}{9}$ $(= 51.66)$	MA1	
		$2\pi r = \frac{148\pi}{9}$	M1	
		$r = 8.\dot{2}$ $\left(\text{or } \frac{74}{9}\right)$	A1	
		$h^2 = 37^2 - 8.\dot{2}^2, \therefore\ h = 36.07485\ldots$	A1	
		$\frac{1}{3}\pi \times 8.\dot{2}^2 \times 36.07485\ldots$	M1	
		2553.9454	A1	6
			Total	**50**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier



[GMT62]

GMT62

TUESDAY 26 MAY, 3.00pm–4.15pm

TIME

1 hour 15 minutes.

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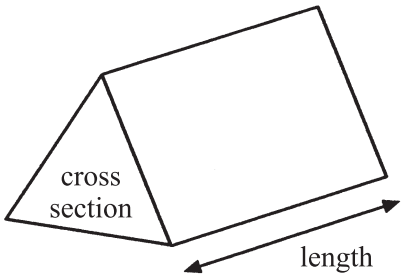
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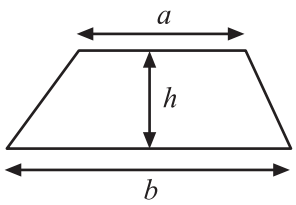
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Formula Sheet

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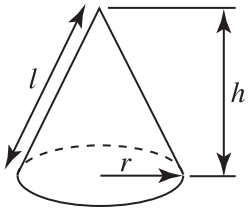


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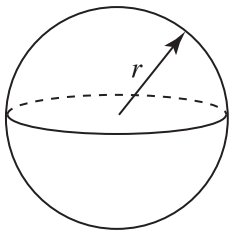
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl

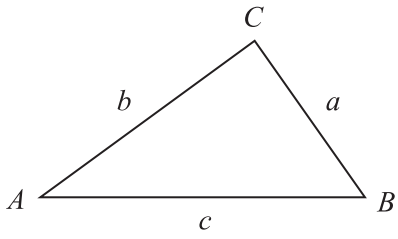


Volume of sphere = $\frac{4}{3}\pi r^3$

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



In any triangle *ABC*



Quadratic Equation

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

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 = $\frac{1}{2}ab\sin C$

1 Bobby the builder has nails of five different lengths in a jar.

The probability of a nail being a certain length is given in the table.

Length (mm)	20	24	30	36	44
Probability	0.15		0.2	0.25	0.35

(a) What is the probability of a nail being 24 mm long?

Answer _____ [2]

There are 60 nails in the jar.

(b) How many nails are longer than 30 mm?

Answer _____ [3]

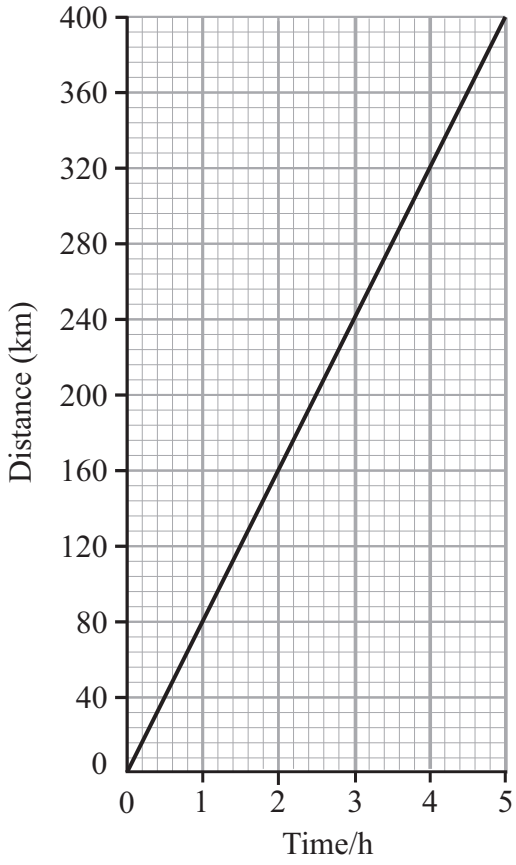
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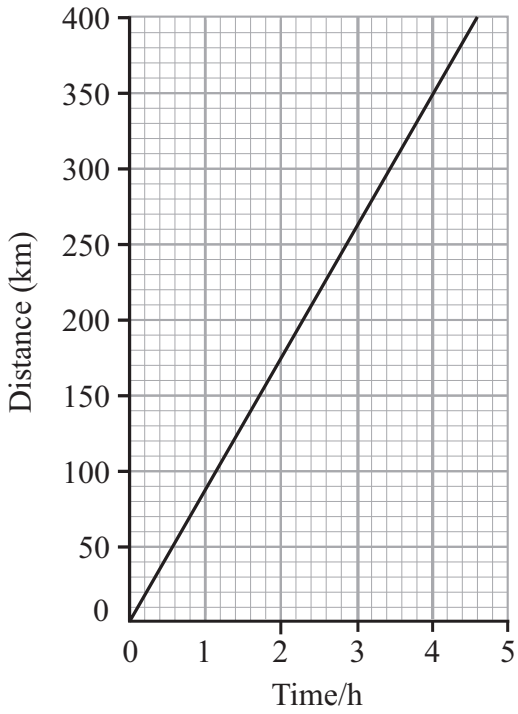
Quality of written communication will be assessed in this question.

2

Train A



Train B



The graphs show how two trains complete a 400 km journey.

Which of the trains A or B has the greater average speed?

Explain your answer clearly.

Train _____ because _____

_____

_____

[3]

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3 Rewrite $3y + 1 = 5y - x$ to make x the subject.

Answer $x =$ _____ [2]

4 n is an integer.
Which of the statements below describes the number $(2n + 1)^2$?
Explain your answer.

"always even" **"always odd"** **"could be even or odd"**

Answer _____

because _____

_____ [2]

[Turn over

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5 Jane works in a jewellery shop and earns £7.75 per hour.
She works eight hours a day.
For each Gem product she sells, Jane receives a bonus of £5.25
The manager noted that in the previous 40 working days Jane sold 5 Gem products.

Jane asks for advance payment of her next month's wages. The manager agrees. There are 24 working days in the next month. Calculate the amount the manager should pay her in advance, taking account of her previous performance.

Answer £ _____ [4]

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6 **(a)** Solve $4n + 3 > 28$

Answer _____ [2]

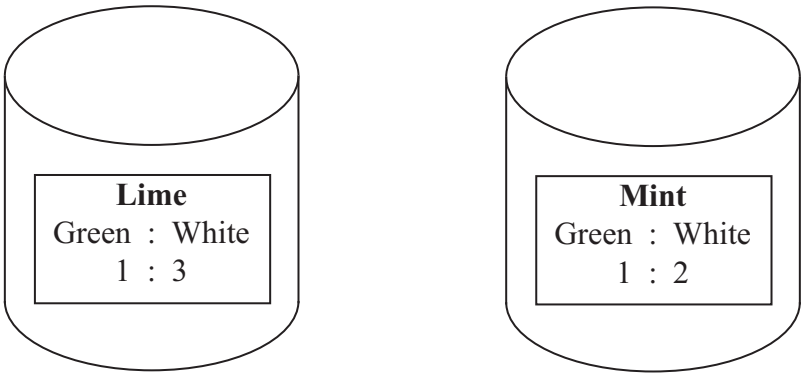
(b) Hence write down the smallest integer value to satisfy the inequality.

Answer _____ [1]

[Turn over

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7 Green and white paint can be mixed in different ratios to make different shades.



Janet has 1.2 litres of Lime. How much extra green paint does she need to add to turn it into Mint?

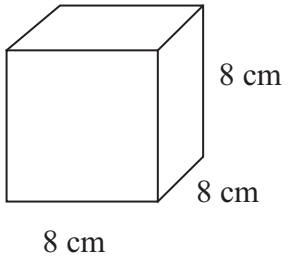
Answer _____ [4]

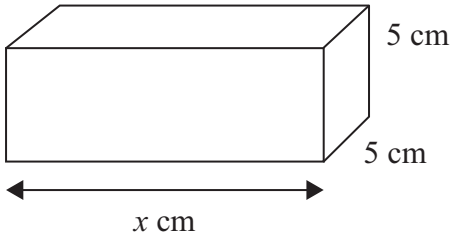
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8 Simplify $\dfrac{a^8 \times a^{-2}}{a^3}$

Answer _____ [2]

9





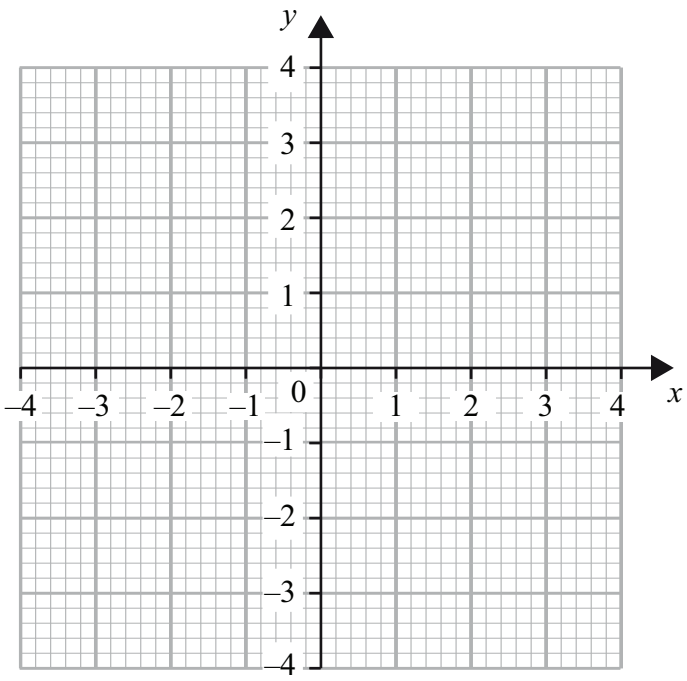
The surface area of a cube of side length 8 cm is the same as the surface area of the cuboid shown.
Find the value of the side marked x cm.

Answer _____ cm [4]

[Turn over

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10 **(a)** Draw the graph of $y = x^2 - x - 2$ for values of x from –2 to 3 [2]



(b) **(i)** Write down the equation of the line of symmetry of the curve.

Answer _____ [1]

(ii) Hence **calculate** the minimum value of the curve.

Answer _____ [1]

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11 The lengths of the edges of a cube are all increased by 10%.

By what percentage is the volume of the cube increased?

Answer _____ [3]

12 A metal cube made of lead is melted down to make 100 identical spherical weights with a radius of 2 cm.

Calculate the smallest **integer** side length for the cube.

Answer _____ cm [4]

[Turn over



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13 Given that $a(5x + 1) + b(2x - 3) \equiv 4x + 11$ work out the values of a and b.

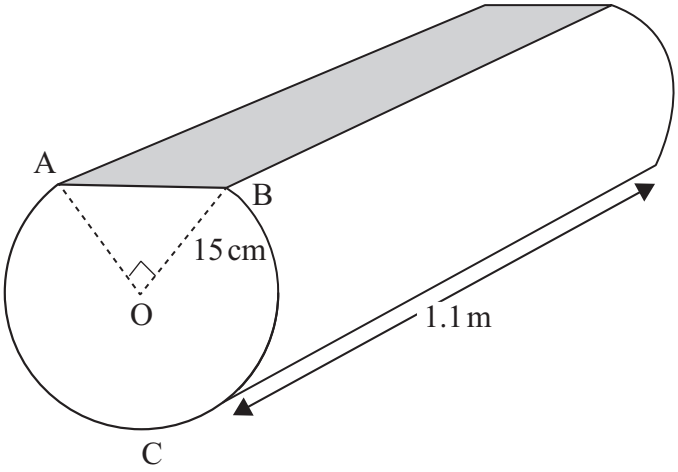
Show all your working clearly.
A solution by trial and improvement will not be accepted.

Answer $a =$ _____ $b =$ _____ [5]

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14 A cylindrical wooden log of length 1.1 m has been sliced along the upper end to leave a flat top with a uniform cross section as shown.

ACB is the arc of a circle of radius 15 cm. Angle AOB = 90°
Calculate the remaining volume.



Answer _____ m^3 [5]

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Question Number	**Marks**
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14	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2015

Mathematics

Unit T6 Paper 2
(With calculator)

Higher Tier

[GMT62]

TUESDAY 26 MAY
3.00 pm–4.15 pm

MARK SCHEME

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Introduction

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MA indicates marks for combined method and accurate working.
C indicates marks for quality of written communication.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

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(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier, only a proportion of the marks will be available (based on the professional judgement of the examiner).

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General Marking Advice:

(i) If the correct answer is seen in the body of the script and the answer given in the answer line is clearly a transcription error, full marks should be awarded.

(ii) If the answer is missing, but the correct answer is seen in the body of the script, full marks should be awarded.

(iii) If the correct answer is seen in working but a completely different answer is seen in the answer space, then some marks will be awarded depending on the severity of the error.

(iv) Work crossed out but not replaced should be marked.

(v) In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.

(vi) For methods not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work.

(vii) Where a follow through mark is indicated on the mark scheme for a particular part question, the marker must ensure that you refer back to the answer of the previous part of the question.

(viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen. E.g. the answer in the mark scheme is 4.65 and the candidate then correctly rounds to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.

(ix) Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.

(x) For any question, the range of answers given in the mark scheme is inclusive.

Quality of written communication

In GCSE Mathematics, particular questions are identified where candidates must demonstrate the quality of their written communication.

In particular, candidates must:

(i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear (i.e. comprehension and meaning is clear by using the correct notation and labelling conventions);

(ii) select and use a form and style of writing appropriate to their purpose and to complex subject matter (i.e. reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning); and

(iii) organise information clearly and coherently, using specialist vocabulary where appropriate (i.e. the mathematical methods and processes used are coherently and clearly organised and appropriate mathematical vocabulary used).

This assessment may be through, for example, an explanation of the geometrical properties of a given shape or, for example, through concise mathematical argument in a multi-step problem.

				AVAILABLE MARKS
1	**(a)**	$1 - (0.15 + 0.2 + 0.25 + 0.35)$	M1	
		0.05	A1	
	(b)	0.6	A1	
		0.6×60	M1	
		36	A1	5
2		Train B because it has an average speed of 86.96 km/h and train A has an average speed of 80 km/h thus making train B faster	C2 A1	3
		or		
		Train A and train B both complete the same distance of 400 km. Train B completes it in a shorter time than train A therefore train B has the greater average speed.	C2 A1	
3		$x = 5y - 3y - 1$	MA1	
		$x = 2y - 1$	A1	2
4		Always odd because If n is even then $2n$ is even so $2n + 1$ is odd and any odd squared is odd If n is odd then $2n$ is even so $2n + 1$ is odd and any odd squared is odd	A1 A1	2
		or		
		Always odd because $(2n + 1)^2 = 4n^2 + 4n + 1 = 4(n^2 + n) + 1$ $4(\ldots)$ is a multiple of 4 and so is even and then plus 1 makes it odd	A1 A1	
		or		
		$(2n + 1)$ is an odd number An odd number squared is always odd	A1 A1	
5		$7.75 \times 8 \times 24 = 1488$	MA1	
		$\frac{5}{40} = \frac{1}{8}$ Gem		
		$\frac{1}{8}$ of $24 = 3$	MA1	
		$1488 + 3 \times 5.25$	M1	
		1503.75	A1	4

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			AVAILABLE MARKS
6	**(a)** $4n > 25$	M1	
	$n > \frac{25}{4}$ **or** $n > 6\frac{1}{4}$ **or** $n > 6.25$	A1	
	(b) 7	A1	3
7	$\frac{1200}{4} = 300$ **or** $\frac{1.2}{4} = 0.3$		
	Lime = 300 : 900 Lime = 0.3 : 0.9	MA1	
	Mint = 1 : 2 = 450 : 900 Mint = 1 : 2 = 0.45 : 0.9	MA1	
	Extra 150 ml (0.15 litres) Extra 0.15 litres (150 ml)	A1, A1 (units)	4
8	$\frac{a^6}{a^3}$ **or** $a^5 \times a^{-2}$	MA1	
	$= a^3$	A1	2
9	Surface area of cube = 64 × 6 = 384	MA1	
	Surface area of cuboid = $20x + 50$	MA1	
	$20x + 50 = 384$ $20x = 334$	MA1	
	x = 16.7cm	A1	4
10	**(a)** A completely correct quadratic graph drawn (apply [–1] for each error, e.g. incomplete graph, or a wrong point, no proper minimum point, not a smooth curve, etc.)	A2	
	(b) **(i)** $x = \frac{1}{2}$	A1	
	(ii) $-2\frac{1}{4}$	A1	4
11	For a cube of side x the volume = x^3		
	For a cube of side $1.1x$ the volume = $1.331x^3$	A1	
	$\frac{0.331x^3}{x^3} \times 100$	M1	
	33.1%	A1	3
	Accept work done with a selected value for side length		
12	Volume of lead needed = $\frac{4}{3}\pi \times 2^3 \times 100$	M1	
	$= 3351.032164\,\text{cm}^3$	A1	
	$\sqrt[3]{3351.03(2164)} = 14.96$	MA1	
	Side length = 15 cm	A1	4

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			AVAILABLE MARKS
13	$5ax + a + 2bx - 3b \equiv 4x + 11$	MA1	
	$5a + 2b = 4$ $a - 3b = 11$	MA1	
	$5a + 2b = 4$ $5a - 15b = 55$ or alternative equating of b coefficients $15a + 6b = 12$ $2a - 6b = 22$	MA1	
	$a = 2$	A1	
	$b = -3$	A1	5
14	Major sector area $= \frac{270}{360} \times \pi \times 15^2$	M1	
	530.14	A1	
	Triangle area $= \frac{1}{2} \times 15 \times 15$ (112.5)		
	Cross-sectional area = 530.14 + 112.5 (642.64)	MA1	
	Volume of wood = 642.64 × 110 (70690.8)	MA1	
	$= 0.0707\ m^3$	A1	5
		Total	**50**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
January 2015

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier



[GMT62]

GMT62

WEDNESDAY 14 JANUARY, 10.45 am–12.00 noon

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided. Do not write outside the box, around each page, on blank pages or tracing paper.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all twelve** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

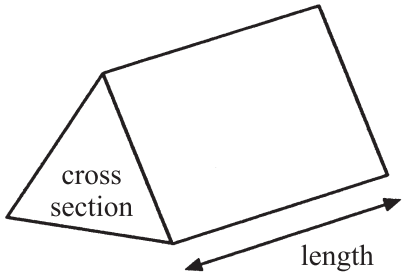
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **questions 2 and 3**.
You should have a calculator, ruler, compasses and protractor.
The Formula Sheet is on page 2.

9317

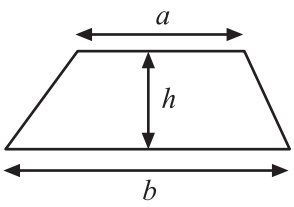
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Formula Sheet

Volume of prism = area of cross section × length

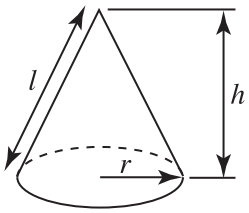


Area of trapezium $= \frac{1}{2}(a+b)h$



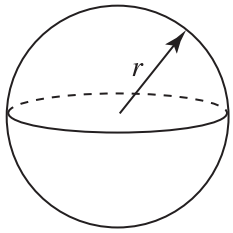
Volume of cone $= \frac{1}{3}\pi r^2 h$

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

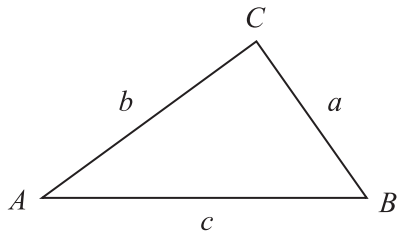


Volume of sphere $= \frac{4}{3}\pi r^3$

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



In any triangle ABC



Quadratic Equation

The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

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

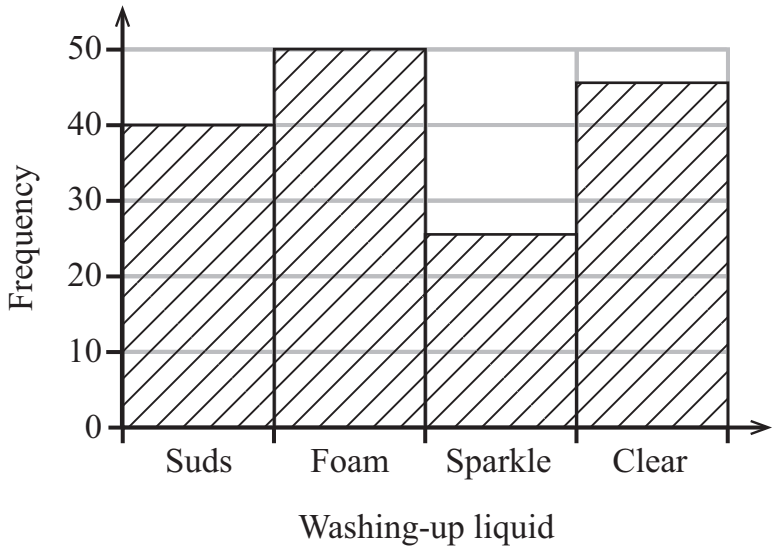
Sine Rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

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1 A survey was carried out in a supermarket to find which washing-up liquid people buy.



(a) A customer is chosen at random. What is the probability that they buy either Foam or Sparkle?

Answer _____ [2]

(b) The supermarket is ordering new stock. They are going to order 8000 bottles in total. Based on the results of this survey, how many bottles of Clear should they order?

Answer _____ [2]

[Turn over

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Quality of written communication will be assessed in this question.

2 A plane flies between two cities.
The plane leaves London at 0850, flies to Glasgow and returns to London arriving at 1305
The time spent in Glasgow is 45 minutes.
The second flight is 10 minutes longer than the first flight.
What is the arrival time in Glasgow of the first flight?
Show each stage of your working clearly.

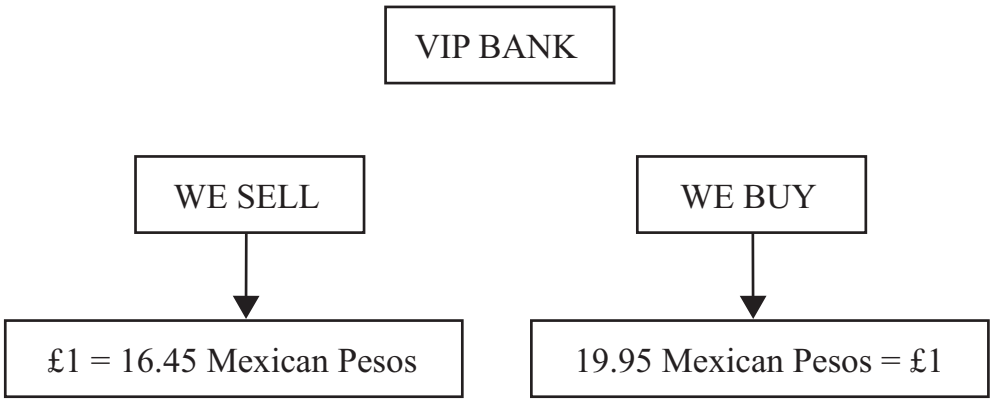
Answer _____ [4]

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Quality of written communication will be assessed in this question.

3 Banks have different rates for **selling** foreign currency or **buying** it.

The VIP Bank advertises its rates as follows.



Daniel changes £900 into Pesos.
He has to cancel his holiday and change his Pesos back into Pounds.
There is a £3 commission charge on each exchange.
What is the total loss on his money exchange?
Show clearly all your working.

Answer £ _____ [4]

[Turn over

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4 Electricity readings from a bill are shown below.

Previous	Present
93449	94969

(a) Calculate the number of units used.

Answer _____ [1]

(b) The cost of each unit is £0.1455
VAT is charged at 5%
Calculate the total electricity bill.

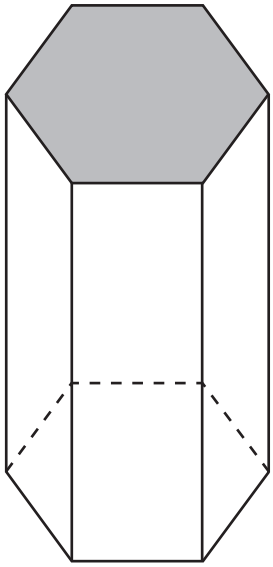
Answer £ _____ [3]

5 The probability that a pupil in Meadowcroft School wears glasses is 0.15
Seventy-two pupils in the school wear glasses.
How many pupils are in Meadowcroft School?

Answer _____ [2]

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6 A pillar is in the shape of a hexagonal prism as shown below.



The area of the shaded cross-section is $960cm^2$
The height of the pillar is 1.2m
Calculate the volume of the pillar.

Answer _____ [3]

[Turn over

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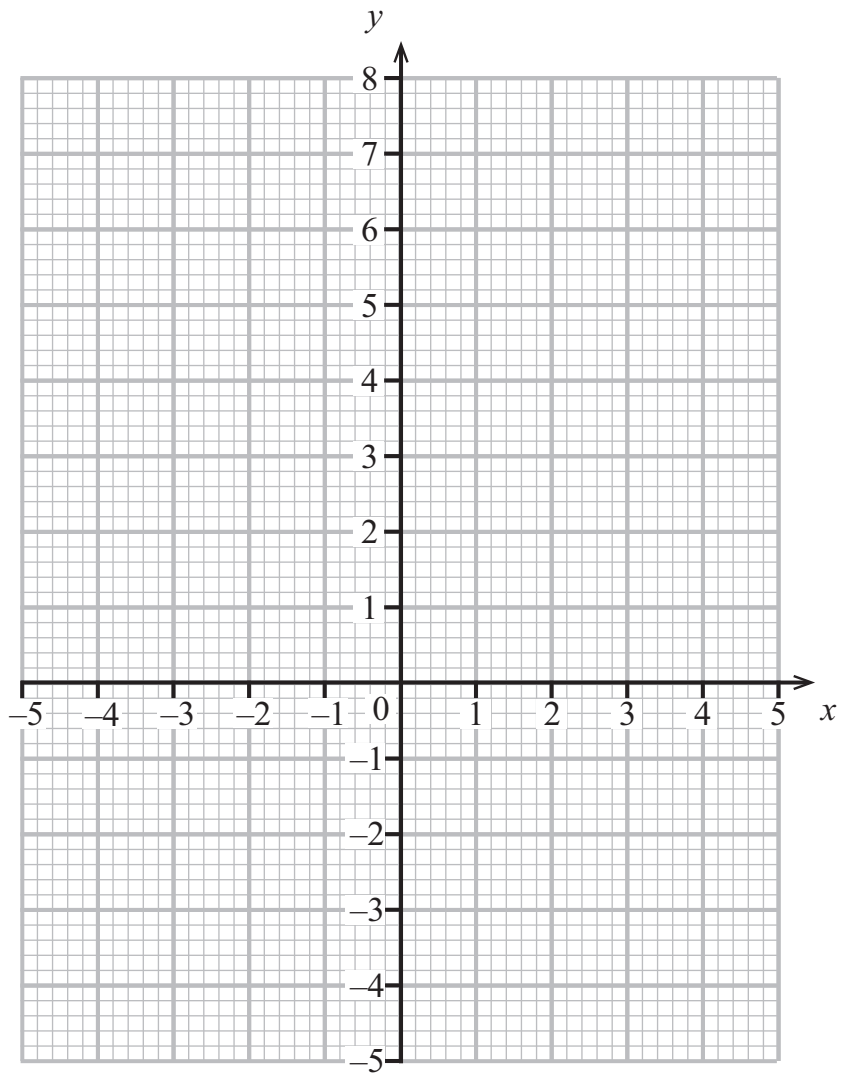
7 Part of the table for the graph of $y = x^2 - 2x - 3$ is shown below.

(a) Fill in the blanks in the table.

x	–2	–1	0	1	2	3	4
y	5	0			–3	0	5

[2]

(b) Use the values from the table to draw the graph.



[2]

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(c) By drawing an appropriate line on the graph, solve the equation

$$x^2 - 2x - 3 = x - 1$$

Answer $x =$ _____ [3]

8 **(a)** The teacher to pupil ratio in a school is 1:15
There are 960 pupils in the school.
How many teachers are there?

Answer _____ [2]

(b) 418 of these pupils play football, netball or hockey in the ratio 11:3:8
How many pupils play netball?

Answer _____ [3]

[Turn over

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9 **Show clearly** how one solution to the equation $2x - \frac{12}{x} = 0$ is $\sqrt{6}$

[2]

10 **(a)** Given $\sqrt{x+2} = 3a$ find x in terms of a

Answer $x =$ _____ [2]

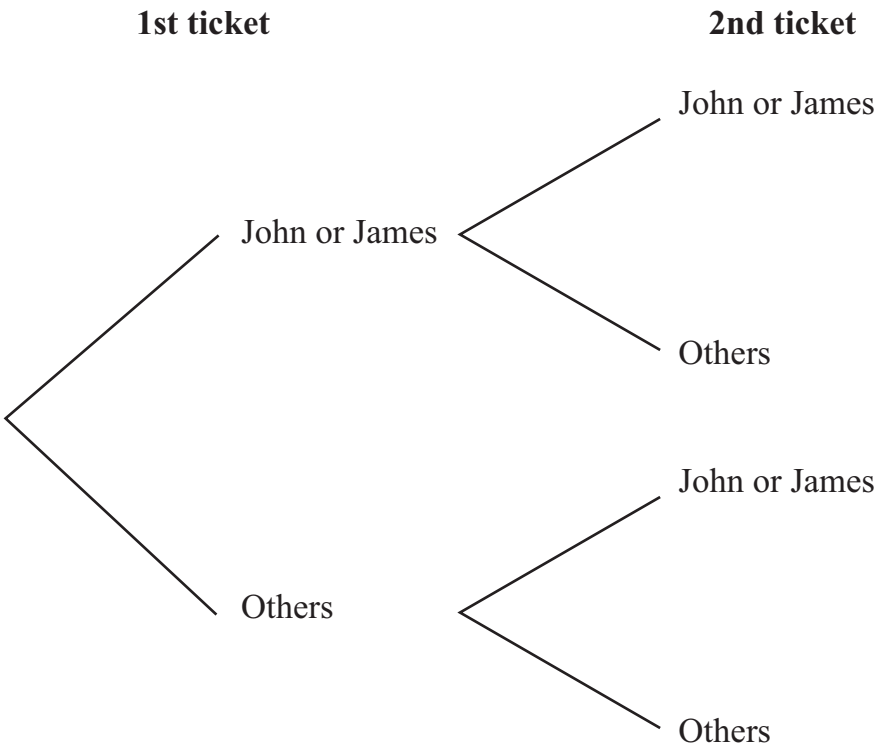
(b) Simplify $(\frac{1}{2}xy^3)^2$

Answer _____ [2]

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11 John, his best friend James and three other friends share two season tickets for the rugby season matches. Before each match, the five select at random two of their names, to decide who gets the tickets for the match. John and James hope to go to the next match together.

(a) Complete the tree diagram showing the probabilities for the selection of tickets for the next match.



[3]

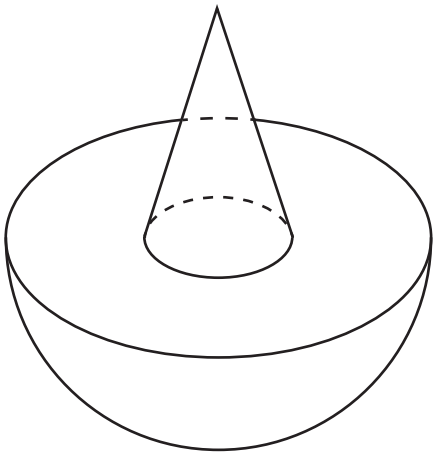
(b) Calculate the probability that John and James both get tickets for the next match.

Answer _____ [2]

[Turn over

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12 A solid wooden spinner is made up of a cone attached to a hemisphere as shown.



The hemisphere has a diameter of 16cm.
The base radius of the cone is 3cm and the vertical height of the cone is 10cm.
The surface of the spinner is to be painted. Calculate the surface area of the spinner.
Give your answer correct to 3 significant figures.

Answer _____ cm^2 [6]

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For Examiner's use only	
Question Number	**Marks**
1	
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10	
11	
12	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
January 2015

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier

[GMT62]

WEDNESDAY 14 JANUARY
10.45 am–12.00 noon

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(v) In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.

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(viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen. E.g. the answer in the mark scheme is 4.65 and the candidate then correctly rounds to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.

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(x) For any question, the range of answers given in the mark scheme is inclusive.

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(iii) organise information clearly and coherently, using specialist vocabulary where appropriate (i.e. the mathematical methods and processes used are coherently and clearly organised and appropriate mathematical vocabulary used).

This assessment may be through, for example, an explanation of the geometrical properties of a given shape or, for example, through concise mathematical argument in a multi-step problem.

				AVAILABLE MARKS
1	**(a)**	Total of 75 or 76	MA1	
		$\frac{75}{160}$ (or $\frac{15}{32}$) or $\frac{76}{162}$ (or $\frac{38}{81}$) or $\frac{75}{161}$ or $\frac{76}{161}$	MA1	
	(b)	$\frac{45}{160}\times 8000$ or $\frac{46}{162}\times 8000$ or $\frac{45}{161}\times 8000$ or $\frac{46}{161}\times 8000$	M1	
		= 2250 or 2272 or 2236 or 2285 or 2286 or 2271	A1	4
2		Total journey = $4\frac{1}{4}$ hours or 4.25 hrs or 4 hr 15 mins or 255 mins	C1	
		255 – 45 = 210 minutes for flights or $3\frac{1}{2}$ hours or 3.5 hours or 3 hr 30 mins	C1	
		105 ± 5 = 100 and 110 (10 min. difference)	C1	
		0850 + 100 minutes = 1030	C1	4
3		900 × 16.45 = 14805 pesos	C1	
		14805 ÷ 19.95 = £742.10 or £742.11	C1	
		900 – 742.10(1) = £157.90 or £157.89	C1	
		157.90(89) + 6 = £163.90 or £163.89	C1	4
4	**(a)**	1520 units	MA1	
	(b)	1520 × 0.1455 = £221.16	MA1	
		5% = £11.05 (8)	MA1	
		Total Bill = £232.21 (8) or £232.22	MA1	4
5		$\frac{72}{0.15}$ or $\frac{72}{15}\times 100$ or $72\times 6.\dot{6}$ or $1\% = \frac{72}{15}$ or $1\% = 4.8$	M1	
		480	A1	2
6		960 × 120 **or** 0.096 × 1.2	M1	
		115200 cm^3 0.1152 m^3	A1 A1 units	
		(an attempt to multiply 960 by 1.2 gains first mark only and no units mark)		3
7	**(a)**	–3 and –4	A1 A1	
	(b)	plot all points correctly	A1	
		smooth curve through all the points	A1	
	(c)	line $y = x - 1$ correctly drawn	MA1	
		answers from graph – 0.6 and 3.6	A1 A1	7

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				AVAILABLE MARKS
8	**(a)**	$960 \div 15 = 64$	M1 A1	
	(b)	$418 \div 22$	M1	
		19	A1	
		$3 \times 19 = 57$	MA1	5
9		$2x = \frac{12}{x}$		
		$2x^2 = 12$	MA1	
		$x^2 = 6$		
		$x = \sqrt{6}$	MA1	2
10	**(a)**	$x + 2 = 9a^2$	M1	
		$x = 9a^2 - 2$	A1	
	(b)	$\frac{1}{4}x^2y^6$	A2 (A1 for two parts correct)	4
11	**(a)**	A1 each branch correct		
		$\frac{2}{5}$ and $\frac{3}{5}$	A1	
		$\frac{1}{4}$ and $\frac{3}{4}$	A1	
		$\frac{2}{4}$ and $\frac{2}{4}$	A1	
	(b)	$\frac{2}{5} \times \frac{1}{4}$	M1	
		$= \frac{1}{10}$ or $\frac{2}{20}$	A1	5
12		Curved SA of hemisphere $= 2 \times \pi \times 8^2 = 402.1238597$ or 128π	MA1	
		Top of hemisphere $= \pi \times 8^2 - \pi \times 3^2$	M1	
		$= 172.7875959$	A1	
		Slant height of cone $= \sqrt{(3^2 + 10^2)} = 10.44030651$	MA1	
		csa cone $= \pi \times 3 \times 10.44030651 = 98.39757069$	MA1	
		Total $= 673\text{cm}^2$	A1	6
			Total	**50**

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Centre Number

Candidate Number

Rewarding Learning

General Certificate of Secondary Education
January 2014

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier



[GMT62]

GMT62

WEDNESDAY 15 JANUARY 10.45 am–12.00 noon

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided. Do not write outside the box, around each page, on blank pages or tracing paper.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all sixteen** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **question 10**.
You should have a calculator, ruler, compasses and protractor.
The Formula Sheet is on page 2.

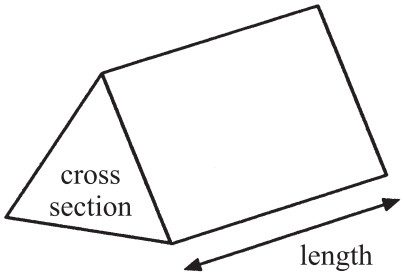
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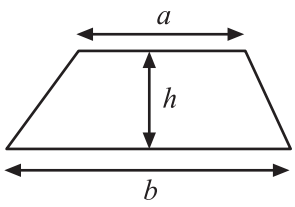
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Formula Sheet

Volume of prism = area of cross section × length

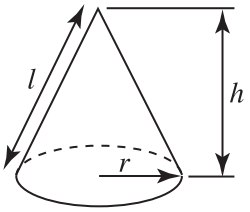


Area of trapezium = $\frac{1}{2}(a+b)h$



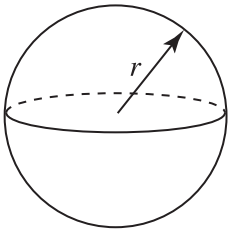
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl

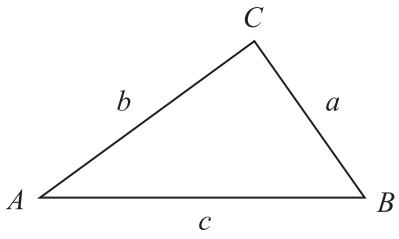


Volume of sphere = $\frac{4}{3}\pi r^3$

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



In any triangle *ABC*



Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

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

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 = $\frac{1}{2}ab\sin C$

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1 Divide £292 in the ratio 1:7

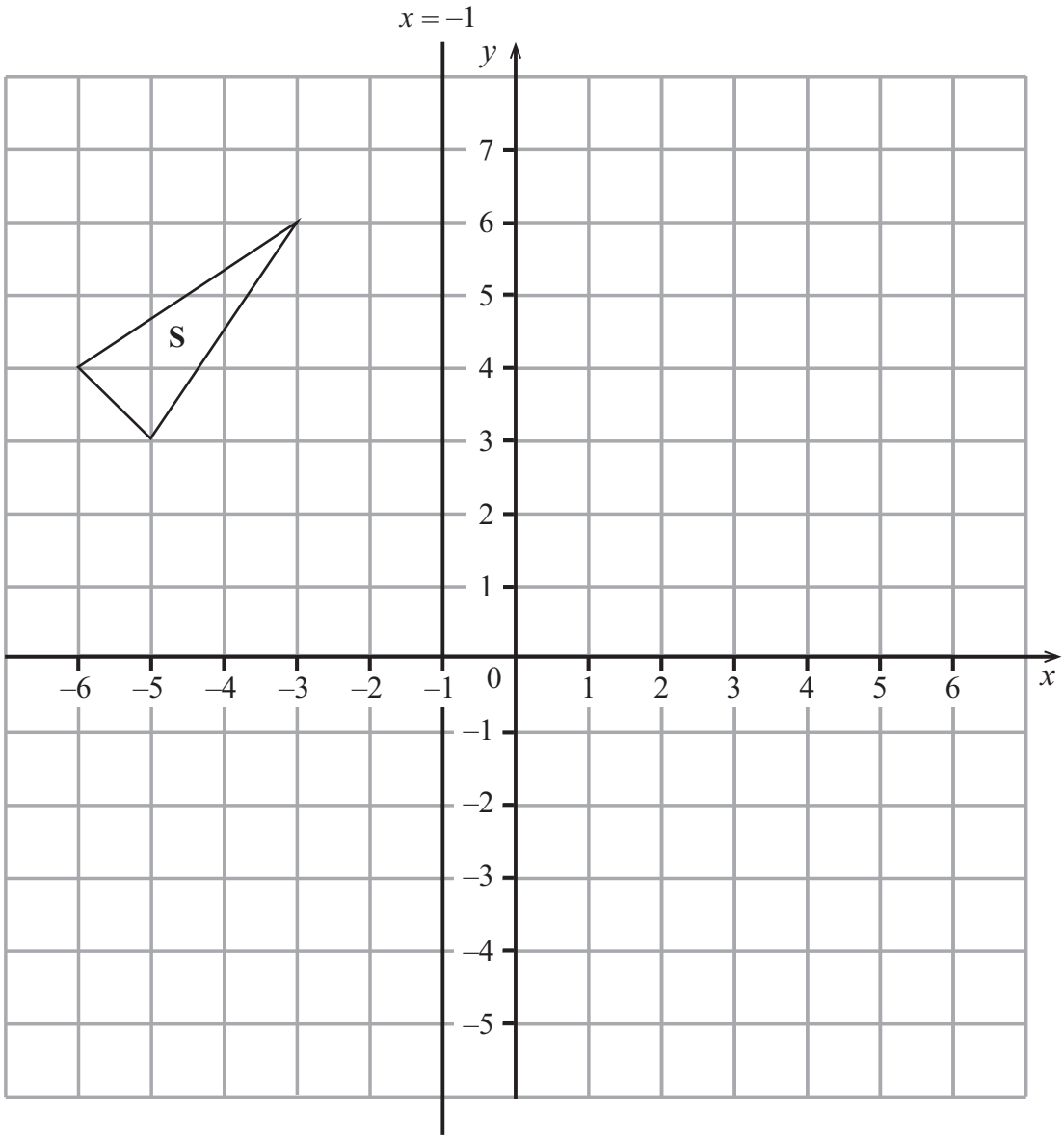
Answer £ _____ and £_____[2]

Examiner Only	
Marks	Remark
Total Question 1	

[Turn over

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2



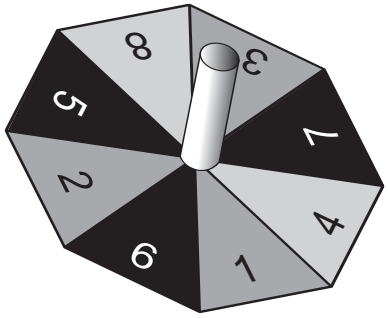
(a) Reflect the shape S in the line $x = -1$ [1]

(b) Draw the image of shape S after a translation 5 right and 4 down. [1]

Examiner Only	
Marks	Remark
Total Question 2	

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3 **(a)** This spinner is a regular octagon.



The spinner is spun 60 times.
How many times would you expect it to land on a number greater than 2?

Answer _____ [2]

(b) A box contains a number of packets of crisps of different flavours.
A packet of crisps is taken at random from the box.
Some of the probabilities of taking each flavour are shown in the table below.

Flavour	Cheese	Vinegar	Bacon	Sausage	Beef
Probability	0.3	0.12		0.25	0.05

Calculate the probability that the crisps are Bacon flavour.

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 3	

[Turn over

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4 Three friends share a flat.
Martin claims 1 in 20 phone calls to the flat are for him.
Peter claims that the probability a phone call is for him is 0.4
Noel claims 60% of the phone calls are for him.

(a) Explain why their claims cannot be correct.

_____ [1]

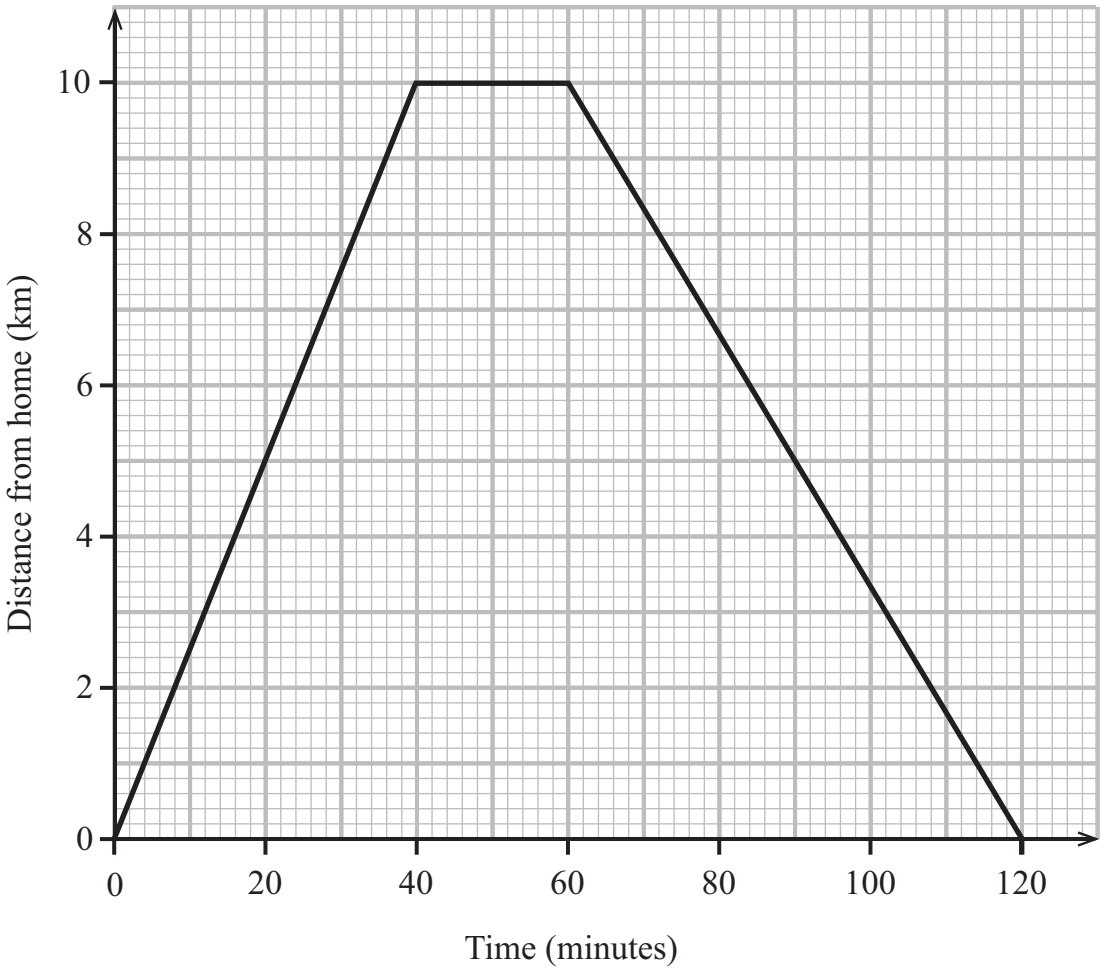
(b) Martin and Noel are correct.
Calculate the probability that a phone call is for Peter.

Answer _____ [1]

Examiner Only	
Marks	Remark
Total Question 4	

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5 Katie went on a cycling trip from her home.
The diagram below shows the distance/time graph for her complete journey.



(a) What was the average speed for the first 30 minutes?

Answer _____ km/h [1]

(b) At what stage of the trip was she travelling at the fastest average speed?

Answer _____ [1]

(c) After how many minutes had she travelled a distance of 14 kilometres?

Answer _____ minutes [1]

Examiner Only	
Marks	Remark
Total Question 5	

[Turn over

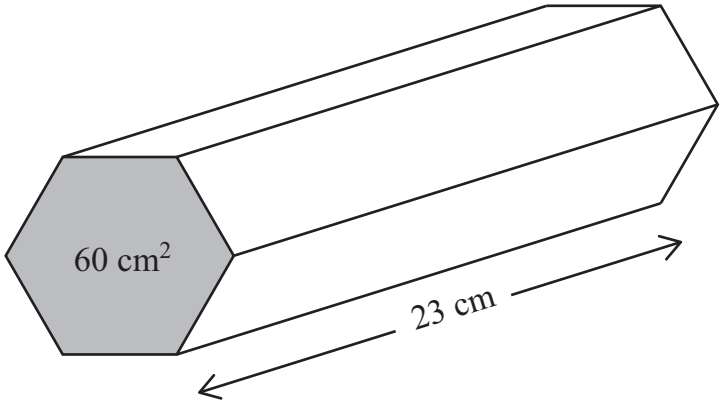
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6 Work out the value of $y^2 - 4y$ when $y = -3$

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 6	

7 A solid hexagonal prism of mass 8600 g has a cross-sectional area of 60 cm^2 and length 23 cm.



Calculate the density of the prism in g/cm^3.

Give your answer to an appropriate degree of accuracy.

Answer _____ g/cm^3 [4]

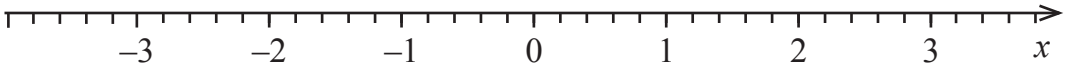
Total Question 7	

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8 **(a)** Solve the inequality $5x + 4 > 11$

Answer _____ [2]

(b) Illustrate your answer to part **(a)** on the number line below.



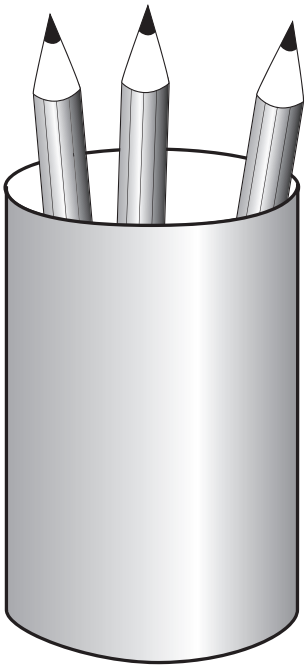
[1]

Examiner Only	
Marks	Remark
Total Question 8	

[Turn over

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9 A pencil holder is in the shape of an open-topped cylinder with radius 5 cm and height 14 cm. Find the **total** surface area of the cylindrical pencil holder.



Answer _____ cm^2 [3]

Examiner Only	
Marks	Remark
Total Question 9	

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Quality of written communication will be assessed in this question.

Examiner Only	
Marks	Remark

10 In a school there are 340 pupils, of which 180 are boys.
The total number of pupils in the Sports Club is 164
The probability that a boy is a member of the Sports Club is 0.6
Calculate the probability that a girl in the school is a member of the Sports Club.

Answer _____ [4]

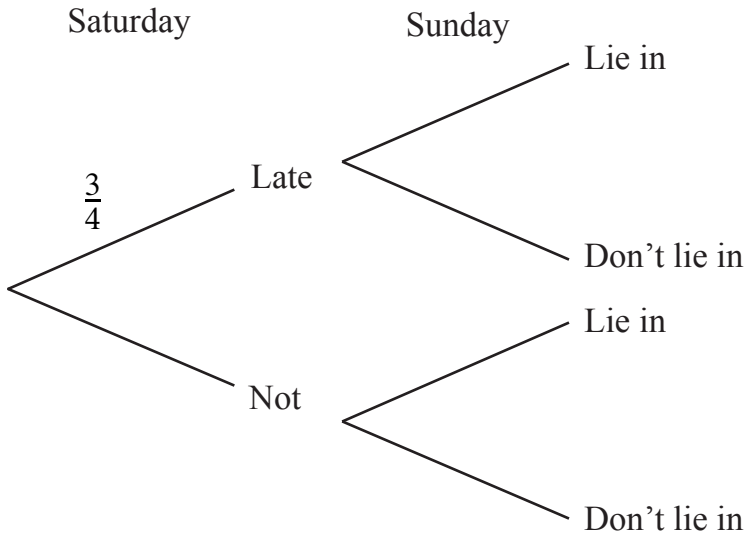
Total Question 10

[Turn over

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11 The probability that I stay up late on a Saturday night is $\frac{3}{4}$
When I stay up late, the probability that I lie in on Sunday morning is $\frac{2}{3}$
When I do not stay up late on Saturday night, then the probability that I lie in on Sunday morning is $\frac{1}{5}$

(a) Complete the tree diagram.



[2]

(b) Calculate the probability that I lie in on a Sunday morning.

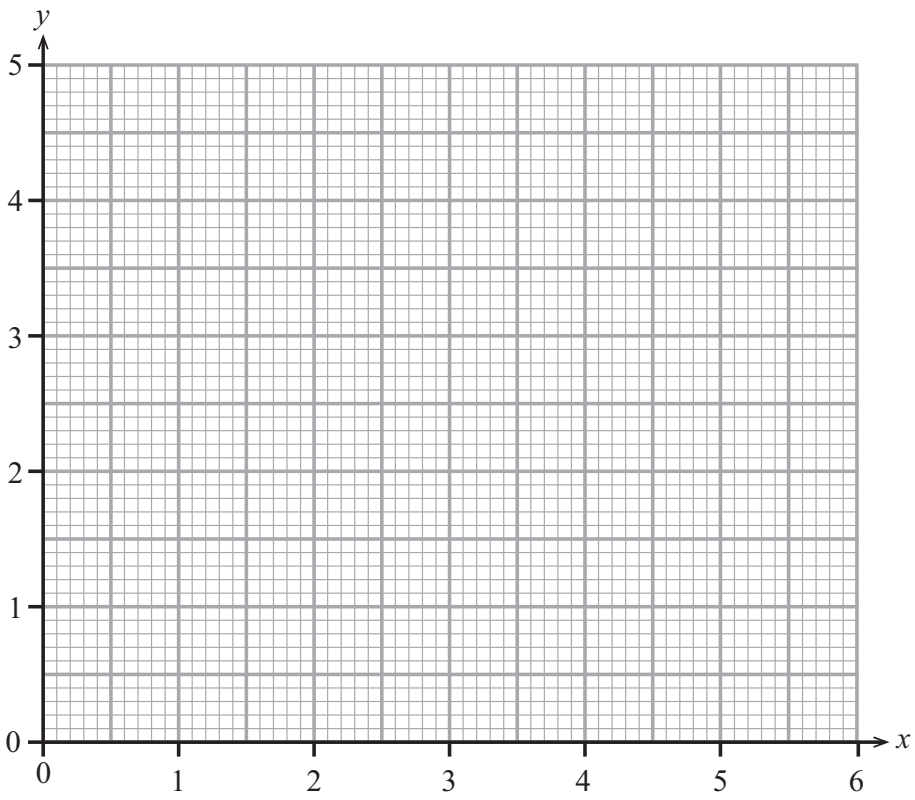
Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 11	

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12 (a) On the grid below, show by shading **and the letter R**, the region which satisfies all the inequalities.

$x \geqslant 1$
$y \geqslant x$
$x + 2y \leqslant 6$



[3]

(b) Work out the greatest value of $2x + y$ in the region R above.

Answer _____ [2]

Total Question 12

13 (a) Write 0.0000473 in standard form.

Answer _____ [1]

(b) Write 3.6×10^{-12} in decimal form.

Answer _____ [1]

Total Question 13

Examiner Only

Marks	Remark

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14 Rationalise the denominator of $\frac{10}{\sqrt{5}}$

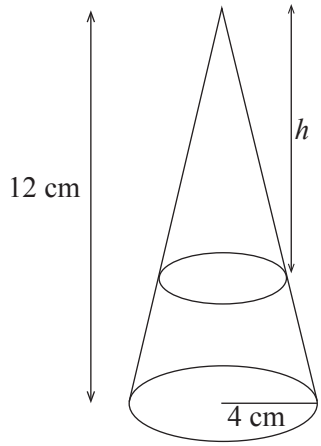
Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 14	

15 The diagram below shows a large cone of radius 4 cm and height 12 cm and a small cone with height h.

The volume of the large cone is three times the volume of the small cone.

Calculate the height h of the small cone.



Answer h = _____ cm [4]

Total Question 15

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16 Prove that $\frac{p+r}{pr} - \frac{p+q}{pq} \equiv \frac{q-r}{qr}$

[4]

Examiner Only	
Marks	Remark
Total Question 16	

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
January 2014

Mathematics

Unit T6 Paper 2

Higher Tier

[GMT62]

WEDNESDAY 15 JANUARY
10.45 am–12 noon

MARK SCHEME

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Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The solution to a question gains marks for correct method and marks for accurate working based on this method. The marks awarded for each question are shown in the right hand column and they are prefixed by the letters **M**, **A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.
A indicates marks for accurate working, whether in calculation, reading from tables, graphs or answers. Accuracy marks may depend on preceding **M** (method) marks, hence **M**0 **A**1 cannot be awarded, i.e. where the method is not correct no marks can be given.
MA indicates marks for combined method and accurate working.
C indicates marks for quality of written communication.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking:

It is our intention to regard candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier, only a proportion of the marks will be available (based on the professional judgement of the examiner).

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This assessment may be through, for example, an explanation of the geometrical properties of a given shape or, for example, through concise mathematical argument in a multi-step problem.

			AVAILABLE MARKS
1	$\frac{292}{8} = 36.50$	MA1	
	36.50, 255.50	MA1	2
2	**(a)** correct reflection	A1	
	(b) correct translation	A1	2
3	**(a)** $\frac{3}{4} \times 60$ oe	M1	
	$= 45$	A1	
	(b) $1 - (0.3 + 0.12 + 0.25 + 0.05)$	M1	
	$= 0.28$	A1	4
4	**(a)** total probability > 1 (or 100%)	A1	
	(b) 0.35 (or 35%)	A1	2
5	**(a)** 15 accept answers in range (14.8 – 15.2)	A1	
	(b) first stage	A1	
	(c) 84 accept answers in range (83 – 85)	A1	3
6	$9 + 12$ or $(-3)^2 - 4(-3)$	M1	
	21	A1	2
7	$60 \times 23 = 1380$	MA1	
	$8600 \div 1380 = 6.23$ (1884)	M1, A1	
	6.2 or 6	A1	4
8	**(a)** $5x > 11 - 4$	M1	
	$x > 1.4$	A1	
	(b) Correct illustration on number line follow through from **(a)**	A1	3
9	$\pi \times 10 \times 14$ or $2 \times \pi \times 5 \times 14$	M1	
	439.8 (229715) or 440	A1	
	$\pi \times 5^2 = 78.5398$		
	$78.53981634 + 439.8229715 = 518.3627878$ or 520	MA1	3

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			AVAILABLE MARKS
10	340 – 180 = 160 girls	C1	
	0.6 × 180 = 108 boys	C1	
	164 – 108 = 56 girls in the club	C1	
	p (girl is a member) = $\frac{56}{160}$ oe	C1	4
11	**(a)** Late branches complete $\frac{2}{3}$ and $\frac{1}{3}$	A1	
	Not late branches complete $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{4}{5}$	A1	
	(b) $\frac{3}{4}\times\frac{2}{3}+\frac{1}{4}\times\frac{1}{5}$ follow through using tree in **(a)**	M1	
	$=\frac{11}{20}$ oe	A1	4
12	**(a)** Each boundary line correct with shading and correct region identified	A3	
	(b) 6 (allow A1 if point (2,2) is identified)	A2	5
13	**(a)** 4.73×10^{-5}	A1	
	(b) 0.0000000000036	A1	2
14	$\frac{10}{\sqrt{5}}\times\frac{\sqrt{5}}{\sqrt{5}}\left(=\frac{10\sqrt{5}}{5}\right)$	M1	
	$=2\sqrt{5}$	A1	2
15	$\frac{\pi\times4^2\times12}{3}=\frac{3\pi\times(\frac{1}{3}h)^2\times h}{3}$ or equivalent	M1, A1	
	$192=\frac{1}{3}h^3$ or $576=h^3$	MA1	
	$h = 8.32$	A1	4
	Alternative method		
	$\frac{1}{3}\pi\times4^2\times12=64\pi$ or 201.06	MA1	
	$64\pi=3\times\frac{1}{3}\pi\times(\frac{1}{3}h)^2\times h$	MA1	
	$64=\frac{h^3}{9}$ or $576=h^3$	MA1	
	$h = 8.32$	A1	

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			AVAILABLE MARKS
16	$\frac{q(p+r)-r(p+q)}{pqr}$	MA1	
	$\frac{pq+qr-pr-qr}{pqr}$	MA1	
	$\frac{pq-pr}{pqr}=\frac{p(q-r)}{pqr}$	MA1	
	$\frac{q-r}{qr}$	MA1	4
		Total	**50**

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Centre Number

Candidate Number

Rewarding Learning

General Certificate of Secondary Education
2013

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier



[GMT62]

GMT62

FRIDAY 14 JUNE, 10.45 am – 12.00 pm

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided. Do not write outside the box, around each page, on blank pages or tracing paper.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all fifteen** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

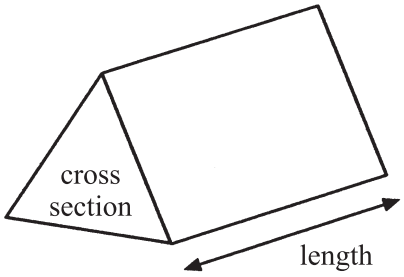
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **question 15**.
You should have a calculator, ruler, compasses and protractor.
The Formula Sheet is on page 2.

8172

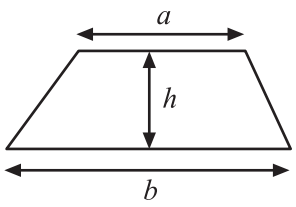
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Formula Sheet

Volume of prism = area of cross section × length

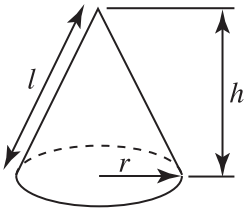


Area of trapezium = $\frac{1}{2}(a+b)h$



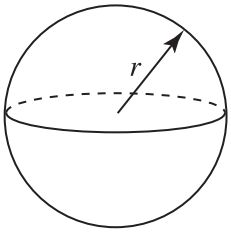
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl

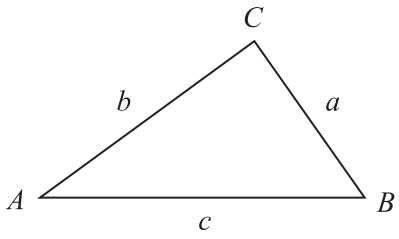


Volume of sphere = $\frac{4}{3}\pi r^3$

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



In any triangle *ABC*



Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

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

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 = $\frac{1}{2}ab\sin C$

8172

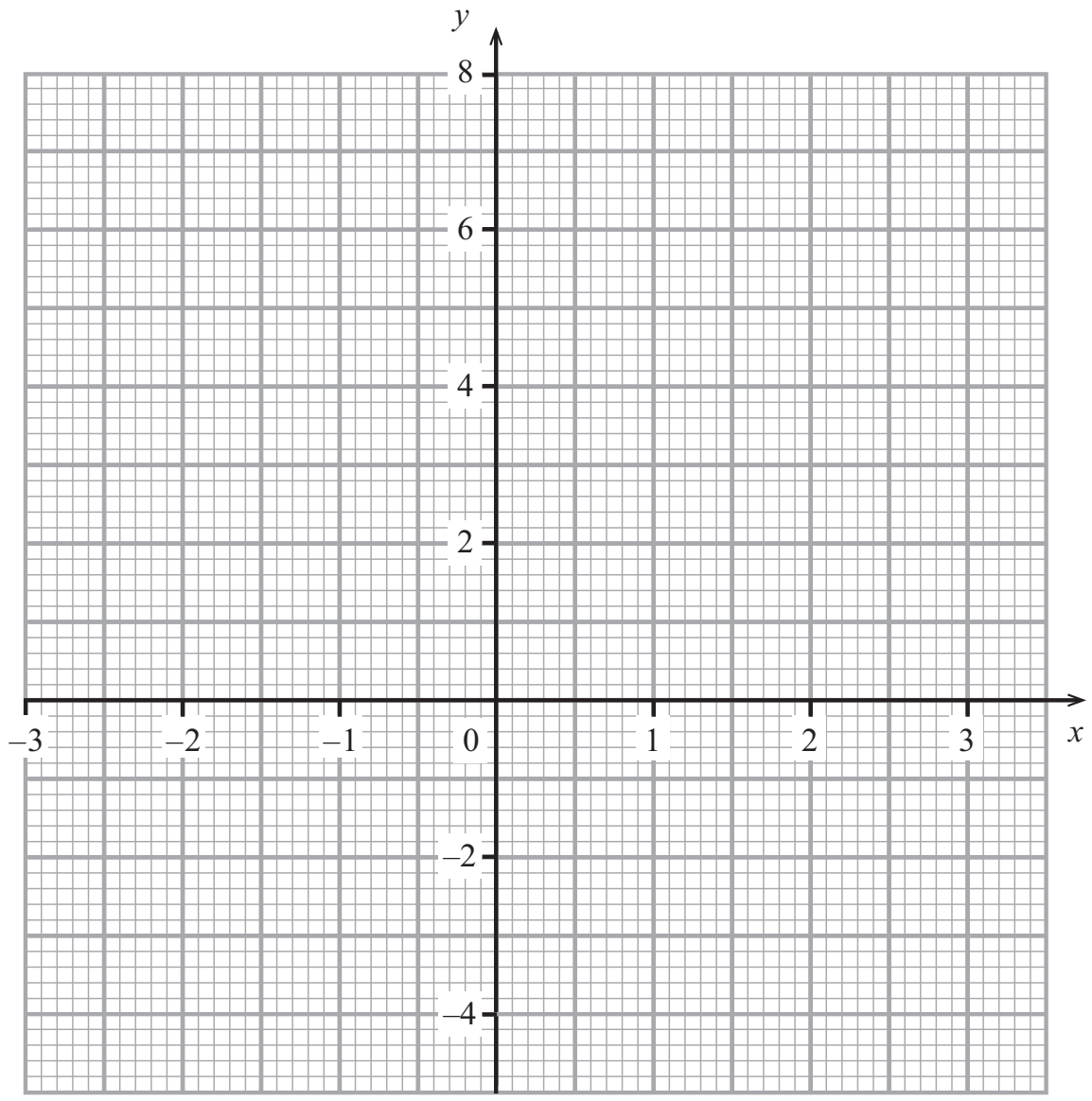
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1 **(a)** Complete the table for $y = 6 - x^2$

x	–2	–1	0	1	2	3
$y = 6 - x^2$		5	6	5	2	–3

[1]

(b) Draw the graph of $y = 6 - x^2$



[2]

Examiner Only	
Marks	Remark
Total Question 1	

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2 On the way to school Sean stops at the shop. When he goes to pay for a drink he finds he has forgotten his money. He runs back home to get it and arrives home at 8.35 am.

The graph opposite shows his journey.

(a) What was Sean's average speed running home in km/h?

Answer _____ km/h [2]

On his way home Sean meets his sister Maura on her way to school.

She left home at 8.15 am and arrives in school which is 1500 m away at 8.50 am.

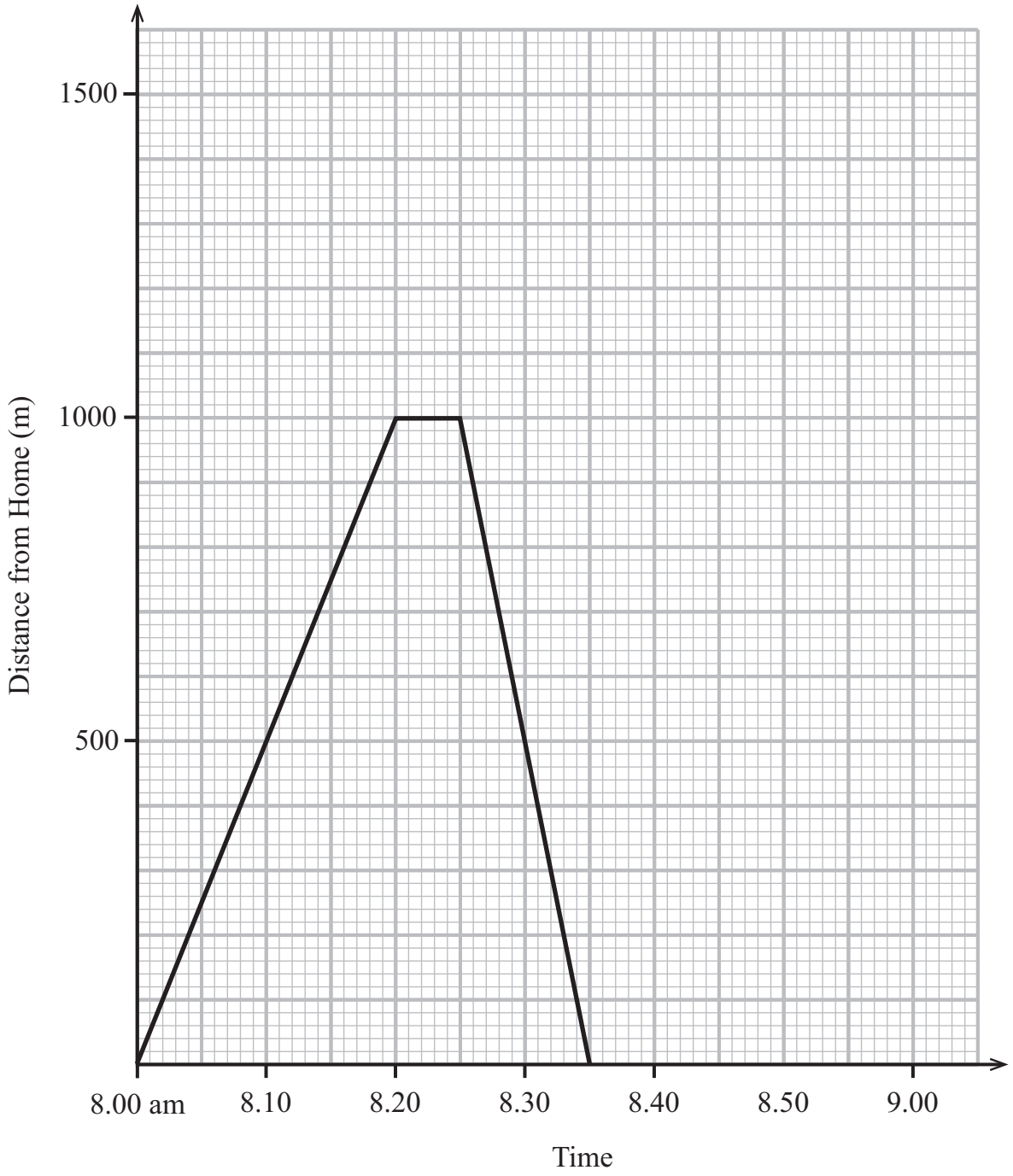
(b) Draw on the graph Maura's journey to school. [1]

(c) At what time does Sean meet Maura?

Answer _____ am [1]

Examiner Only	
Marks	Remark
Total Question 2	

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[Turn over

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3 Use your calculator to find the value of

$$\frac{3.862 + 42.19}{23.17 - 5.967}$$

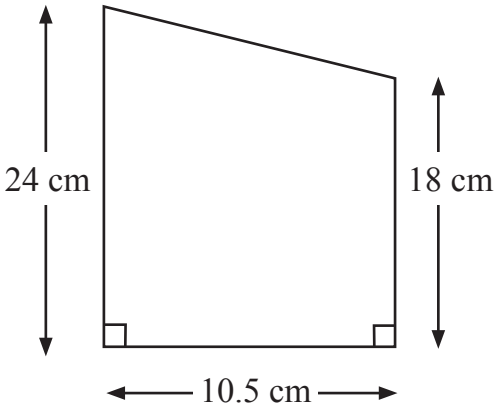
Give your answer correct to one decimal place.

Answer _____ [2]

Examiner Only	
Marks	Remark

Total Question 3

4 Calculate the area of the trapezium shown.



Give your answer to an appropriate degree of accuracy.

Answer _____ cm^2 [3]

Total Question 4

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5 A car travels 450 km in 6 hours 15 minutes.

Calculate its average speed in km/h.

Answer _____ km/h [3]

Examiner Only	
Marks	Remark
Total Question 5	

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6 For a charity event pupils in a school were asked to guess how many sweets were in a jar.

The pupils paid 10p for a guess and the results were collected in a table.

Number of sweets guessed	Frequency
50–75	24
76–100	86
101–125	113
126–150	97

(a) Calculate the probability that the guess was greater than 100

Answer _____ [2]

No one guessed the correct number of sweets and it was decided that everyone who guessed within 5 of the correct answer would get a prize of 50p. The probability of someone guessing within 5 turned out to be 0.05 and the sweets originally cost £5

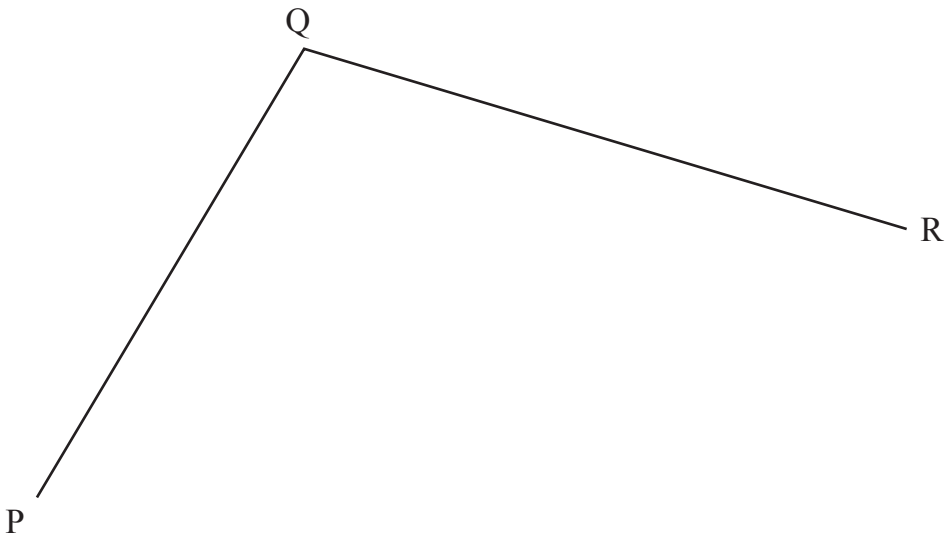
(b) How much profit was made and passed on to the charity?

Answer £ _____ [2]

Examiner Only	
Marks	Remark
Total Question 6	

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7 Using **ruler and compasses only** bisect the angle PQR shown.



[2]

Examiner Only	
Marks	Remark
Total Question 7	

8 The angles in a triangle are in the ratio of 3 : 5 : 7

Work out the sizes of the angles in the triangle.

Answer _____ , _____ , _____ [3]

Total Question 8	

[Turn over

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9 A small gold bar has a cross-sectional area of 8 cm^2 and a length of 5.5 cm.
The mass of the bar is 849 g.
Find the density of the gold.

Answer _____ g/cm^3 [3]

Examiner Only	
Marks	Remark
Total Question 9	

10 Solve $4x - 10 < 5$

Answer _____ [2]

Total Question 10	

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11 The speed of light is approximately 2.9979×10^8 m/s.
The speed of sound is approximately 3.4×10^2 m/s.
Work out how many times faster the speed of light is than the speed of sound.
Give your answer in standard form, correct to 2 significant figures.

Answer _____ [2]

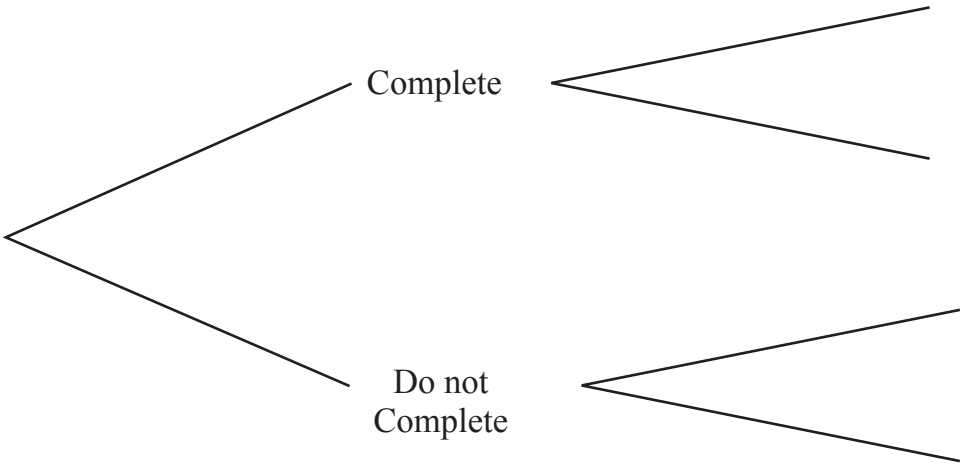
Examiner Only	
Marks	Remark
Total Question 11	

[Turn over

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12 A maths teacher estimates that the probability of a student obtaining a grade A in their final examination is improved if they complete all their assignments throughout the year. Two thirds of his class complete all the assignments and their probability of getting grade A is 0.6
For those who do not complete the assignments the probability of getting grade A is 0.3

(a) Complete the tree diagram below to show this information.



[3]

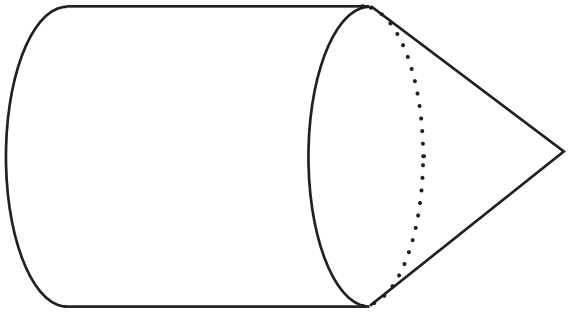
(b) Calculate the probability that a student taken at random from the class will get a grade A.

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 12	

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13 A solid is formed by attaching a cylinder to a cone.
The cylinder has a base radius of 3 cm and a height of 7.2 cm.
The slant height of the cone is 4.2 cm.
Find the total surface area of the solid.



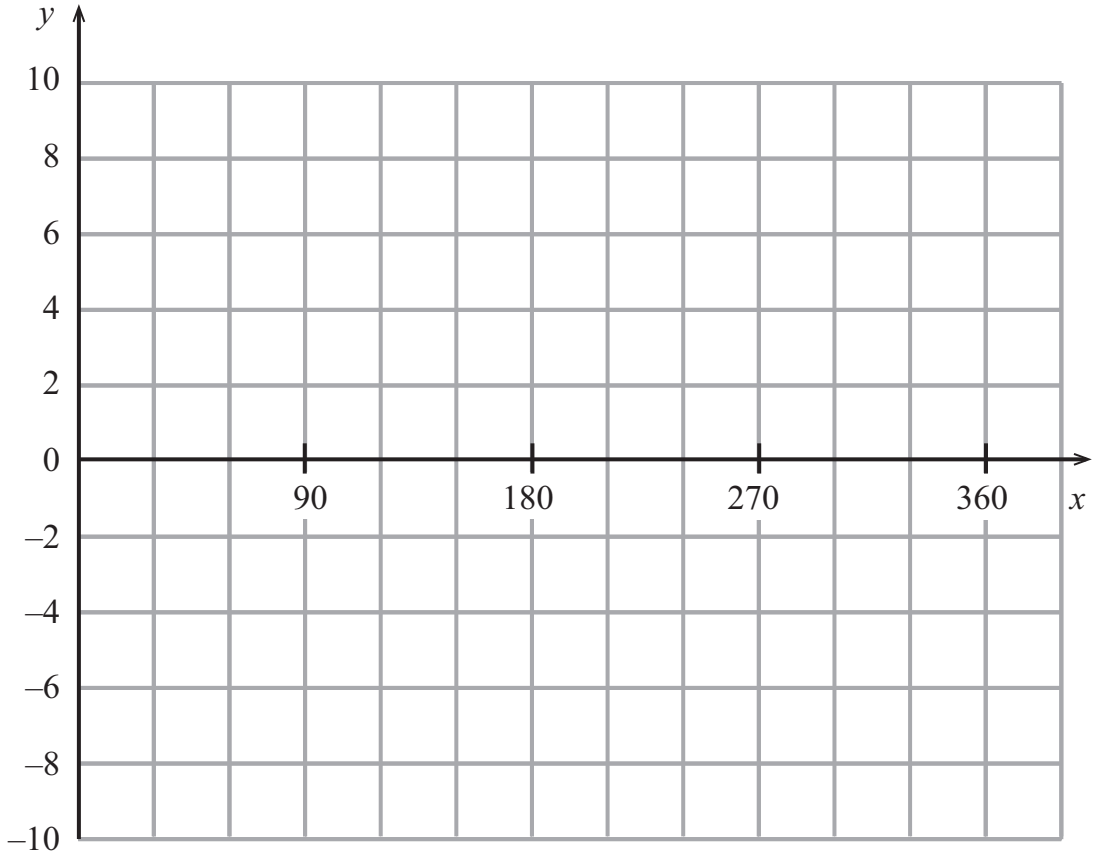
Answer _____ cm^2 [4]

Examiner Only	
Marks	Remark
Total Question 13	

[Turn over

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14



(a) Sketch the graph of $y = \tan x$ on the axes provided. [3]

(b) Use the graph to find solutions of

$$\tan x + 4 = 0$$

for $0 \leqslant x \leqslant 360°$

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 14	

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Quality of written communication will be assessed in this question.

15 Simplify $\left(\frac{n}{n+1}\times\frac{n}{n+2}\right)\div\left(\frac{n}{n+1}-\frac{n}{n+2}\right)$

[4]

Examiner Only	
Marks	Remark
Total Question 15	

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2013

Mathematics

Unit T6 Paper 2
Higher Tier

[GMT62]

FRIDAY 14 JUNE

10.45 a.m. – 12.00 p.m.

MARK SCHEME

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Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The solution to a question gains marks for correct method and marks for accurate working based on this method. The marks awarded for each question are shown in the right-hand column andthey are prefixed by the letters **M, A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.
A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers. Accuracy marks may depend on preceding **M** (method) marks, hence **M**0 **A**1 cannot be awarded i.e. where the method is not correct no marks can be given.
MA indicates marks for combined method and accurate working.
C indicates marks for quality of written communication.
oe indicates "or equivalent" i.e. where a solution can be expressed in an alternative correct form, e.g. $\frac{1}{4} = 0.25$
ft indicates "follow through". See explanation below.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier, only a proportion of the marks will be available (based on the professional judgement of the examiner).

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General Marking Advice

(i) If the correct answer is seen in the body of the script and the answer given in the answer line is clearly a transcription error, full marks should be awarded.

(ii) If the answer is missing, but the correct answer is seen in the body of the script, full marks should be awarded.

(iii) If the correct answer is seen in working but a completely different answer is seen in the answer space, then some marks will be awarded depending on the severity of the error.

(iv) Work crossed out but not replaced should be marked.

(v) In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.

(vi) For methods not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work.

(vii) Where a follow through mark is indicated on the mark scheme for a particular part question, the marker must ensure that you refer back to the answer of the previous part of the question.

(viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen. E.g. the answer in the mark scheme is 4.65 and the candidate then correctly rounds to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.

(ix) Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.

(x) For any question, the range of answers given in the mark scheme is inclusive.

(xi) Incorrect money notation will generally lose one mark but will be penalised only once per paper.

(xii) In general, a tolerance of ±2° is allowed in drawing angles, and ±2 mm in measuring length.

(xiii) In algebra, if further inaccurate work is done to a correct answer, some marks may be lost.

Quality of written communication

In GCSE Mathematics, particular questions are identified where candidates must demonstrate the quality of their written communication.

In particular, candidates must:

(i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear (i.e. comprehension and meaning is clear by using the correct notation and labelling conventions);

(ii) select and use a form and style of writing appropriate to their purpose and to complex subject matter (i.e. reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning); and

(iii) organise information clearly and coherently, using specialist vocabulary where appropriate (i.e. the mathematical methods and processes used are coherently and clearly organised and appropriate mathematical vocabulary used).

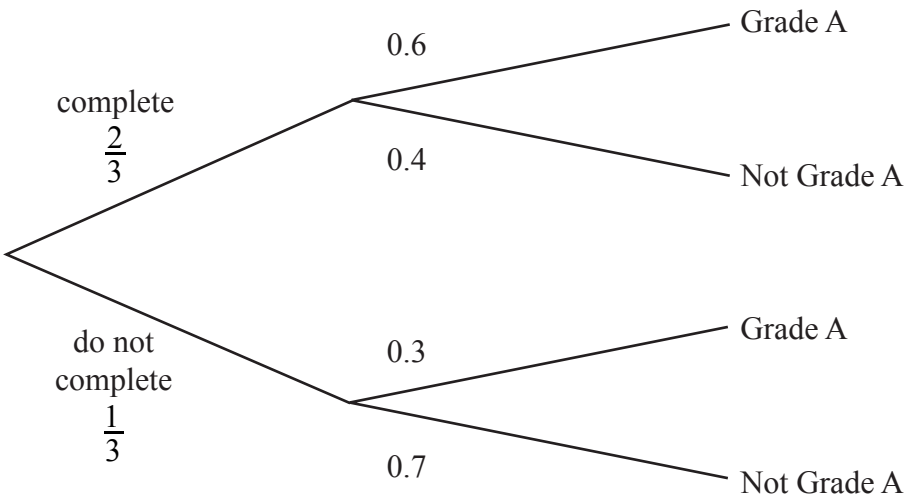
This assessment may be through, for example, an explanation of the geometrical properties of a given shape or, for example, through concise mathematical argument in a multi-step problem.

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				AVAILABLE MARKS
1	**(a)**	2	A1	
	(b)	6 points plotted correctly **ft** from part **(a)**	A1	
		smooth curve joining all 6 points from the table	A1	3
2	**(a)**	1 km in 10 mins (oe)	M1	
		6	A1	
	(b)	correct line drawn from (8.15, 0) to (8.50, 1500) only	A1	
	(c)	correct reading from intersection of candidate's graphs	A1	4
3		$\frac{46.052}{17.203}$ or 2.67(6974946)	A1	
		Ans 2.7	A1	2
4		$\frac{1}{2}(24 + 18) \times 10.5$	MA1	
		= 220.5	A1	
		Ans 200 or 220	A1	3
5		450 ÷ 6 hours 15 minutes (oe)	MA1	
		$\frac{450}{6\frac{1}{4}}$ **oe**	MA1	
		= 72 k/hr	A1	3
6	**(a)**	113 + 97 (= 210)	MA1	
		= $\frac{210}{320}$ or 0.65625 **oe**	A1	
	(b)	follow through from part **(a)** for candidate's "320"		
		0.05 × 320 = 16 winners = £8 win	MA1	
		320 × 10p = £32		
		Profit = £32 –£8 –£5 = £19	A1	4
7		Three or four arcs drawn indicating correct method	M1	
		Angle bisector drawn accurately with arcs	A1	2
8		180 ÷ 15 = 12	MA1	
		36°, 60°, 84°	A2	3
		(2 angles correct, A1)		

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			AVAILABLE MARKS
9	volume = $8 \times 5.5 = 44\ cm^3$	MA1	
	$D = \frac{849}{44}$ **ft** for candidate's volume	MA1	
	$= 19.3$	A1	3
10	$4x < 15$	MA1	
	$x < \frac{15}{4}$ or $3\frac{3}{4}$ or 3.75	A1	2
11	$(2.9979 \times 10^8) \div (3.4 \times 10^2)$ or 881 735.2941 or 880 000	MA1	
	8.8×10^5	A1	2
12	**(a)**		



all labels	A1	
$\frac{2}{3}, \frac{1}{3}$	A1	
0.6, 0.4, 0.3, 0.7	A1	
(b) $p(A) = p(C \text{ and } A)$ **or** $p(NC \text{ and } A)$	M1	
$= \left(\frac{2}{3} \times 0.6\right) + \left(\frac{1}{3} \times 0.3\right)$ **ft** from candidate's tree diagram	MA1	
$= 0.4 + 0.1 = 0.5$	MA1	6
13 Surface area of cylinder $= 2 \times \pi \times 3 \times 7.2 + \pi \times 3^2$	MA1	
$= 164$	A1	
Surface area of cone $= \pi \times 3 \times 4.2$		
$= 39.58$	MA1	
Total area = 203.6	A1	4
NB: The final mark can only be awarded for correct formulae throughout.		

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			AVAILABLE MARKS
14	**(a)** $0 \rightarrow 90, 90 \rightarrow 270, 270 \rightarrow 360$	A1, A1, A1	
	(b) 104(.04) 284(.04) (correct readings from candidate's graph) NB: Unless some marks are achieved in **(a)** there is no **ft** to part **(b)**	A1 A1	5
15	$\left(\frac{n}{n+1} \times \frac{n}{n+2}\right) \div \left(\frac{n}{n+1} - \frac{n}{n+2}\right)$		
	$\frac{n^2}{(n+1)(n+2)} \div \frac{n(n+2) - n(n+1)}{(n+1)(n+2)}$	C1, C1	
	$\frac{n^2}{(n+1)(n+2)} \times \frac{(n+1)(n+2)}{n^2 + 2n - n^2 - n}$	C1	
	$\frac{n^2}{n} = n$	C1	4
		Total	**50**

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Centre Number

Candidate Number

Rewarding Learning

General Certificate of Secondary Education
January 2013

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier



[GMT62]

GMT62

TUESDAY 15 JANUARY, 3.00 pm – 4.15 pm

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
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Complete in blue or black ink only. **Do not write in pencil or with a gel pen.**
Answer **all fifteen** questions.
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You **may** use a calculator for this paper.

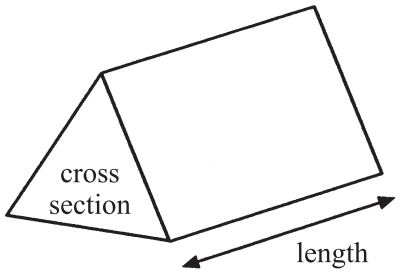
INFORMATION FOR CANDIDATES

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Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **questions 10 and 13**.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on page 2.

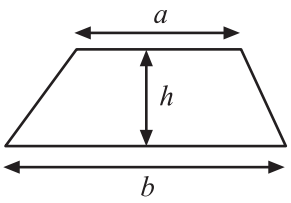
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Formula Sheet

Volume of prism = area of cross section × length

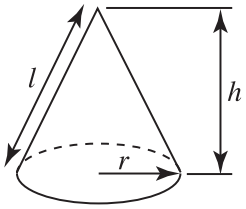


Area of trapezium $= \frac{1}{2}(a+b)h$



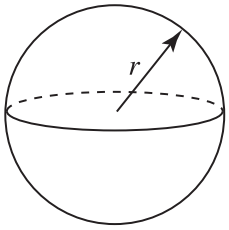
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

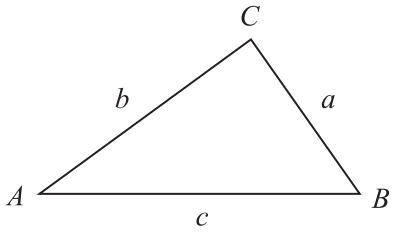


Volume of sphere $= \frac{4}{3}\pi r^3$

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



In any triangle *ABC*



Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

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

Sine Rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

Examiner Only	
Marks	Remark

1 Calculate $\frac{3.4 \times 2.8}{5.8 - 2.9}$ giving your answer correct to 1 decimal place.

Answer _____ [2]

Total Question 1

2 Nathan earns £36 000 per year. His tax free allowance is £8 000
He pays 26% of the remaining salary in tax.
How much of his salary is left after tax has been deducted?

Answer £ _____ [3]

Total Question 2

[Turn over

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3 **(a)** Complete the table below for the curve $y = 4 - x^2$.

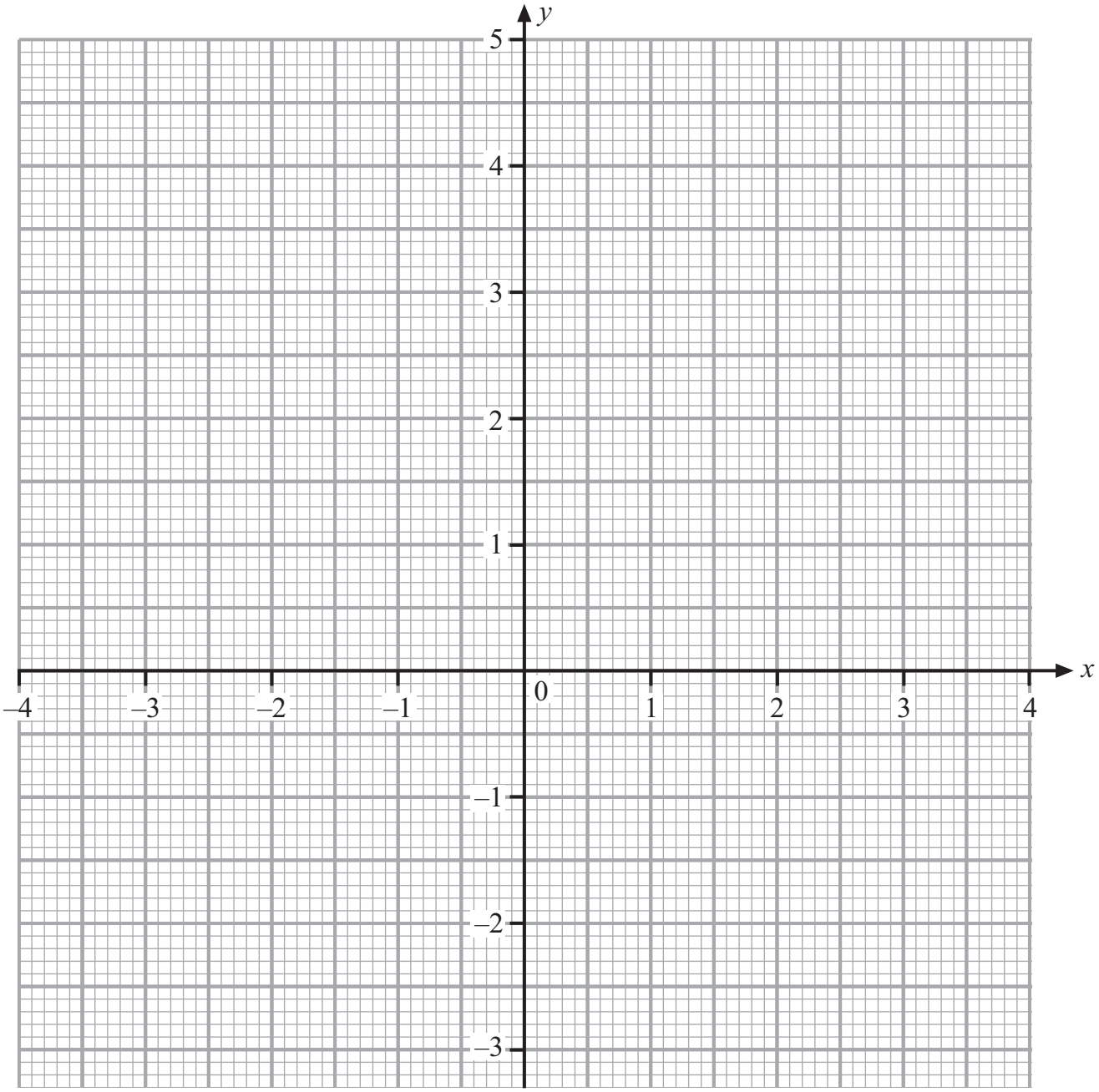
x	–2	–1	0	1	2
y	0		4	3	0

[1]

Examiner Only	
Marks	Remark

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(b) Hence draw the graph of $y = 4 - x^2$ on the graph paper.



[2]

Examiner Only	
Marks	Remark
Total Question 3	

[Turn over

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4 A factory machine fills bags of chocolate minibars. Each bag should contain 18 minibars.

Leanne tests the machine's accuracy by selecting 100 bags at random and counting the number of minibars.
The table shows her results.

Number of minibars	Less than 18	Exactly 18	More than 18
Number of Bags	8	76	16

A bag is then chosen at random from the 100

(a) (i) What is the probability that it contains at least 18 minibars?

Answer _____ [2]

(ii) What is the probability that it will **not** contain exactly 18 minibars?

Answer _____ [2]

(b) 500 bags are delivered from the same factory to a nearby supermarket. Estimate the number of bags which contain exactly 18 minibars.

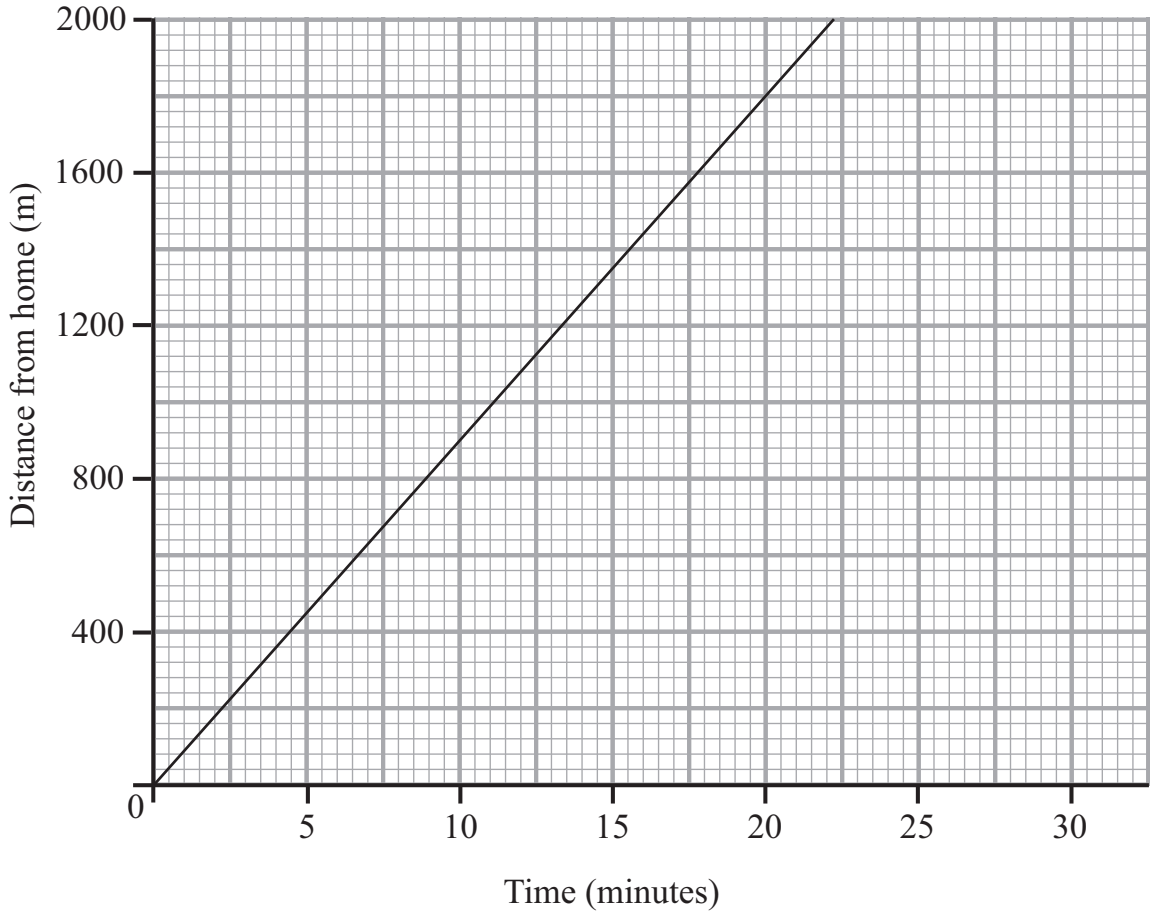
Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 4	

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5 Sarah cycles to school.

The graph illustrates the journey.



Calculate the average speed for Sarah cycling to school.

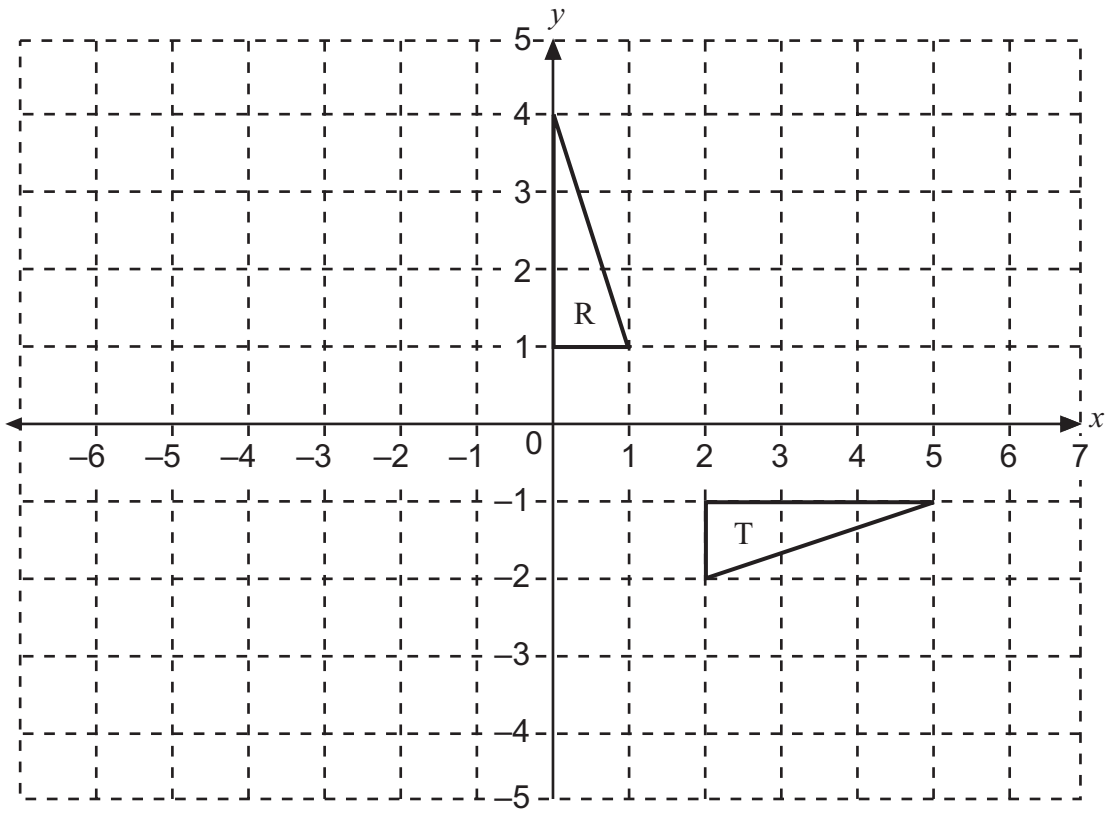
Answer _____ km/hr [2]

Examiner Only	
Marks	Remark
Total Question 5	

[Turn over

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6 **(a)** Rotate triangle T, 90° clockwise, about the origin. [3]



(b) Describe fully the **single** transformation which takes triangle T onto triangle R.

_____

_____ [3]

Examiner Only	
Marks	Remark
Total Question 6	

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7 Rewrite $k = ax - b$ to make x the subject.

Answer $x =$ _____ [2]

Examiner Only

Marks	Remark

Total Question 7

8 Audrey, Becks and Clare invest money in a business in the ratio 3:4:5
Audrey invests £5400
How much do Becks and Clare each invest?

Answer Becks £ _____

Clare £ _____ [2]

Total Question 8

9 There are 480 boys and 560 girls in Digby High School.
The probability that a boy has brown hair is 0.6
The probability that a girl has brown hair is 0.45
How many pupils in the school have brown hair?

Answer _____ [3]

Total Question 9

[Turn over

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Quality of written communication will be assessed in this question.
Show your working.

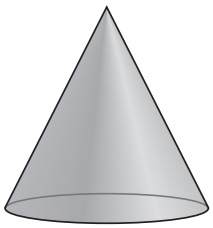
Examiner Only	
Marks	Remark

10 Show that $(2n + 1)^2 + n - 3n(n + 1) \equiv (n + 1)^2$ [2]

Total Question 10

11 A glass paperweight is cone shaped with a base radius of 5 cm and a slant height of 13 cm.
Calculate the curved surface area of the cone.

Give your answer to an appropriate degree of accuracy.



Answer _____ cm^2 [3]

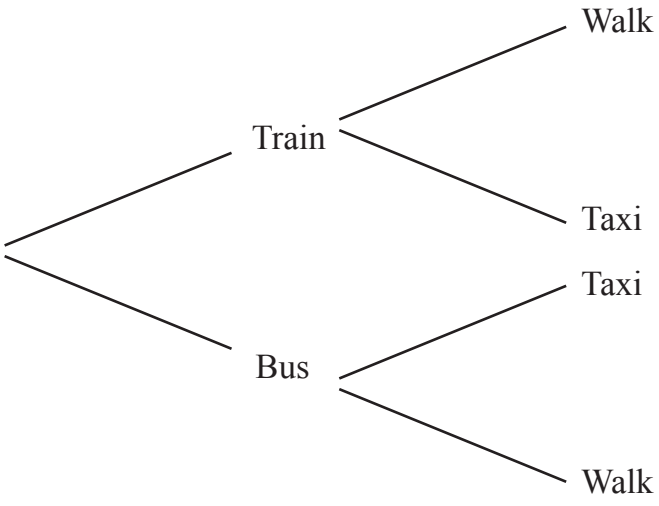
Total Question 11

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12 Nina has 4 ways of travelling home from work.
For the first part of her journey she can either go by train or by bus. The probability she will go by train is $\frac{2}{3}$. If she goes by train she will then either walk home with a probability of $\frac{3}{5}$ or take a taxi.

If she goes by bus on the first part of her journey home then she will either take a taxi with a probability of $\frac{3}{4}$ or walk.

(a) Complete the tree diagram to show the probabilities for her 4 ways home from work.



[2]

(b) What is Nina's most likely way home? Explain your answer.

_____

_____ [2]

(c) Calculate the probability that Nina walks part of the way home.

Answer _____ [2]

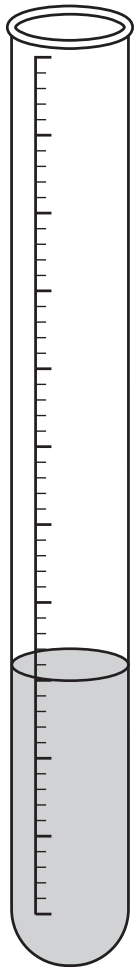
Examiner Only	
Marks	Remark
Total Question 12	

[Turn over

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Quality of written communication will be assessed in this question.
Show your working.

Examiner Only	
Marks	Remark

13 

A hollow circular cylinder with internal radius of 0.9 cm is joined to a hollow hemisphere of the same internal radius to make a test tube 12 cm long.

Will the test tube be large enough to hold 32 cm^3?
Explain your answer.

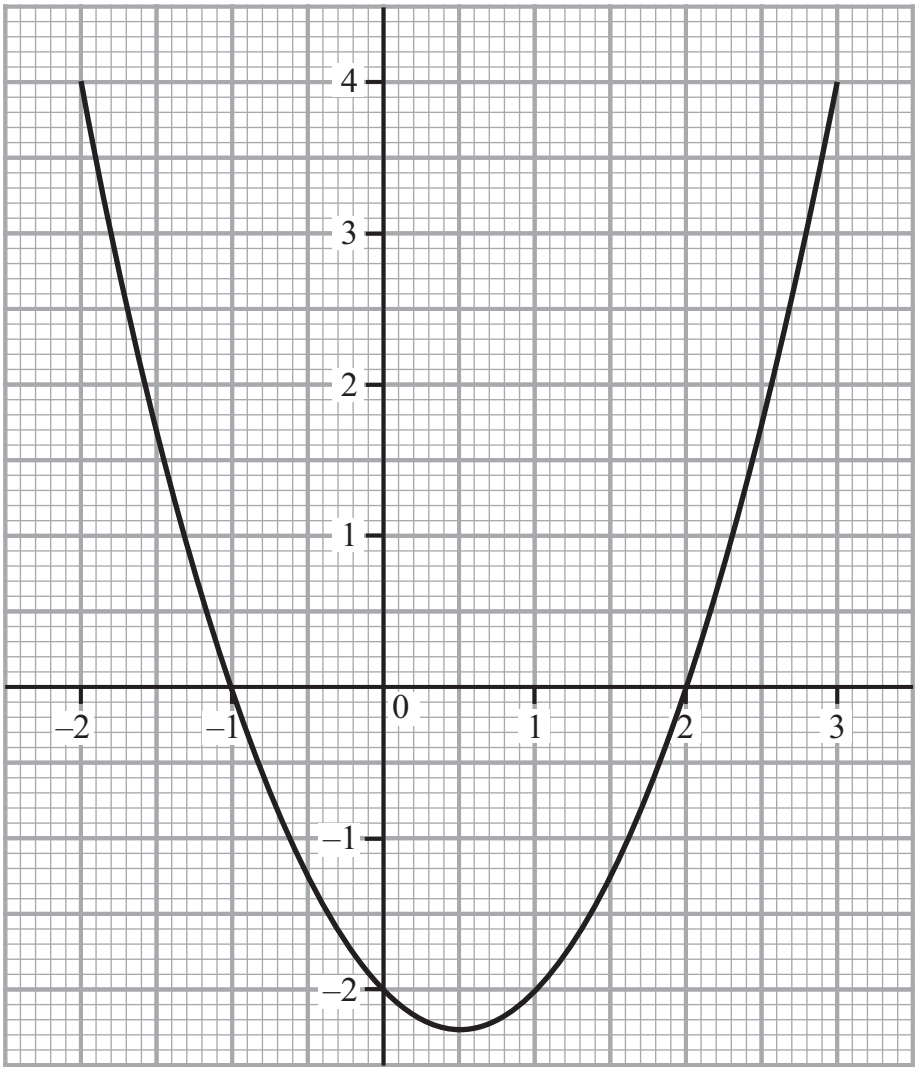
Show all your working.

Answer _____ because _____ [4]

Total Question 13

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14 The grid shows the graph of $y = x^2 - x - 2$



By drawing an appropriate straight line, solve the equation $x^2 - 2x = 1$

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 14	

[Turn over

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15 Aine, Belle and Charlie take part in the school sports day.

The chance of each of them winning in the sack race and the egg and spoon race are as follows:

	Aine	Belle	Charlie
Sack Race	$\frac{3}{10}$	$\frac{1}{10}$	$\frac{2}{5}$
Egg and Spoon	$\frac{1}{12}$	$\frac{1}{2}$	$\frac{1}{3}$

What is the probability that both events are won by some other competitors?

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 15	

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
January 2013

Mathematics

Unit T6 Paper 2
Higher Tier

[GMT62]

TUESDAY 15 JANUARY
3.00 pm–4.15 pm

MARK SCHEME

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GCSE MATHEMATICS

Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The solution to a question gains marks for correct method and marks for an accurate working based on this method.

The marks awarded for each question are shown in the right-hand column and they are prefixed by the letters **M, A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers. Accuracy marks may depends on preceding **M** (method) marks, hence **M**0 **A**1 cannot be awarded i.e. where the method is not correction marks can be given

MA indicates marks for combined method and accurate working.

C indicates marks for quality of written communication.

Where the method is not correct no marks can be given.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examiner).

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General Marking Advice

(i) If the correct answer is seen in the body of the script and the answer given in the answer line is clearly a transcription error, full marks should be awarded.

(ii) If the answer is missing, but the correct answer is seen in the body of the script, full marks should be awarded.

(iii) If the correct answer is seen in working but a completely different answer is seen in the answer space, then some marks will be awarded depending on the severity of the error.

(iv) Work crossed out but not replaced should be marked.

(v) In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.

(vi) For methods not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work.

(vii) Where a follow through mark is indicated on the mark scheme for a particular part question, the marker must ensure that you refer back to the answer of the previous part of the question.

(viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen. E.g. the answer in the mark scheme is 4.65 and the candidate then correctly rounds to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.

(ix) Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.

(x) For any question, the range of answers given in the mark scheme is inclusive.

Quality of written communication

In GCSE Mathematics, particular questions are identified where candidates must demonstrate the quality of their written communication.

In particular, candidates must:

(i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear (i.e. comprehension and meaning is clear by using the correct notation and labelling conventions);

(ii) select and use a form and style of writing appropriate to their purpose and to complex subject matter (i.e. reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning); and

(iii) organise information clearly and coherently, using specialist vocabulary where appropriate (i.e. the mathematical methods and processes used are coherently and clearly organised and appropriate mathematical vocabulary used).

This assessment may be through, for example, an explanation of the geometrical properties of a given shape or, for example, through concise mathematical argument in a multi-step problem.

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			AVAILABLE MARKS
1	3.28(2758621) or $\frac{476}{145}$	MA1	
	3.3 (No follow through)	A1	2
2	$36000 - 8000 = 28000$	MA1	
	$\frac{26}{100} \times 28000 = 7280$	MA1	
	$36000 - 7280 = 28720$ (Must be a complete, correct method)	MA1	3
3	**(a)** 3	A1	
	(b) Points plotted accurately	A1	
	Smooth symmetrical curve	A1	3
4	**(a)** **(i)** $\frac{92}{100}$ oe (A1 for 76 + 16 or 92 seen)	A2	
	(ii) $\frac{24}{100}$ oe (A1 for 8 + 16 or 24 seen)	A2	
	(b) $\frac{76}{100} \times 500 = 380$ $\left(\text{A1 for } \frac{380}{500}\right)$	M1, A1	6
5	450 m in 5 mins (or equivalent comparison to indicate speed) or for using speed = $\frac{\text{Distance}}{\text{Time}}$ e.g. $\frac{1800}{20}$ or $\frac{1800}{1200}$	MA1	
	= 5.4 km/hr (accept answers in the range 5.0 to 5.8)	A1	2
6	**(a)** Correct rotation (A1 for each vertex correct) (A2 if rotation of 90° anticlockwise about the origin) (A1 for correct orientation or if triangle R is used by mistake)	A3	
	(b) A rotation, 90° anticlockwise or 270° clockwise or +90° about (0, –1)	A1 A1 A1	6
7	$k + b = ax$ or $-ax = -k - b$	MA1	
	$x = \frac{k+b}{a}$ or $x = \frac{-k-b}{-a}$ sc Award MA1 for $x = \frac{k-b}{a}$	MA1	2

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			AVAILABLE MARKS
8	7200	A1	
	9000 (Award A1 for 5400 ÷ 3 = 1800 but not for just 1800)	A1	2
9	$480 \times 0.6 + 560 \times 0.45$ or $480 \times 0.6 = 288$	MA1	
	$= 288 + 252$ or $560 \times 0.45 = 252$	MA1	
	$= 540$	A1	3
10	$4n^2 + 4n + 1 + n - 3n^2 - 3n$	C1	
	$= n^2 + 2n + 1$		
	$= (n+1)^2$	C1	2
11	$5 \times 13 \times \pi$ or 65π	M1	
	204.2035	A1	
	200	A1	3
12	**(a)** $\frac{2}{3}$, $\frac{3}{5}$ and $\frac{2}{5}$ marked correctly on the tree	MA1	
	$\frac{1}{3}$, $\frac{3}{4}$ and $\frac{1}{4}$ marked correctly on the tree	MA1	
	(b) To go by train first and then walk	A1	
	because it has the largest probability (with evidence of the four probabilities calculated)	A1	
	sc Award MA1 if all four probabilities $\left(\frac{2}{5}, \frac{4}{15}, \frac{1}{4}, \frac{1}{12}\right)$ are calculated but no conclusion stated		
	(c) $\frac{2}{3} \times \frac{3}{5} \times \frac{1}{3} \times \frac{1}{4}$	MA1	
	$= \frac{29}{60}$ oe	A1	6
13	Height of cylinder = 11.1 cm	A1	
	So vol of cylinder = $\pi \times 0.9^2 \times 11.1 = 28.246$	C1	
	Vol of hemisphere = $\frac{2}{3} \times \pi \times 0.9^3 = 1.527$	C1	
	Total = 29.773		
	So not large enough to hold 32 cm^3		
	Answer: No because Total < 32 cm^3	C1	4
	(NOTE. Follow through if height of cylinder = 12 cm and/or volume of sphere used)		
14	$y = x - 1$ identified and drawn	MA1	
	Solutions at $x = 2.4$ and -0.4	A1, A1	3
	(NOTE. Graphical solution only accepted)		

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			AVAILABLE MARKS
15	P(Someone else wins sack race) $= 1 - \left(\frac{3+1+4}{100}\right) = \frac{2}{10}$	MA1	
	P(Someone else wins egg and spoon race) $= 1 - \left(\frac{(1+6+4)}{12}\right) = \frac{1}{12}$	MA1	
	P(Someone else wins both) $= \frac{2}{10} \times \frac{1}{12} = \frac{1}{60}$	MA1	3
		Total	**50**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2012

Mathematics

Unit T6 Paper 2
(With calculator)
Higher Tier



[GMT62]

GMT62

MONDAY 11 JUNE 3.00 pm–4.15 pm

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in the question paper.
Complete in blue or black ink only. **Do not write in pencil or with a gel pen.**
Answer **all thirteen** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **questions 2 and 5**.
You should have a calculator, ruler, compasses and protractor.
The Formula Sheet is on page 2.

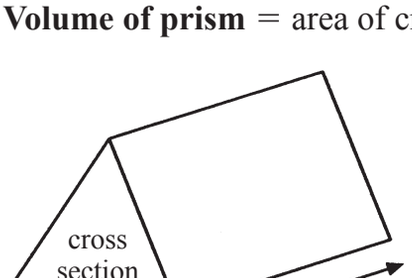
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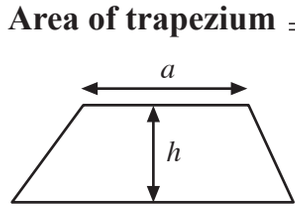
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Formula Sheet

Volume of prism = area of cross section × length

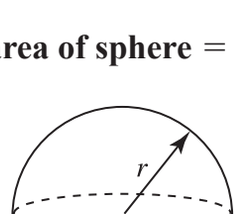


Area of trapezium $= \frac{1}{2}(a+b)h$



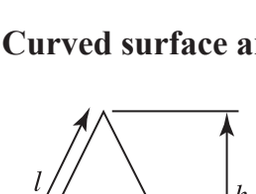
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$

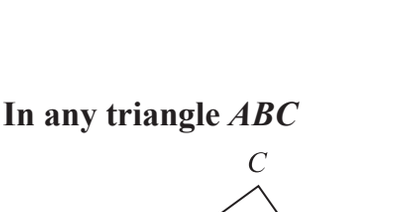


Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

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

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 $= \frac{1}{2}ab\sin C$

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Answer **all** questions.

Examiner Only	
Marks	Remark

1 75 grams of flour and 135 millilitres of milk are needed to make 12 biscuits.

(a) How much flour is needed to make 30 biscuits?

Answer _____ grams [1]

(b) How many biscuits can be made with 175 grams of flour, provided there is enough milk?

Answer _____ biscuits [1]

(c) A number of biscuits are made using 300 grams of flour.

How much milk is needed?

Answer _____ millilitres [1]

Total Question 1

[Turn over

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Quality of written communication will be assessed in this question.

Examiner Only	
Marks	Remark

2 **(a)** Make y the subject in the following equation and simplify the answer.

$$5x - 7 = 5 - y$$

Answer $y =$ _____ [2]

(b) Which of the statements below describes the number $3n + 1$, where n represents any whole number? Explain your answer.

"always even" **"always odd"** **"could be even or odd"**

Answer _____

because _____

[2]

Total Question 2

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3 In a game a square, triangle, hexagon or star will appear on the screen. Some probabilities of the shapes appearing are recorded in the table.

Shape				
Probability	0.14	0.32		0.08

(a) What is the probability of the hexagon appearing?

Answer _____ [2]

(b) If I play the game 60 times, how many times should I expect the triangle to appear?

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 3	

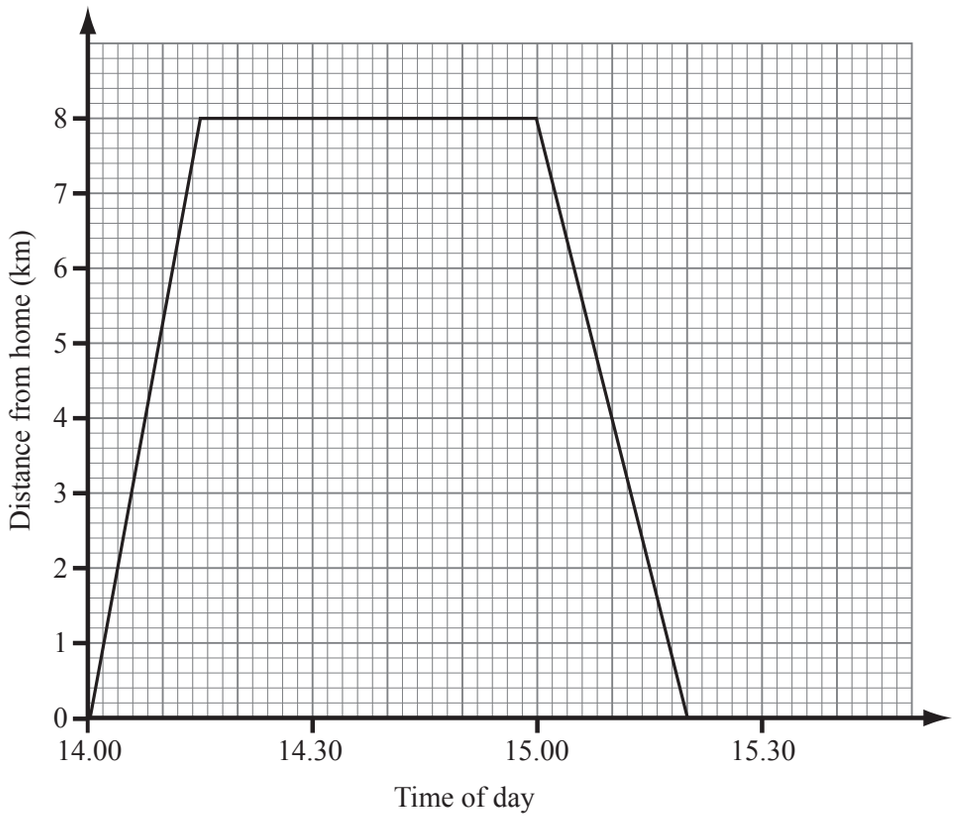
[Turn over

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Examiner Only	
Marks	Remark

4 Bob drove to the DIY store from his home. He bought some decorating materials and then returned home.

The distance–time graph below shows his journey.



(a) By looking at the graph, how can you tell that the average speed going to the store was greater than the average speed coming from the store?

Answer _____

_____ [1]

(b) Work out Bob's average speed on his journey to the store.

Give your answer in kilometres per hour.

Answer _____ km/h [2]

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(c) Bob's wife left home at 14.30 and drove to the same store to meet Bob.

She drove at an average speed of 24 km/h.

Draw a graph of her journey on the distance–time graph opposite. [1]

(d) How far from the store was Bob's wife at 14.42?

Answer _____ km [1]

Examiner Only	
Marks	Remark
Total Question 4	

[Turn over

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Quality of written communication will be assessed in this question.

Examiner Only	
Marks	Remark

5 Jennifer knows the probability of getting a 2 when a fair dice is thrown is $\frac{1}{6}$

She also knows the probability of getting a prime number when a fair dice is thrown is $\frac{1}{2}$

She concludes then, that the probability of getting a 2 or a prime number on one throw of a fair dice is:

$$\frac{1}{6}+\frac{1}{2}=\frac{1}{6}+\frac{3}{6}=\frac{4}{6}=\frac{2}{3}$$

Is Jennifer correct in her conclusion? Explain your answer.

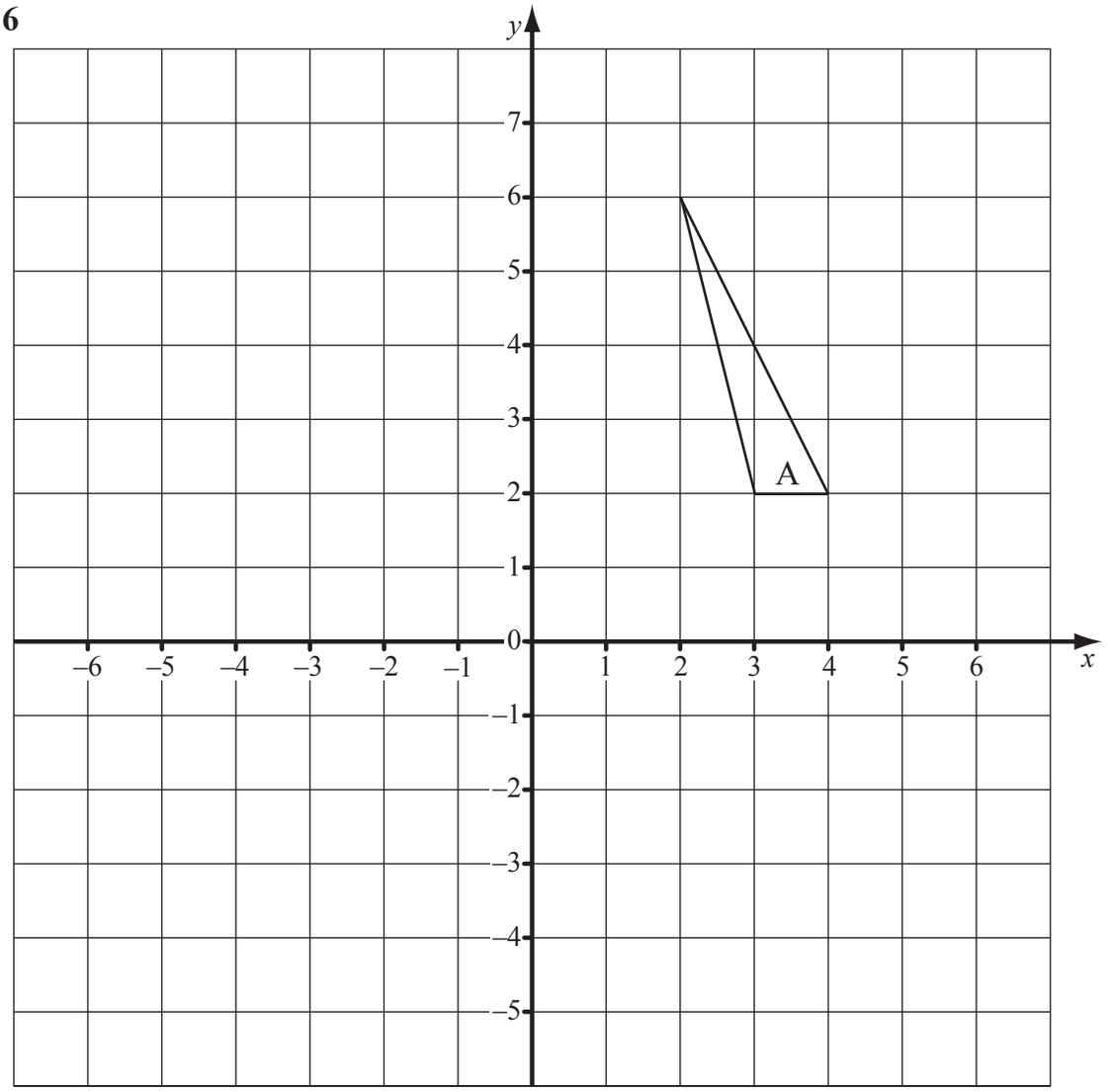
Answer _____ because _____

_____ [2]

Total Question 5

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6



(a) Draw the image of triangle A after a translation $\begin{pmatrix} -6 \\ -2 \end{pmatrix}$. Label it B. [2]

(b) Draw the image of triangle A after a rotation of 90° clockwise about the point (−1, 0). Label it C. [2]

Examiner Only	
Marks	Remark
Total Question 6	

[Turn over

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7 **(a)** Simplify:

(i) $a^4 \times a^4$

Answer _____ [1]

(ii) $\dfrac{b \times b^5}{b^2}$

Answer _____ [1]

(iii) $12c^5 \div 3c^7$

Answer _____ [1]

(b) Solve $8x < 6 + 3x$

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 7	

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8 Find the **total** surface area of a solid cylindrical rolling pin with radius 3 cm and length 40 cm.

Give your answer to an appropriate degree of accuracy.



Answer _____ cm^2 [4]

Examiner Only	
Marks	Remark
Total Question 8	

[Turn over

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9 Each letter, a, b, c and d, represents a length.

Complete the table below indicating whether the expressions could represent length, area, volume or none of these.

$\frac{4a^2}{\sqrt{b^2+c^2}}$	$\frac{\pi abc}{ab^2}$	$2\pi b(c+d)$

[3]

Examiner Only	
Marks	Remark
Total Question 9	

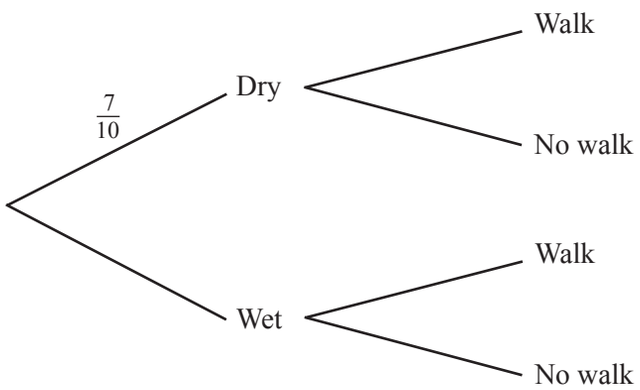
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10 In March the probability of a dry day is $\frac{7}{10}$

If it is dry, the probability that I go for a walk is $\frac{3}{5}$

If it is wet, the probability that I go for a walk is $\frac{1}{5}$

(a) Complete the tree diagram to show all the probabilities



[2]

(b) Calculate the probability that I go for a walk on a day in March.

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 10	

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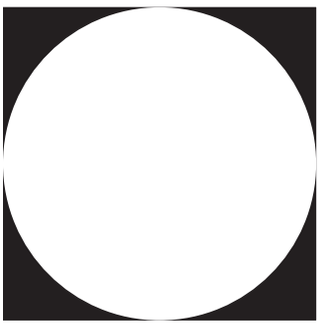
11 Simplify $\left(\frac{2x^2}{y}\right)^5$

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 11	

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12 In a game, a dart is dropped at random onto a square board which has a circle inscribed in it as shown.



Find the probability that the dart lands on the shaded area. Leave your answer in terms of π.

Answer _____ [4]

Examiner Only	
Marks	Remark
Total Question 12	

[Turn over

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13 The diagram below shows a sector of a circle of radius 10 cm. Part of this sector is shaded leaving unshaded a sector of a circle of radius x. The angle A is 80°.

The shaded area BCDE is twice the unshaded area ABE.

Calculate the radius x of the small sector.

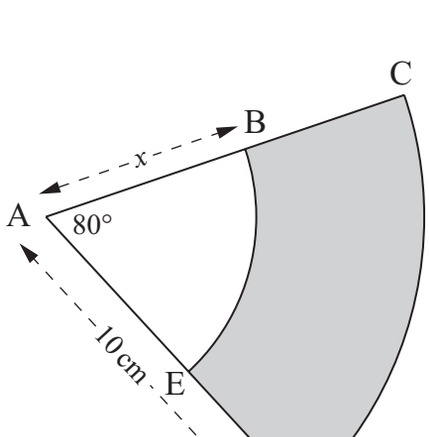


Diagram not drawn accurately

Show your working.

Answer x = _____ cm [5]

Examiner Only	
Marks	Remark
Total Question 13	

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
QWC	
Total Marks	

Examiner Number

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New Specification

Rewarding Learning

General Certificate of Secondary Education
2012

Mathematics

Unit T6 Paper 2
Higher Tier

[GMT62]

MONDAY 11 JUNE, AFTERNOON

MARK SCHEME

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Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The marks awarded for each question are shown in the right-hand column and they are prefixed by the letters **M, A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers.

MA indicates marks for combined method and accurate working.

The solution to a question gains marks for correct method and marks for an accurate working based on this method. Where the method is not correct no marks can be given.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

Positive marking

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examiner).

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General Marking Advice

(i) If the correct answer is seen in the body of the script and the answer given in the answer line is clearly a transcription error, full marks should be awarded.

(ii) If the answer is missing, but the correct answer is seen in the body of the script, full marks should be awarded.

(iii) If the correct answer is seen in working but a completely different answer is seen in the answer space, then some marks will be awarded depending on the severity of the error.

(iv) Work crossed out but not replaced should be marked.

(v) In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.

(vi) For methods not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work.

(vii) Where a follow through mark is indicated on the mark scheme for a particular part question, the marker must ensure that you refer back to the answer of the previous part of the question.

(viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen. E.g. the answer in the mark scheme is 4.65 and the candidate then correctly rounds to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.

(ix) Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.

(x) For any question, the range of answers given in the mark scheme is inclusive.

Quality of written communication

In GCSE Mathematics, particular questions are identified where candidates must demonstrate the quality of their written communication.

In particular, candidates must:

(i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear (i.e. comprehension and meaning is clear by using the correct notation and labelling conventions);

(ii) select and use a form and style of writing appropriate to their purpose and to complex subject matter (i.e. reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning); and

(iii) organise information clearly and coherently, using specialist vocabulary where appropriate (i.e. the mathematical methods and processes used are coherently and clearly organised and appropriate mathematical vocabulary used).

This assessment may be through, for example, an explanation of the geometrical properties of a given shape or, for example, through concise mathematical argument in a multi-step problem.

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				AVAILABLE MARKS
1	**(a)**	187.5	A1	
	(b)	28	A1	
	(c)	540	A1	3
2	**(a)**	$5x + y = 5 + 7$	MA1	
		$y = 12 - 5x$	A1	
		Quality of written communication		
	(b)	'could be even or odd'	A1	
		suitable examples to illustrate	A1	4
3	**(a)**	$1 - (0.14 + 0.32 + 0.08)$	M1	
		$= 0.46$	A1	
	(b)	60×0.32	M1	
		$=$ 19 or 20 times	A1	4
4	**(a)**	Suitable reason (e.g. line is steeper, time is less)	A1	
	(b)	8 km in 15 minutes	MA1	
		32	A1	
	(c)	straight line through (1430, 0) and (1450, 8)	A1	
	(d)	from graph $\approx$ 3.2 km	A1	5
		Quality of written communication		
5		No; because 2 is a prime and is counted twice	A1, A1	2
6	**(a)**	left 6, down 2,	A1, A1	
	(b)	rotation, centre,	A1, A1	4

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			AVAILABLE MARKS
7	**(a)** **(i)** a^8	A1	
	(ii) b^4	A1	
	(iii) $4c^{-2}$ **or** $\frac{4}{c^2}$	A1	
	(b) $5x < 6$	MA1	
	$x < \frac{6}{5}$ **or** 1.2	A1	5
8	$6\pi \times 40 = 753(.98\ldots)$	MA1	
	$2\pi \times 9 = 56(.54\ldots)$	MA1	
	Total $= 810.53\ldots$	A1	
	810 **or** 800	A1 (acc)	4
9	length, none, area	A1, A1, A1	3
10	**(a)** $\left(\frac{7}{10}\right)$ $\frac{3}{5}$ $\frac{2}{5}$	A1	
	$\frac{3}{10}$ $\frac{1}{5}$ $\frac{4}{5}$	A1	
	(b) $\frac{7}{10} \times \frac{3}{5} + \frac{3}{10} \times \frac{1}{5}$	MA1	
	$= \frac{21}{50} + \frac{3}{50}$	MA1	
	$= \frac{24}{50}$ $\left(\frac{12}{25}\right)$	A1	5
11	$\frac{32x^{10}}{y^5}$	MA2	2
12	Area of square $= 4r^2$	MA1	
	Shaded area $= 4r^2 - \pi r^2$	MA1	
	P(shaded area) $= \frac{4r^2 - \pi r^2}{4r^2}$ P (unshaded area) $= \frac{\pi}{4}$	MA1	
	$= 1 - \frac{\pi}{4}$ P (shaded area) $= 1 - \frac{\pi}{4}$	A1	4

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			AVAILABLE MARKS
13	$\frac{100\pi \times 80}{360} - \frac{\pi x^2 \times 80}{360} = \frac{2\pi x^2 \times 80}{360}$ **or** equivalent	M1, A2	
	$100\pi = 3\pi x^2$ **or** $100 = 3x^2$		
	$x^2 = \frac{100}{3}$	MA1	
	$x = 5.77(3502692)$		
	Accept correct surd	MA1	
	Alternative method		
	$\frac{100\pi \times 80}{360}$ **or** $\frac{\pi x^2 \times 80}{360}$ **or** 69.8	MA1	
	$\frac{80\pi x^2}{360} = 23.27$	MA2	
	$x^2 = \frac{100}{3}$	MA1	
	$x = 5.77$ (3502692)	MA1	5
		Total	**50**

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