CCEA GCSE MATHEMATICS

MATHS



EXAM QUESTION PACK

UNIT T6 PAPER 1 (NON-CALCULATOR) HIGHER TIER GMT61 PAPERS

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
January 2016

Mathematics

Unit T6 Paper 1
(Non-calculator)
Higher Tier



[GMT61]

GMT61

WEDNESDAY 13 JANUARY, 9.15 am–10.30 am

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 eighteen** questions.
All working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

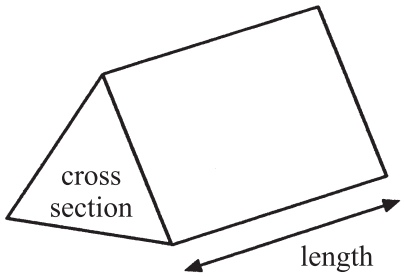
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in Questions **3** and **18**.
You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

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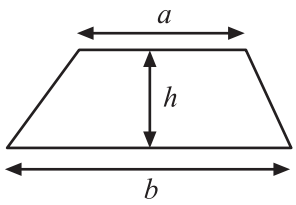
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Formula Sheet

Volume of prism = area of cross section × length

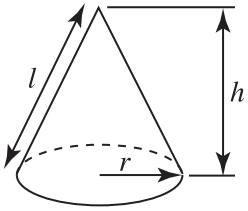


Area of trapezium = $\frac{1}{2}(a+b)h$



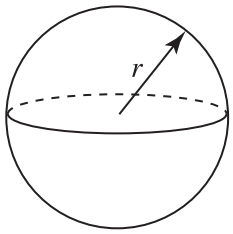
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

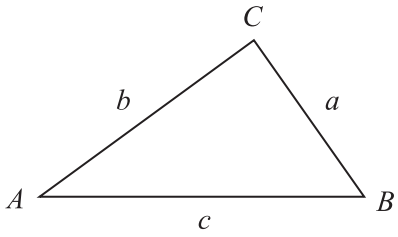


Volume of sphere = $\frac{4}{3}\pi r^3$

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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1 $d = \dfrac{e - f}{g}$

Calculate the value of d when $e = -8$, $f = 12$ and $g = 4$

Answer $d =$ _____ [2]

2 Given that $79 \times 684 = 54036$, find

(a) $\dfrac{54036}{7.9}$

Answer _____ [1]

(b) $\dfrac{540.36}{68.4}$

Answer _____ [1]

[Turn over

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Quality of written communication will be assessed in this question.

3 **(a)** Mark says, "Every number has a reciprocal".

Is Mark correct?

Give a reason for your answer.

Answer _____ because _____

_____ [1]

(b) Mandy says, "With your calculator you can find the square root of every number".

Is Mandy correct?

Give a reason for your answer.

Answer _____ because _____

_____ [1]

4 **Estimate** $\frac{604 \times 2.91}{7.9 - 3.76}$

Show all your working.

Answer _____ [2]

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5 In a game at a fairground, each of 300 people pays 50p to play.

Forty of the 300 people each win a prize worth £1.80 There were no other prize-winners.

What profit does the game make?

Answer £ _____ [2]

6 The probability for the number of goals scored in a league match during the season is given in the table below.

Number of goals	0	1	2	3	4	5 or more
Probability	0.15	0.23	0.13	0.28	0.12	0.09

What is the probability of at least 3 goals being scored in a league match?

Answer _____ [2]

[Turn over

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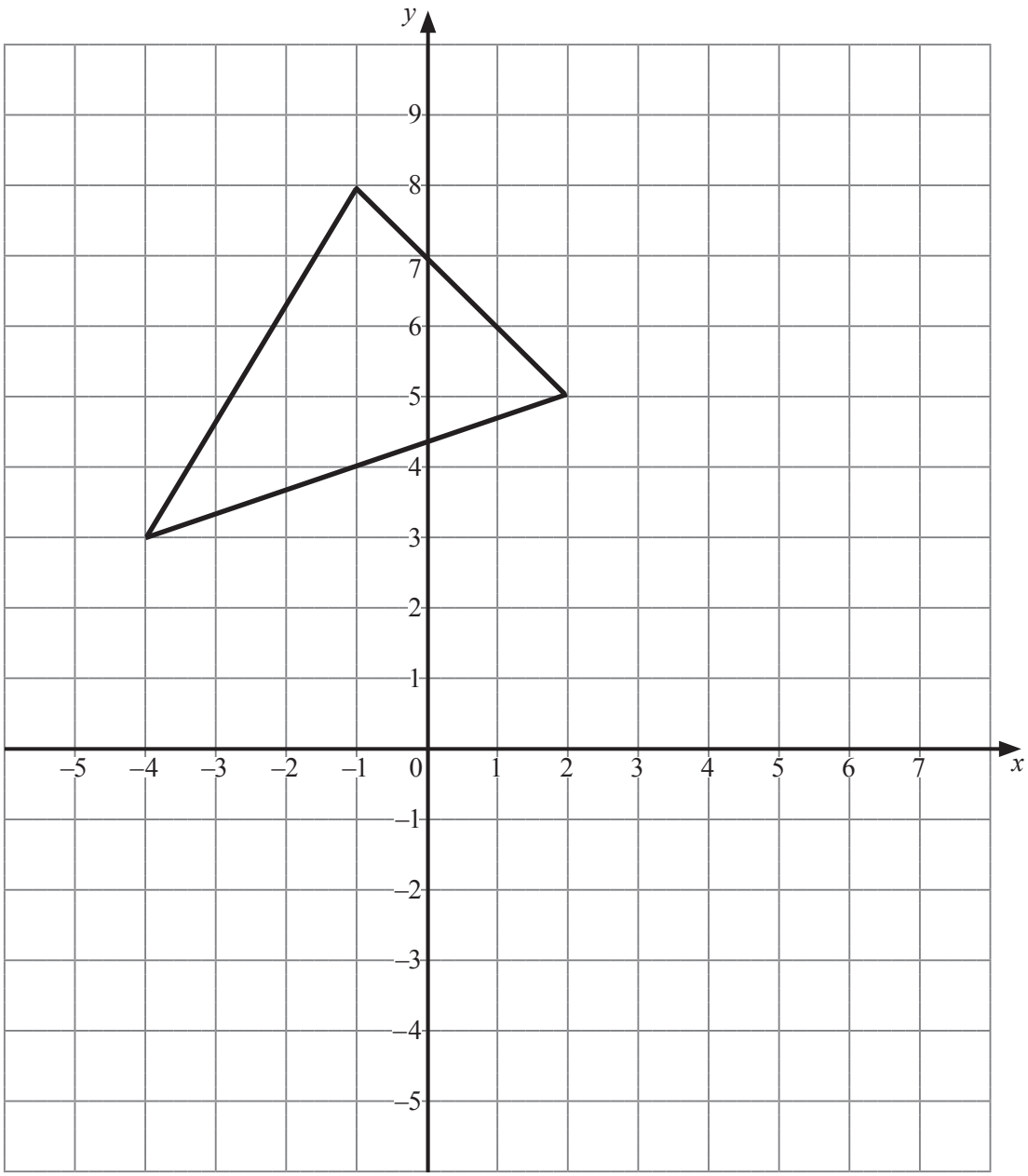
7 In one section of the Circuit of Ireland rally the winning car travelled a distance of 297 miles in $4\frac{1}{2}$ hours.

Calculate the winning car's average speed for this section of the rally.

Answer _____ mph [3]

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8



(a) On the diagram above, reflect the given triangle in the line $y = 2$

Label your answer A. [2]

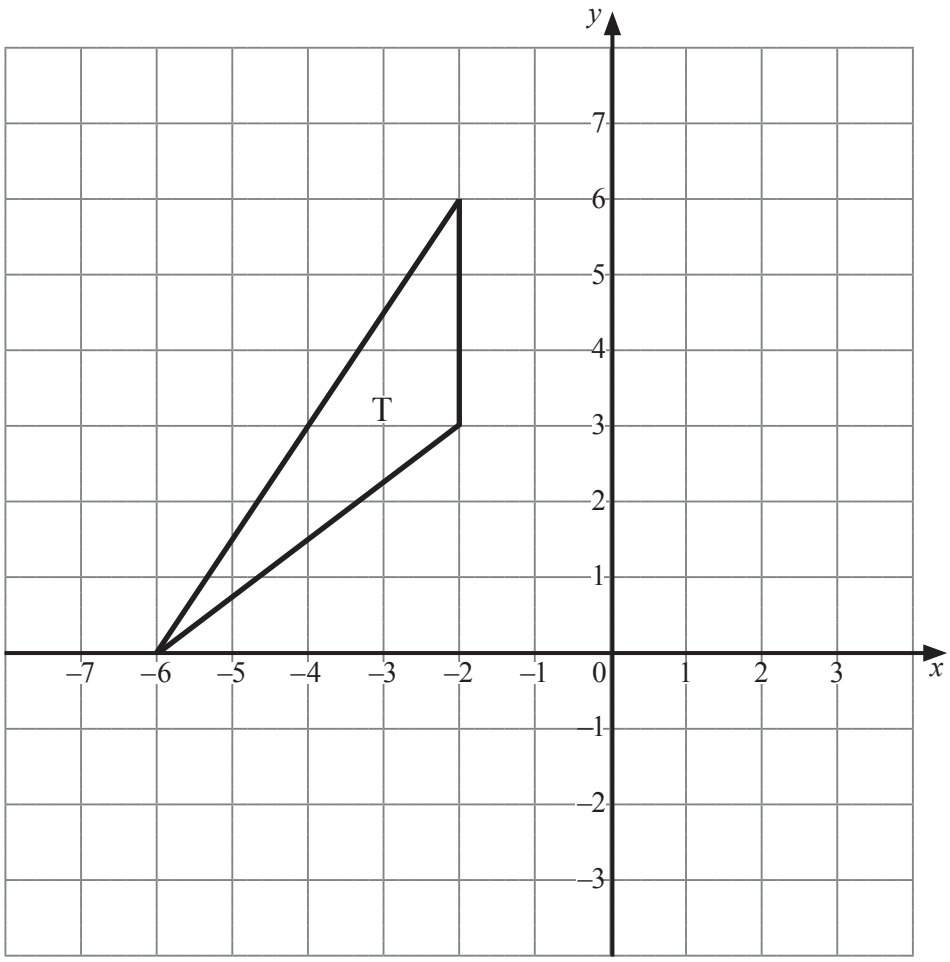
(b) On the same diagram, translate the given triangle by $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$

Label your answer B. [2]

[Turn over

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9 Rotate the triangle T through 90° clockwise about (–3, –1).

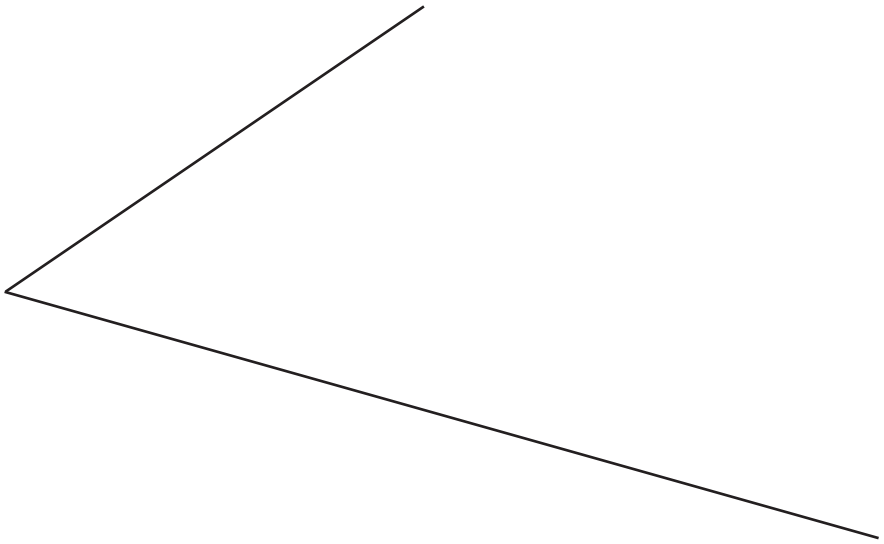


[2]

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10 Using a ruler and compasses only, construct the bisector of the angle below.

You must show all construction lines.



[2]

[Turn over

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11 **(a)** "If a and b are square numbers, then the difference between a and b is always an odd number".

Is this statement true or false?

Explain your answer.

Answer _____ because _____

_____ [1]

(b) Simplify

$$\frac{p^3}{p^7}$$

Answer _____ [1]

(c) Solve the inequality $-7 < 5n \leqslant 15$ for **integer** values of n.

Answer $n =$ _____ [3]

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12 A cylinder has a base radius of 8 cm and a height of 36 cm.

The curved surface area of this cylinder is the same as the surface area of a sphere.

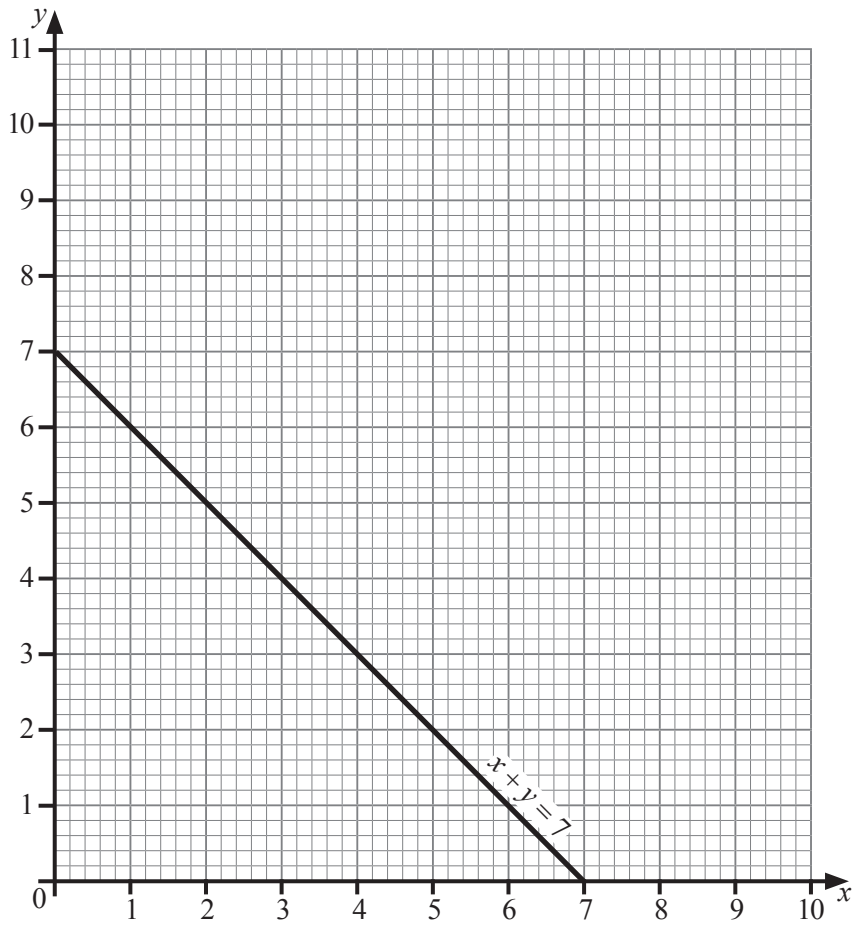
What is the radius of the sphere?

Answer _____ cm [4]

[Turn over

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13 The line $x + y = 7$ is shown below.



(a) On the diagram illustrate the region represented by the inequalities

$x + y \leqslant 7, \qquad y \geqslant 1, \qquad y \leqslant 5x + 1$

Mark the region with the letter R. [2]

(b) In the region R, what is the greatest value of $2x + y$?

Answer _____ [2]

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14 **(a)** Work out $6.543 \times 10^3 + 2.1 \times 10^{-1}$

Give your answer in standard form.

Answer _____ [2]

(b) Given that $(3.6 \times 10^3) + (1.7 \times 10^x) = (y \times 10^5)$ where all three numbers in brackets are in standard form, find the values of x and y.

Answer $x =$_____, $y =$_____ [2]

15 Write the recurring decimal $0.2\dot{1}\dot{7}$ as a fraction.

Answer _____ [2]

[Turn over

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16 Paula buys a packet of ten daffodil bulbs.

The bulbs all look the same.

Seven of the bulbs will produce yellow flowers and three will produce white flowers.

A bulb is taken at random and planted.

A second bulb is taken at random and planted.

Calculate the probability that the two bulbs planted will produce **at least** one white flower.

Answer _____ [3]

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17 Simplify $4\sqrt{3} + 2\sqrt{75} + \sqrt{27}$

Answer _____ [2]

Quality of written communication will be assessed in this question.

18 By expanding each bracket and simplifying, explain why

$$(3 + \sqrt{5})^2 - (2 + \sqrt{2})^2 > 0$$

[3]

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	
17	
18	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
January 2016

Mathematics

Unit T6 Paper 1
(Non-calculator)
Higher Tier

[GMT61]

WEDNESDAY 13 JANUARY

9.15 am–10.30 am

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 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.

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	$\frac{-20}{4}$	MA1	
	–5	A1	2
2	**(a)** 6840	A1	
	(b) 7.9	A1	2
3	**(a)** No because zero has no reciprocal	C1	
	(b) No because you cannot find the square root of a negative number	C1	2
4	$\frac{600 \times 3}{8-4}$ **or** $\frac{604 \times 3}{8-4}$	MA1	
	$\frac{1800}{4} = 450$ **or** $\frac{1812}{4} = 453$	A1	2
5	$300 \times 0.50 - 40 \times 1.80$ or $150 - 72$	M1	
	78	A1	2
6	$0.28 + 0.12 + 0.09$	M1	
	0.49	A1	2
7	$297 \div 9$ **or** $297 \div 4.5$ **or** $297 \div 270$	M1	
	33 miles in $\frac{1}{2}$ hour **or** $594 \div 9$ **or** 1.1×60	A1	
	66	A1	3
8	**(a)** Correct reflection drawn (A1 for 2 vertices correct)	A2	
	(b) 4 right 2 down (A1 for 2 vertices correct)	A1 A1	4
9	Correct rotation (A1 for 2 vertices correct)	A2	2
10	Construction arcs	M1	
	Accurate angle bisector drawn	A1	2

			AVAILABLE MARKS
11	**(a)** False, suitable example, e.g. 1 and 9	A1	
	(b) $\frac{1}{p^4}$ or p^{-4}	A1	
	(c) $\frac{-7}{5} < n \leqslant 3$	MA1	
	$-1, 0, 1, 2, 3$	A2	5
12	$2\pi \times 8 \times 36$	M1	
	576π	A1	
	$4\pi r^2 = 576\pi$	M1	
	$r^2 = 144, \therefore r = 12$	A1	4
13	**(a)** $y = 5x + 1$ and $y = 1$ drawn plus an attempt at shading a region	MA1	
	Region R correct	A1	
	(b) 13 (Allow A1 for (6, 1) identified)	A2	4
14	**(a)** $6543 + 0.21$ or 6543.21	MA1	
	6.54321×10^3	A1	
	(b) $x = 5$	A1	
	$y = 1.736$	A1	4
15	$100x = 21.71717171...$ or $1000x = 217.17171717...$ $x = 0.21717171...$ $10x = 2.17171717...$		
	$99x = 21.5$ or $990x = 215$ or $9999x = 2171.5$	MA1	
	$x = \frac{215}{990}$ or $\frac{43}{198}$ or $\frac{21715}{99990}$	A1	2
16	$\left(\frac{7}{10} \times \frac{3}{9}\right) + \left(\frac{3}{10} \times \frac{7}{9}\right) + \left(\frac{3}{10} \times \frac{2}{9}\right)$	M1	
	$\frac{21}{90} + \frac{21}{90} + \frac{6}{90}$	A1	
	$\frac{48}{90}\left(= \frac{8}{15}\right)$	A1	3
	Alternative method:		
	$1 - \left(\frac{7}{10} \times \frac{6}{9}\right)$	M1	
	$1 - \frac{42}{90}$	A1	
	$\frac{48}{90}\left(= \frac{8}{15}\right)$	A1	

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			AVAILABLE MARKS
17	$4\sqrt{3} + 10\sqrt{3} + 3\sqrt{3}$	MA1	
	$17\sqrt{3}$	A1	2
18	$9 + 6\sqrt{5} + 5 - (4 + 4\sqrt{2} + 2)$	C1	
	$8 + 6\sqrt{5} - 4\sqrt{2}$	C1	
	$\sqrt{2} < 2$, so $4\sqrt{2} < 8$, so $8 + 6\sqrt{5} - 4\sqrt{2} > 0$	C1	3
		Total	**50**

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2015

Mathematics

Unit T6 Paper 1
(Non-calculator)
Higher Tier



[GMT61]

GMT61

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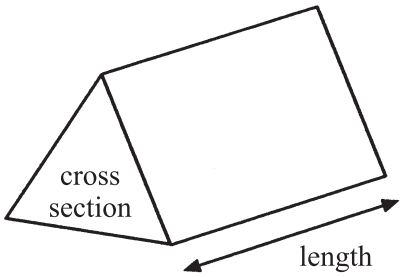
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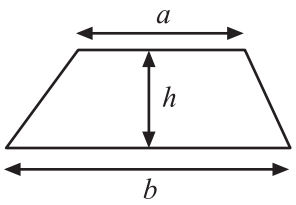
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Formula Sheet

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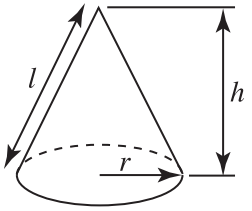


Area of trapezium = $\frac{1}{2}(a+b)h$



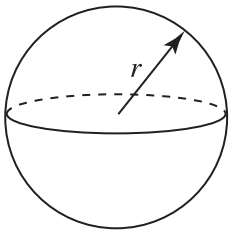
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

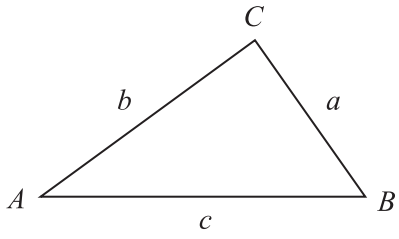


Volume of sphere = $\frac{4}{3}\pi r^3$

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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1 Given that $32.5 \times 24 = 780$, write down the value of

(a) 32.5×2.4

Answer _____ [1]

(b) $78 \div 24$

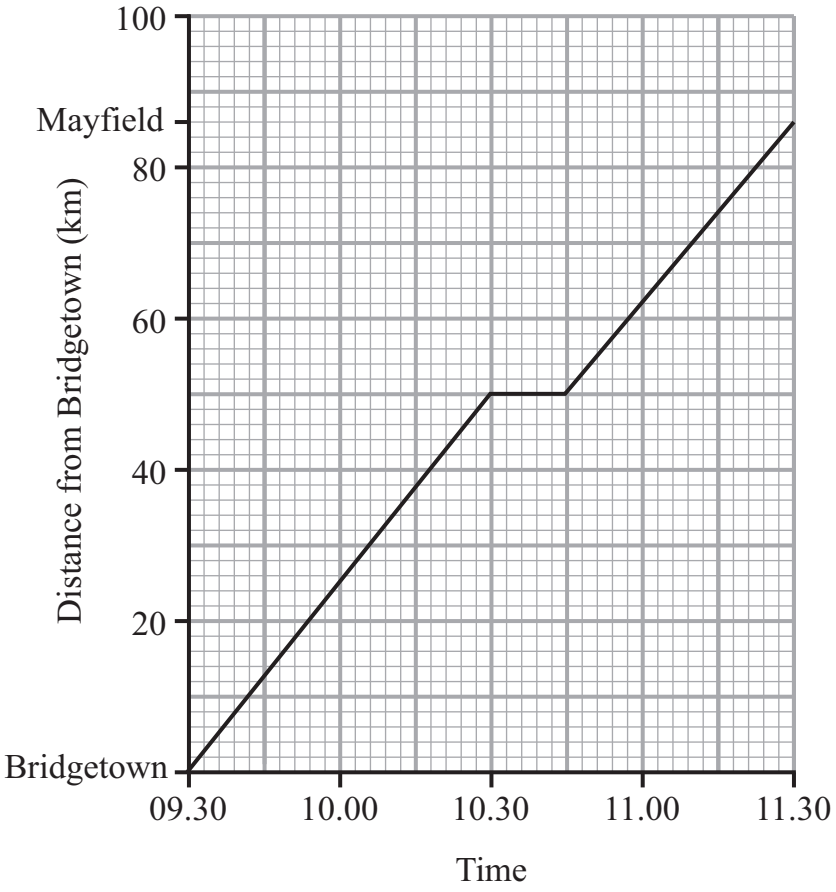
Answer _____ [1]

(c) 32.5×12

Answer _____ [1]

[Turn over

2 The graph shows a journey by coach from Bridgetown to Mayfield.



(a) Calculate the average speed for the complete journey from Bridgetown to Mayfield.

Answer _____ km/hr [2]

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(b) Further on from Mayfield is Kingsrow which is 100 km from Bridgetown.
A coach leaves Kingsrow at 0945 and travels towards Bridgetown at an average speed of 80 km/hr until it reaches Bridgetown.

(i) Draw a graph to represent its complete journey on the grid opposite. [3]

(ii) Estimate the time at which the two coaches pass each other.

Answer _____ [1]

3 $s = ut + \frac{1}{2}at^2$

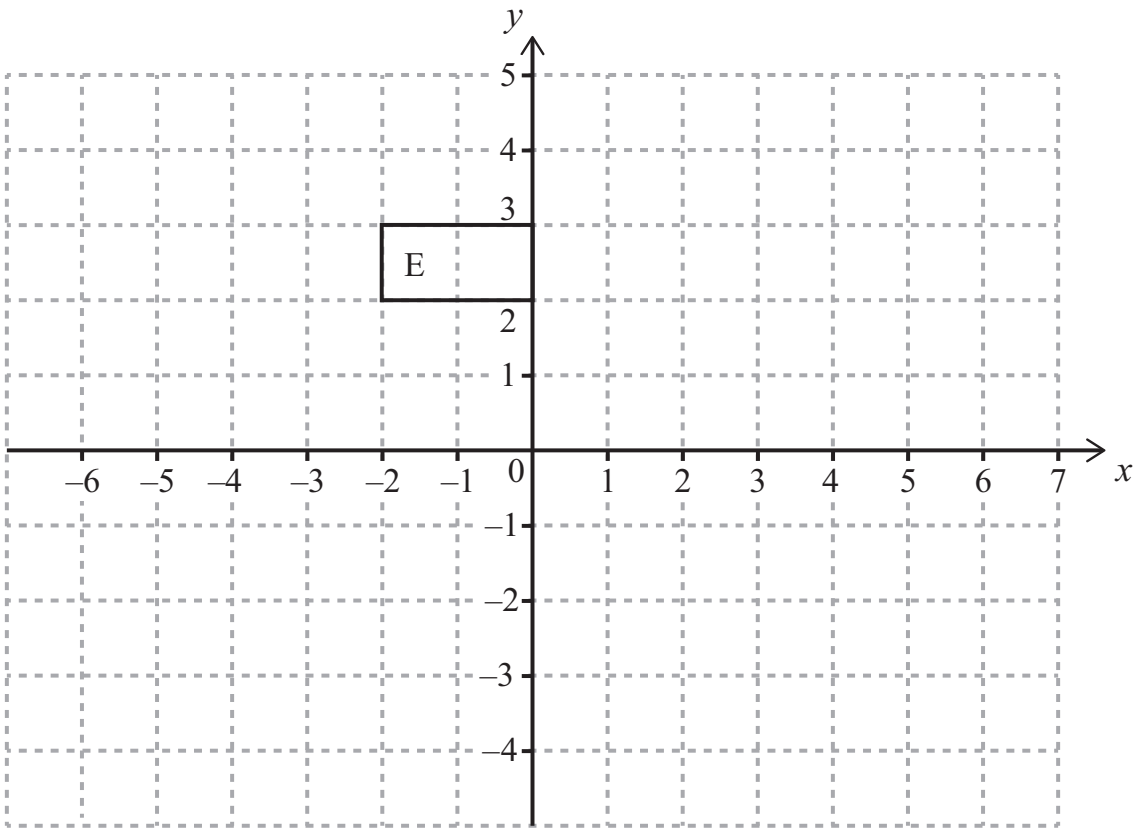
Find the value of s when $u = 80$, $a = -5$ and $t = 4$

Answer $s =$ _____ [3]

[Turn over

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4 **(a)** Enlarge shape E by scale factor 2 with centre of enlargement (–3, 4).
Label your new shape T.



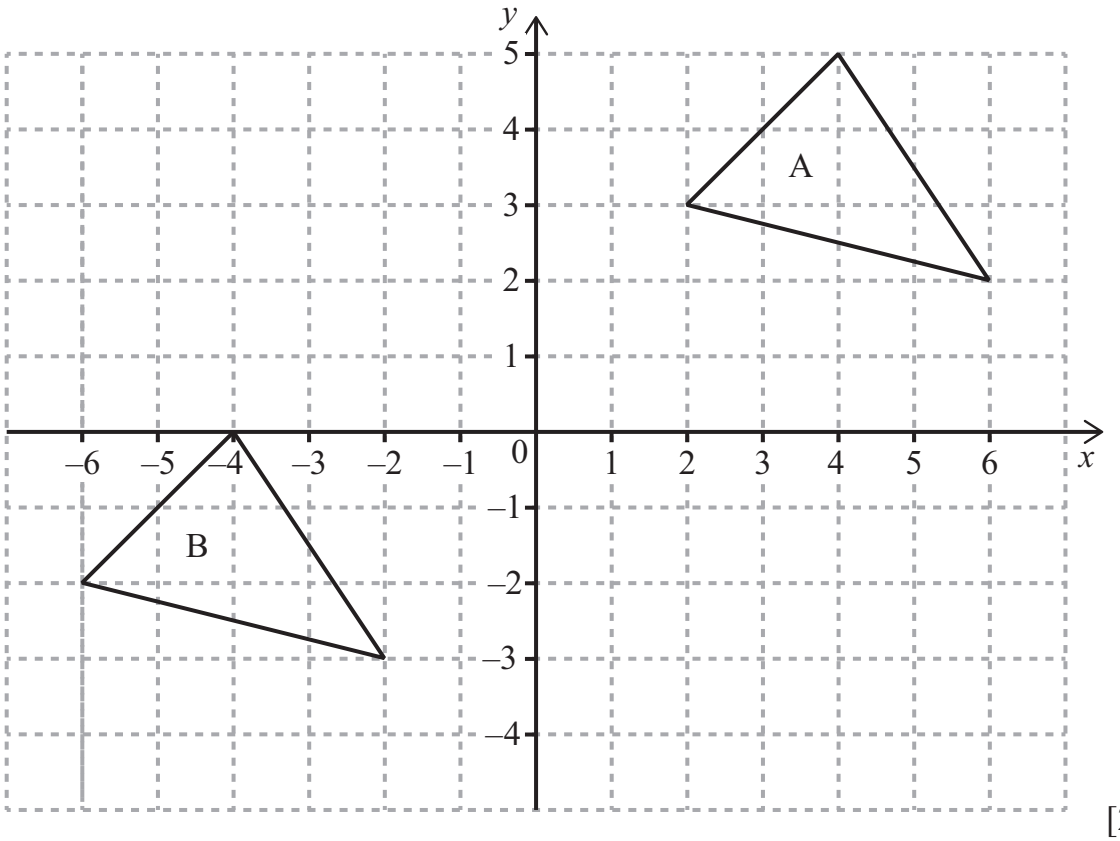
[3]

(b) Express the ratio of the area of T to the area of E in the form n : 1

Answer _____ [1]

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5 **(a)** Reflect triangle A in the line $y = 1$



[2]

(b) Describe fully the single transformation that moves triangle A to triangle B.

_____

_____ [2]

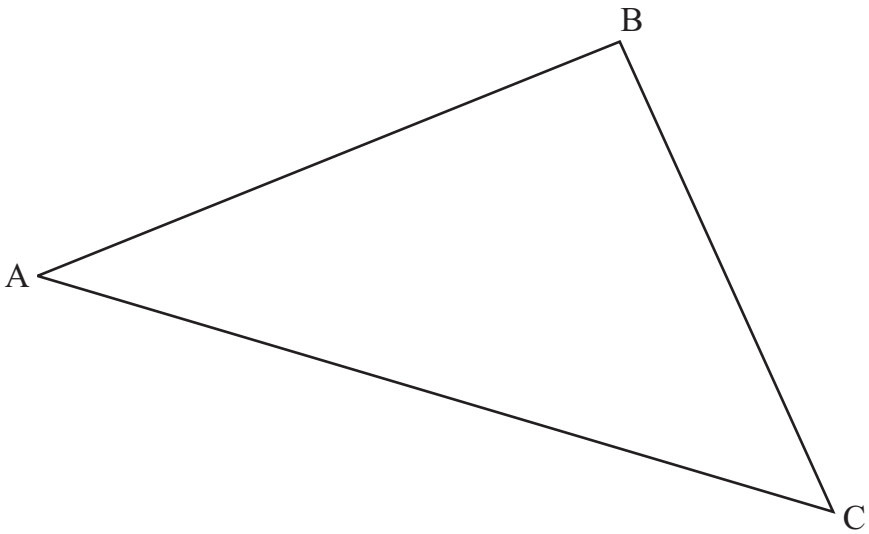
[Turn over

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6 **(a)** Use only a ruler and a pair of compasses to construct an equilateral triangle of side length 7 cm.
Show all your construction arcs.

[2]

(b) Use only a ruler and a pair of compasses to bisect the angle ABC in the triangle below.
Show all your construction arcs.



[2]

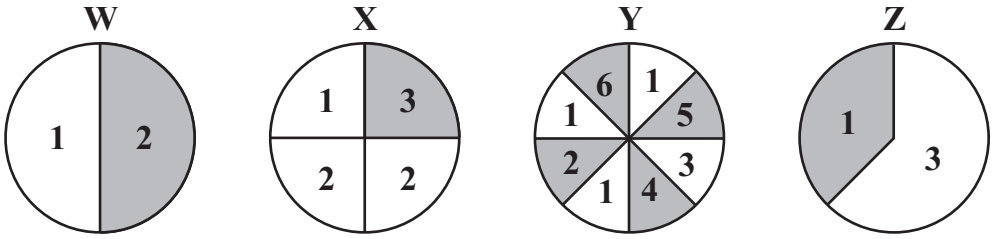
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Quality of written communication will be assessed in this question.

7 Aidan, Ben and Caitlin all spin a spinner 20 times each.
They keep track of their scores of 1, 2 and 3 using a tally chart.

	1	2	3
Aidan	𝍸 |	| | |	𝍸
Ben	𝍸 | |	| |	| | |
Caitlin	𝍸	| | | |	|

They all used the **same** one of the following four spinners.



Which spinner do you think they used?

Explain clearly why you have made this choice.

Answer Spinner _____ because _____

_____

_____

_____ [3]

[Turn over

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8 The heights of patients attending a medical centre are recorded in a frequency table.

Height (cm)	$110 \leqslant h < 130$	$130 \leqslant h < 150$	$150 \leqslant h < 170$	$170 \leqslant h < 190$
Frequency	47	168	236	29

What is the probability that the next patient who enters the centre has a height between 130 cm and 150 cm?

Answer _____ [2]

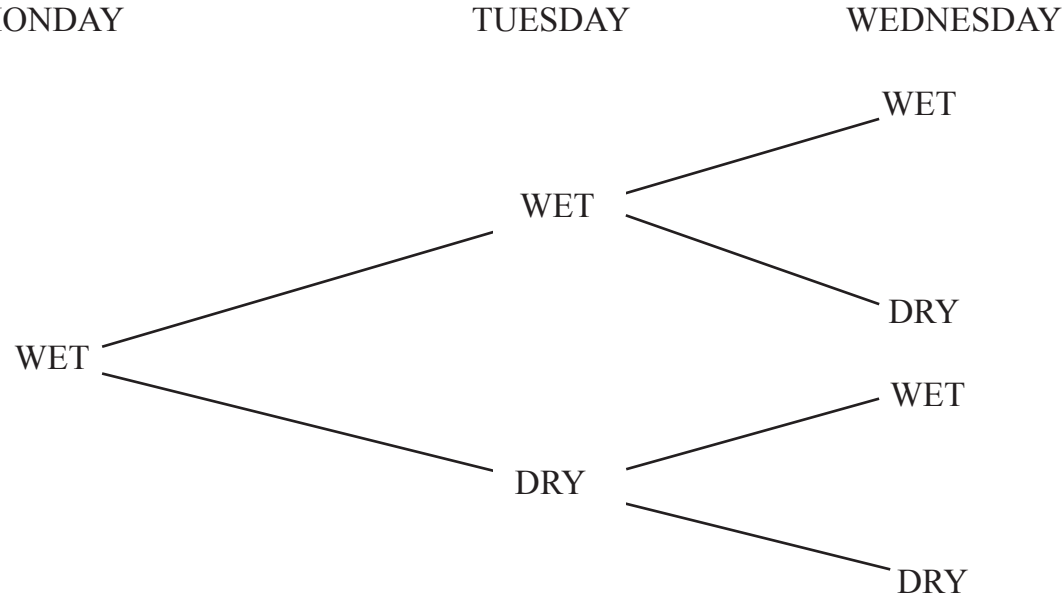
9 The mass of Particle P has been recorded as 0.000 000176 g.
The mass of Particle Q has been recorded as 14.9×10^{-7} g.
Which particle has the bigger mass and by how much?
Give your answer in standard form.

Answer Particle _____ by _____ g [3]

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10 Assume that every day in Northern Ireland can be described as being either wet or dry.
If it is wet today the probability of it being dry tomorrow is 0.4
If it is dry today the probability of it being wet tomorrow is 0.2
On Monday it is wet.

(a) Complete the tree diagram to show the probability of it being wet or dry on Tuesday and Wednesday.



[3]

(b) Calculate the probability that both Tuesday and Wednesday are dry.

Answer _____ [2]

[Turn over

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11 Rewrite $3a - b = c(2 - a)$ to make a the subject.

Answer $a =$ _____ [3]

12 Write $0.3\dot{1}\dot{8}$ as a fraction.

Answer _____ [2]

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Quality of written communication will be assessed in this question.

13 Helen says that the probability of getting exactly one head when two coins are tossed is the same as the probability of getting exactly two heads when four coins are tossed.
Is Helen right?
Show clearly all your working.

[4]

[Turn over

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14 $\dfrac{x\sqrt{2}}{5-\sqrt{5}} = 5 + \sqrt{5}$

Work out the value of x.
Give your answer in the form $a\sqrt{b}$ where a and b are integers.

Answer _____ [4]

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Question Number	**Marks**
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Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2015

Mathematics

Unit T6 Paper 1
(Non-calculator)
Higher Tier

[GMT61]

TUESDAY 26 MAY, 1.30 p.m.–2.45 p.m.

MARK SCHEME

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Introduction

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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.

(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

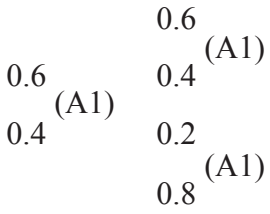
(iii) organise information clearly and coherently, using specialist vocabulary where appropriate (i.e. the mathematical methods and processes used are coherently and clearly organised and appropriate mathematical vocabulary used).

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)**	78	A1	
	(b)	3.25	A1	
	(c)	390	A1	3
2	**(a)**	$\frac{86}{2}$ or $\frac{85}{2}$	MA1	
		$= 43$ or 42.5	A1	
	(b)	**(i)** 1st correct point at (0945, 100)	MA1	
		Correct gradient used to represent speed (1045, 20)	MA1	
		Line drawn to reach Bridgetown at 1100	MA1	
		(ii) Any reading from 1024–1027 (follow through)	A1	6
3	$s = 80 \times 4 + \frac{1}{2} \times (-5) \times 16$		MA1	
	$s = 320 - 40$		A1	
	$s = 280$		A1	3
4	**(a)**	Correct enlargement and orientation	A1	
		All 4 vertices correct (A1 for at least 2 vertices correct)	A2	
	(b)	4 : 1	A1	4
5	**(a)**	Correct reflection (award [1] mark for 2 vertices correct)	MA2	
	(b)	A translation $\begin{pmatrix} -8 \\ -5 \end{pmatrix}$	A1 A1	4
6	**(a)**	One side of length 7 cm plus two intersecting construction arcs	M1A1	
	(b)	Completion of accurately drawn triangle	M1A1	
		Arcs on AB and BC, equidistant from B plus two intersecting arcs Accurately drawn angle bisector		4
7	Answer of 'Y'		A1	
	Because the tally for each person does not add up to 20 (C1: cannot be W as it does not have a 3 and cannot be Z as it does not have a 2) Note. An answer of W or Z scores [0]		C2	3
8	$47 + 168 + 236 + 29 = 480$		A1	
	Probability $= \frac{168}{480}$ (0.35)		A1	2

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			AVAILABLE MARKS
9	$14.9 \times 10^{-7} = 0.000\ 00149$	A1	
	$0.000\ 00149 - 0.000\ 000176 = 0.000\ 001314$	MA1	
	Q by 1.314×10^{-6}	A1	3
	or		
	$0.000\ 000176 = 1.76 \times 10^{-7}$	A1	
	$14.9 \times 10^{-7} - 1.76 \times 10^{-7} = 13.14 \times 10^{-7}$	MA1	
	Q by 1.314×10^{-6}	A1	
10	**(a)** Tree completed correctly	A3 ([1] for each block)	



	(b) 0.4×0.8	M1	
	0.32	A1	5
11	$3a - b = 2c - ac$		
	$3a + ac = 2c + b$	MA1	
	$a(3 + c) = 2c + b$	MA1	
	$a = \dfrac{2c + b}{3 + c}$	A1	3

12			Alternative		
	$100r = 31.8181818$ $-r = 0.3181818$ $99r = 31.5$		$1000r = 318.181818$ $-10r = 3.181818$ $990r = 315$	MA1	
	$r = \dfrac{315}{990}\left(\dfrac{7}{22}\right)$		$r = \dfrac{315}{990}\left(\dfrac{7}{22}\right)$	A1	2
13	One head from two HT or TH $= \dfrac{1}{2}\times\dfrac{1}{2} + \dfrac{1}{2}\times\dfrac{1}{2} = \dfrac{1}{2}$ or $\dfrac{2}{4}$			C1	
	Two heads from four				
	HHTT or HTHT or HTTH or THHT or THTH or TTHH			C1	
	$= 6\times\left(\dfrac{1}{2}\right)^4 = \dfrac{6}{16}$			C1	
	Conclusion: Helen is not correct as $\dfrac{1}{2} \neq \dfrac{6}{16}$			C1	4
14	Multiply both sides by $5 - \sqrt{5}$			M1	
	$x\sqrt{2} = 20$			A1	
	$x = \dfrac{20}{\sqrt{2}}\times\dfrac{\sqrt{2}}{\sqrt{2}}$			MA1	
	$x = \dfrac{20\sqrt{2}}{2} = 10\sqrt{2}$			A1	4
				Total	**50**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
January 2015

Mathematics

Unit T6 Paper 1

(Non-calculator)



Higher Tier

[GMT61]

GMT61

WEDNESDAY 14 JANUARY 9.15am–10.30am

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 **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

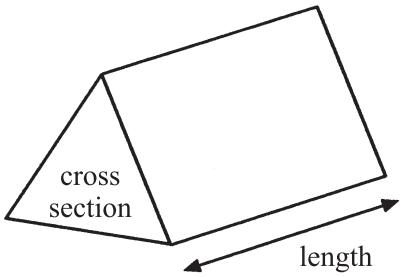
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **Questions 5 and 8**.
You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

9316

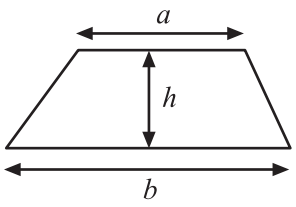
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Formula Sheet

Volume of prism = area of cross section × length

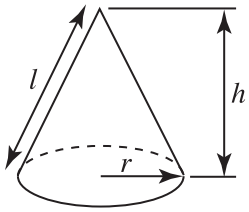


Area of trapezium $= \frac{1}{2}(a+b)h$



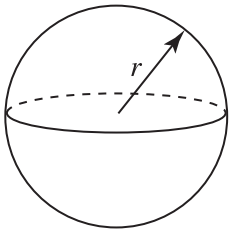
Volume of cone $= \frac{1}{3}\pi r^2 h$

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

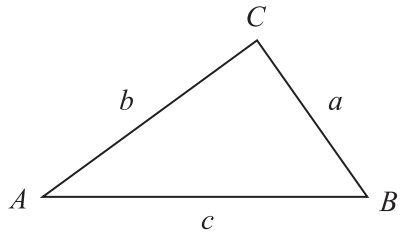


Volume of sphere $= \frac{4}{3}\pi r^3$

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 lorry travels 240 km in 150 minutes.

Calculate the average speed of the lorry in km/hr.

Answer _____ km/hr [3]

2 A ball is dropped from a height h metres.

Its speed, V, in metres per second can be calculated using the formula
$V = \sqrt{2gh}$

Find the value for V when $g = 10$ and $h = 20$

Answer V = _____ m/s [3]

3 $T = \dfrac{4(2M - 3N)}{3}$

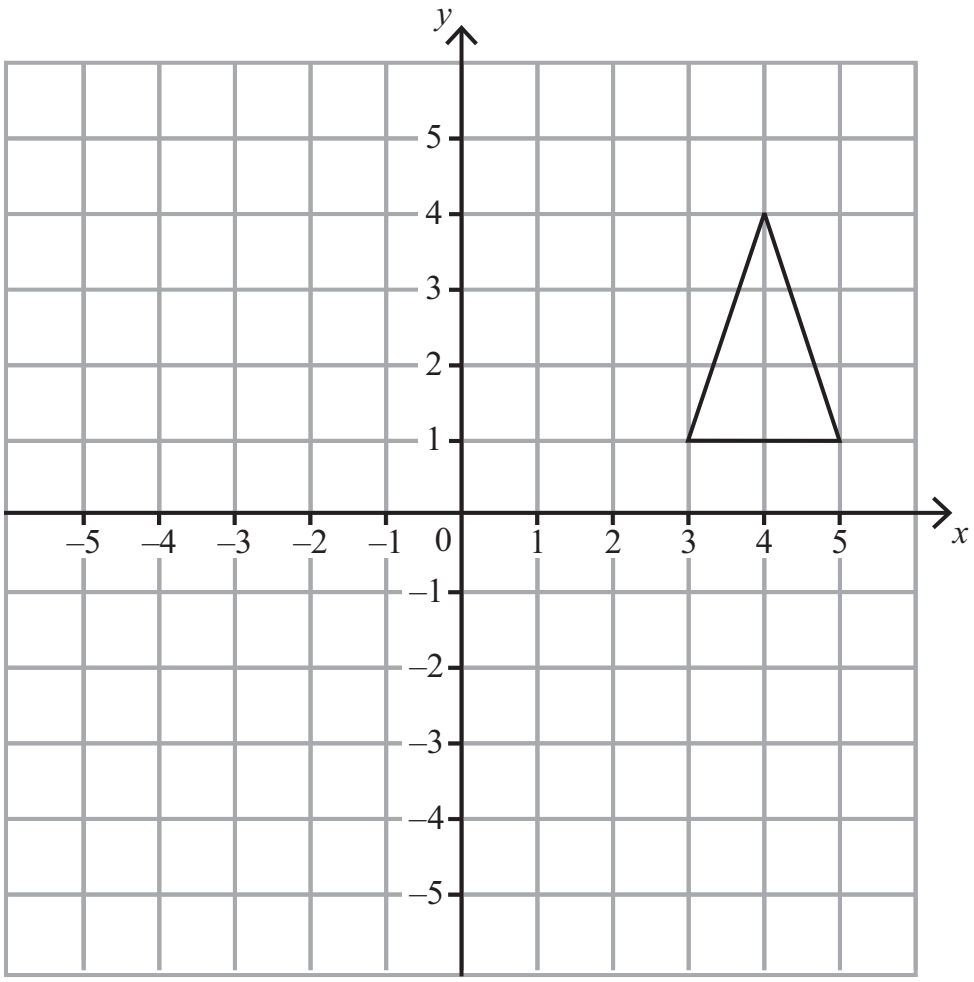
Find the value of T when M = 6 and N = –3

Answer T = _____ [3]

[Turn over

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4 Rotate the triangle 90° anticlockwise about the origin.



[3]

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Quality of written communication will be assessed in this question.

5 In a game at a school fair, a card is bought for 20p.
It will have either 3, 2, 1 or 0 stars.

The probability and prizes for some of these outcomes are shown.

number of stars	3	2	1	0
probability	0.05		0.2	0.65
prize	£1	50p	10p	nothing

300 cards were bought.
How much profit did this game make?

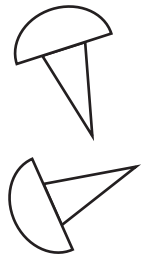
Answer £_____ [6]

[Turn over

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6 Marcus wants to investigate the likelihood of a drawing pin landing point up or point down when dropped.
He drops a drawing pin a number of times. His results are shown in the table.

up
up
down
up
up
down
up
down



(a) What is the relative frequency of the drawing pin landing point up?

Answer _____ [1]

(b) Marcus concludes that a drawing pin is more likely to land point up.
Comment on his conclusion.

_____

_____ [1]

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7 **(a)** List the values of the integer n which satisfies the inequality

$$-7 < 3n \leqslant 6$$

Answer _____ [3]

(b) Find the **smallest** integer value for x which satisfies the inequality

$$3(x - 4) < 5x - 20$$

Answer _____ [3]

[Turn over

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Quality of written communication will be assessed in this question.

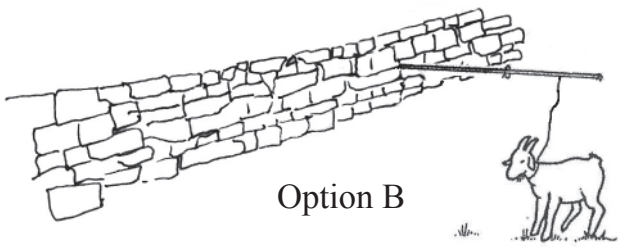
8 Farmer Jack wishes to tie his goat using a rope which is 4 m long.
He has three different options as illustrated below.
Option A: the rope is attached to a pole.
Option B: the rope is attached to (and can slide along and rotate around) a horizontal pole which extends 6 m at right angles from a very long wall.
Option C: the rope is attached to the corner of a shed which is 8 m long and 6 m wide.

Option A





Option C



Option B

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Which option allows for the greatest grazing area for the goat?
What is the greatest area?
You must explain all your work clearly.
You may leave your calculations in terms of π where necessary.

Answer Option _____ grazing area _____ m^2 [4]

[Turn over

9 **(a)** Write 0.000108 in standard form.

Answer _____ [1]

(b) Calculate $5.6 \times 10^5 \div 1.4 \times 10^2$

Answer _____ [1]

(c) Change the recurring decimal 0.727272 ..... into a fraction in its simplest form.

Answer _____ [2]

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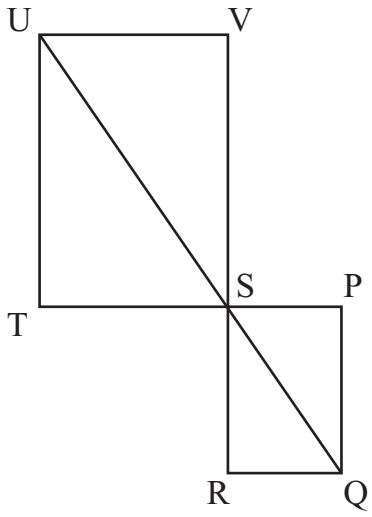
10 At a ski resort, the probability of it snowing on a day in winter is 0.4
If it snows on that day, the probability of it snowing the following day is 0.7
If it doesn't snow the first day, the probability of it snowing the following day is 0.15

Calculate the probability that it will snow on at least one of the two consecutive days.

Answer _____ [3]

[Turn over

11 PQRS is a rectangle. VSTU is a rectangle. USQ is a straight line.
The rectangles touch at S.



(a) Prove that triangle UVS is similar to triangle SPQ.

[3]

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(b) The area of triangle UVS is $108\,cm^2$
The area of triangle SPQ is $12\,cm^2$
The length of UV is 7.5 cm.
Calculate the length of PQ.

Answer _____ cm [3]

[Turn over

12 (a) **Show clearly** that the solutions to the equation $2x - \frac{12}{x} = \frac{x}{2} + 2$ are the same as the solutions to the equation $3x^2 - 4x - 24 = 0$

[3]

(b) A straight line graph of the form $y = ax + b$ is drawn onto the graph of $y = 2x - \frac{12}{x}$ to solve the equation $4x^2 - 2x - 12 = 0$

Find the values of a and b.

Answer a = _____ b = _____ [4]



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THIS IS THE END OF THE QUESTION PAPER

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Question Number	**Marks**
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Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
January 2015

Mathematics

Unit T6 Paper 1
(Non-calculator)
Higher Tier

[GMT61]

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9.15 am–10.30 am

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(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	150 mins = $2\frac{1}{2}$ hours or 2.5 hours or $\frac{5}{2}$ hours	A1	
	$240 \div 2\frac{1}{2}$ or $240 \times \frac{2}{5}$ or $240 \div 2.5$ or $240 \div \frac{5}{2}$	M1	
	= 96 km/hr	A1	3
	alternatively		
	240 = 150 (÷ 5 or ÷ 10)	M1	
	48 km = 30 mins or 24 km = 15 mins	A1	
	96 km/hr	A1	
	or $\frac{240}{150}$ or $240 \div 150$ or 1.6 or $1\frac{3}{5}$	M1	
	16 km in 10 mins	A1	
	96	A1	
2	$V = \sqrt{2 \times 10 \times 20}$	M1	
	$= \sqrt{400}$	A1	
	= 20	A1	3
3	$\frac{4(12 + 9)}{3}$	MA1	
	$\frac{84}{3}$	MA1	
	28	A1	3
4	direction	A1	
	3 points correct	A2	3
	(2 points correct – A1)		
5	1 – (0.05 + 0.2 + 0.65) = 0.1	C2	
	300 × 20p = £60	C1	
	0.05 × 300 × £1 = £15		
	0.1 × 300 × 50p = £15		
	0.2 × 300 × 10p = £6	3 correct C2 (2 correct C1)	
	Profit = £60 – £36 = £24	C1	6
6	**(a)** $\frac{5}{8}$ or 0.625 or 62.5%	A1	
	(b) Not a valid conclusion as he has not made enough trials to support this.	A1	2

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			AVAILABLE MARKS
7	**(a)** $-\frac{7}{3} < n \leqslant 2$	MA1	
	$-2, -1, 0, 1, 2$	M1 A1	
	(–1 for each extra or omitted answer)		
	(b) $3x - 12 < 5x - 20$	MA1	
	$8 < 2x$		
	$4 < x$	A1	
	$x = 5$	A1	6
8	Option A: circle area = 16π or 50.24	C1	
	Option B: $2 \times 4 \times 6 + \frac{1}{2} \times \pi \times 16 = 48 + 8\pi$ or 73.12	C1	
	Option C: $\frac{3}{4} \times \pi \times 16 = 12\pi$ or 37.68	C1	
	Option B with correct area of $48 + 8\pi$ or 73.12	A1	4
9	**(a)** 1.08×10^{-4}	A1	
	(b) 4×10^{3} or 4000	A1	
	(c) $99x = 72$	MA1	
	$x = \frac{8}{11}$	A1	4
10	$0.4 \times 0.3 + 0.6 \times 0.15 + 0.4 \times 0.7$	M1	
	$0.12 + 0.09 + 0.28$	A1	
	0.49	A1	3
	alternatively		
	$1 - (0.6 \times 0.85)$	M1	
	$1 - 0.51$	A1	
	0.49	A1	
11	**(a)** V = P (both right angles in rectangles)		
	VUS = SQR (alternate) = QSP (alternate)		
	or VUS = PSQ (corresponding)		
	USV = RSQ (vert. opp) = SQP (alternate)		
	or USV = SQP (corresponding)		
	So 3 angles equal so similar		
	Need to prove 2 pairs equal A1 each and final statement A1	A3	
	(b) Areas 108 : 12 = 9 : 1 Lengths 3 : 1	MA1	
	SP = 7.5 ÷ 3 = 2.5 cm	MA1	
	PQ = 9.6 cm	A1	6
	alternatively		
	Areas 108 : 12 = 9 : 1 Lengths 3 : 1	MA1	
	VS = 108 ÷ 3.75 = 28.8 cm	MA1	
	PQ = 9.6 cm	A1	

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			AVAILABLE MARKS
12	**(a)** $2x - \frac{12}{x} = \frac{1}{2}x + 2$		
	$2x^2 - 12 = \frac{1}{2}x^2 + 2x$	MA1	
	$4x^2 - 24 = x^2 + 4x$	MA1	
	$3x^2 - 4x - 24 = 0$	MA1	
	alternatively		
	$\frac{3}{2}x - \frac{12}{x} - 2 = 0$	MA1	
	$\frac{3}{2}x^2 - 12 - 2x = 0$	MA1	
	$3x^2 - 24 - 4x = 0$	MA1	
	(b) $2x - \frac{12}{x} = ax + b$		
	$2x^2 - 12 = ax^2 + bx$	MA1	
	$(2 - a)x^2 - bx - 12 = 0$	MA1	
	$2 - a = 4 \quad a = -2$	MA1	
	$b = 2$	A1	7
	alternatively		
	$4x^2 - 2x - 12 = 0$		
	$4x - 2 - \frac{12}{x} = 0$	MA1	
	$2x - \frac{12}{x} = 2 - 2x \equiv ax + b$	MA1	
	$a = -2$ and $b = 2$	A1 A1	
		Total	**50**

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Centre Number

Candidate Number

Rewarding Learning

General Certificate of Secondary Education
January 2014

Mathematics

Unit T6 Paper 1

(Non-calculator)
Higher Tier



[GMT61]

GMT61

WEDNESDAY 15 JANUARY 9.15am–10.30am

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 **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

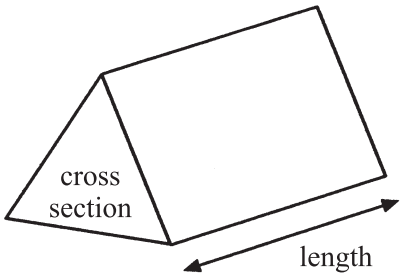
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **questions 14 and 16**.
You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

8696

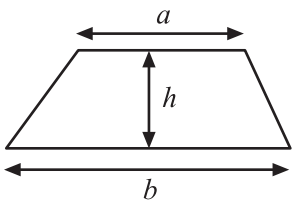
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Formula Sheet

Volume of prism = area of cross section × length

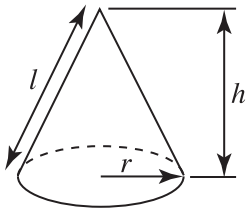


Area of trapezium $= \frac{1}{2}(a+b)h$



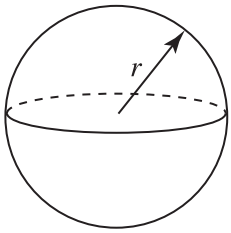
Volume of cone $= \frac{1}{3}\pi r^2 h$

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

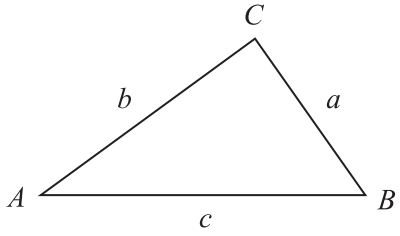


Volume of sphere $= \frac{4}{3}\pi r^3$

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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(Questions start overleaf)

1 In planning a school trip Mr Davison uses the following information.

For every 20 pupils you will need

16 bottles of milk
24 rounds of sandwiches
10 bars of chocolate

Complete the following for 50 pupils on a school trip

_____ bottles of milk

_____ rounds of sandwiches

_____ bars of chocolate [3]

Examiner Only	
Marks	Remark
Total Question 1	

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2 Estimate the value of

$$\frac{28.6 + 302.9}{116.1 - 115.6}$$

Show all your working.

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 2	

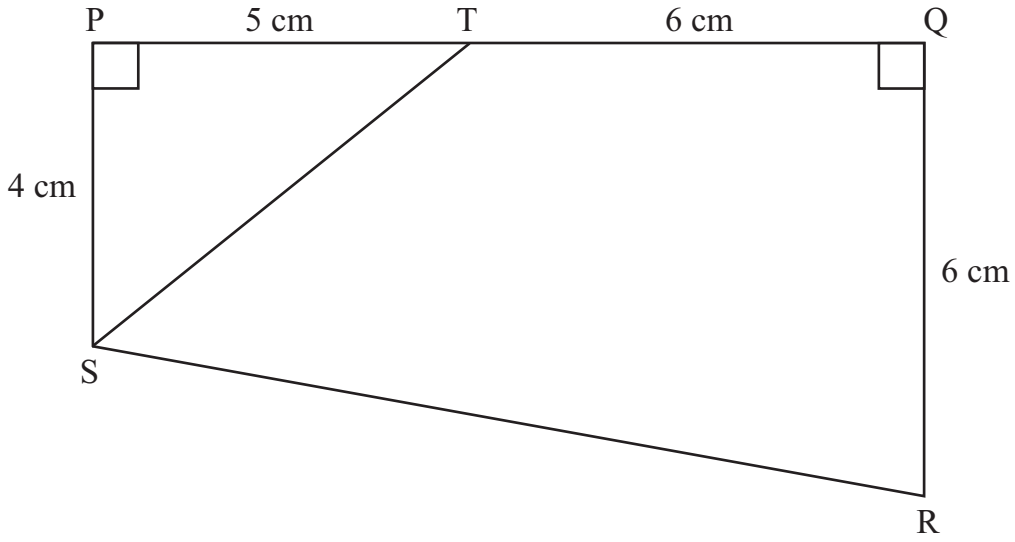
[Turn over

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3 PQRS is a trapezium. PS and QR are perpendicular to the line PQ.

PT = 5 cm, TQ = 6 cm, PS = 4 cm and QR = 6 cm.

Diagram not drawn accurately



Find the area of the

(a) trapezium PQRS,

Answer _____ cm^2 [2]

(b) quadrilateral TQRS.

Answer _____ cm^2 [2]

Examiner Only	
Marks	Remark
Total Question 3	

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4 Work out the value of $\frac{R(3S+T)}{5}$ when $R = -3$, $S = 4$, $T = -2$

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 4	

5 Which of the statements below describes the number $n^2 + 1$, where n represents any whole number?
Explain your answer.

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

Answer _____

because _____

_____ [2]

Total Question 5

[Turn over

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6 A box contains pens.
There are 8 black, 6 blue, 4 green and the rest are red.
The probability of taking a red pen from the box is $\frac{1}{10}$
How many red pens are in the box?

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 6	

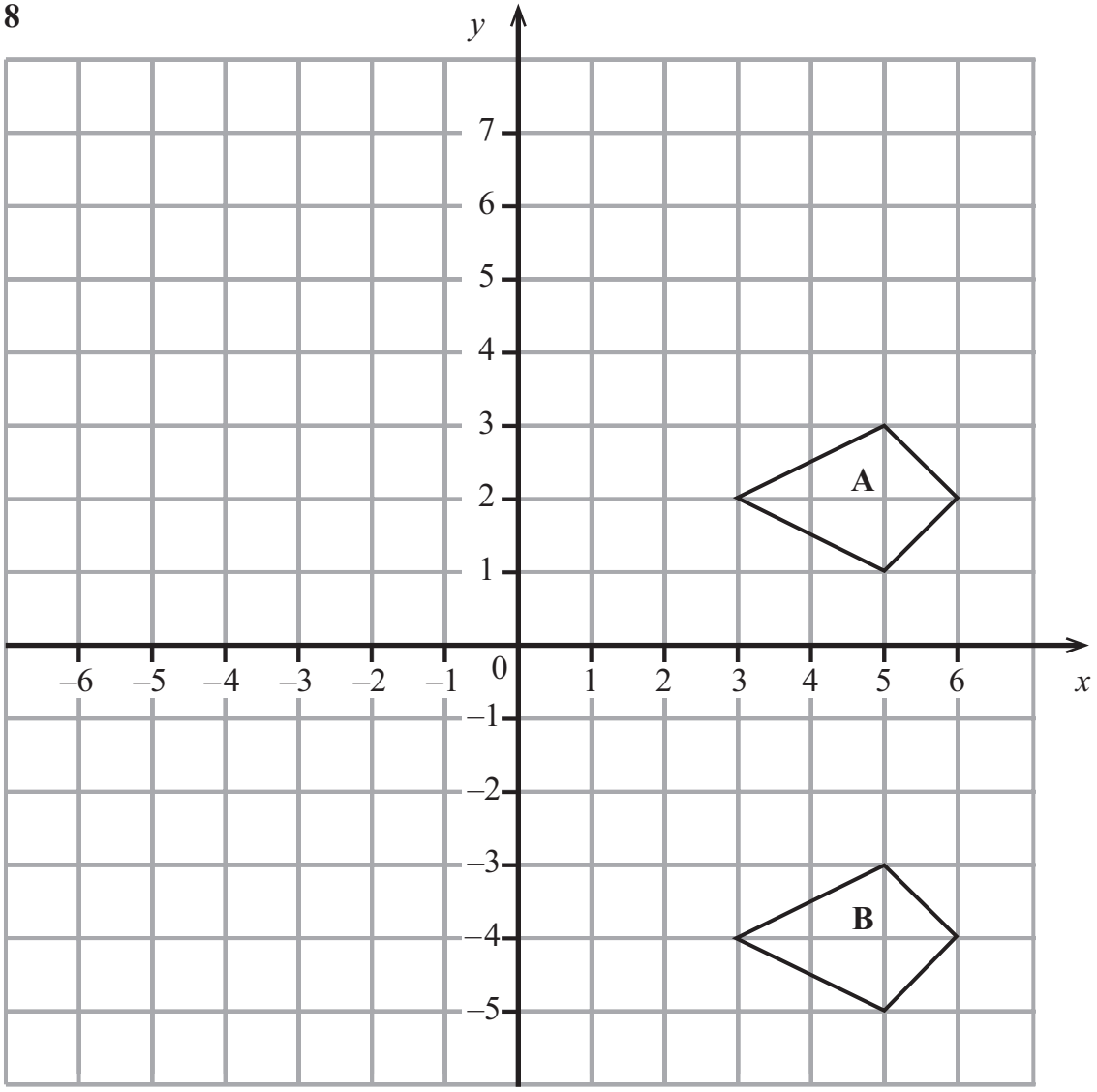
7 Find the reciprocal of 1.2

Answer _____ [2]

Total Question 7	

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8



(a) Describe fully a single transformation which maps shape A onto shape B.

Answer _____ [2]

(b) Describe fully a different single transformation which maps shape A onto shape B.

Answer _____ [2]

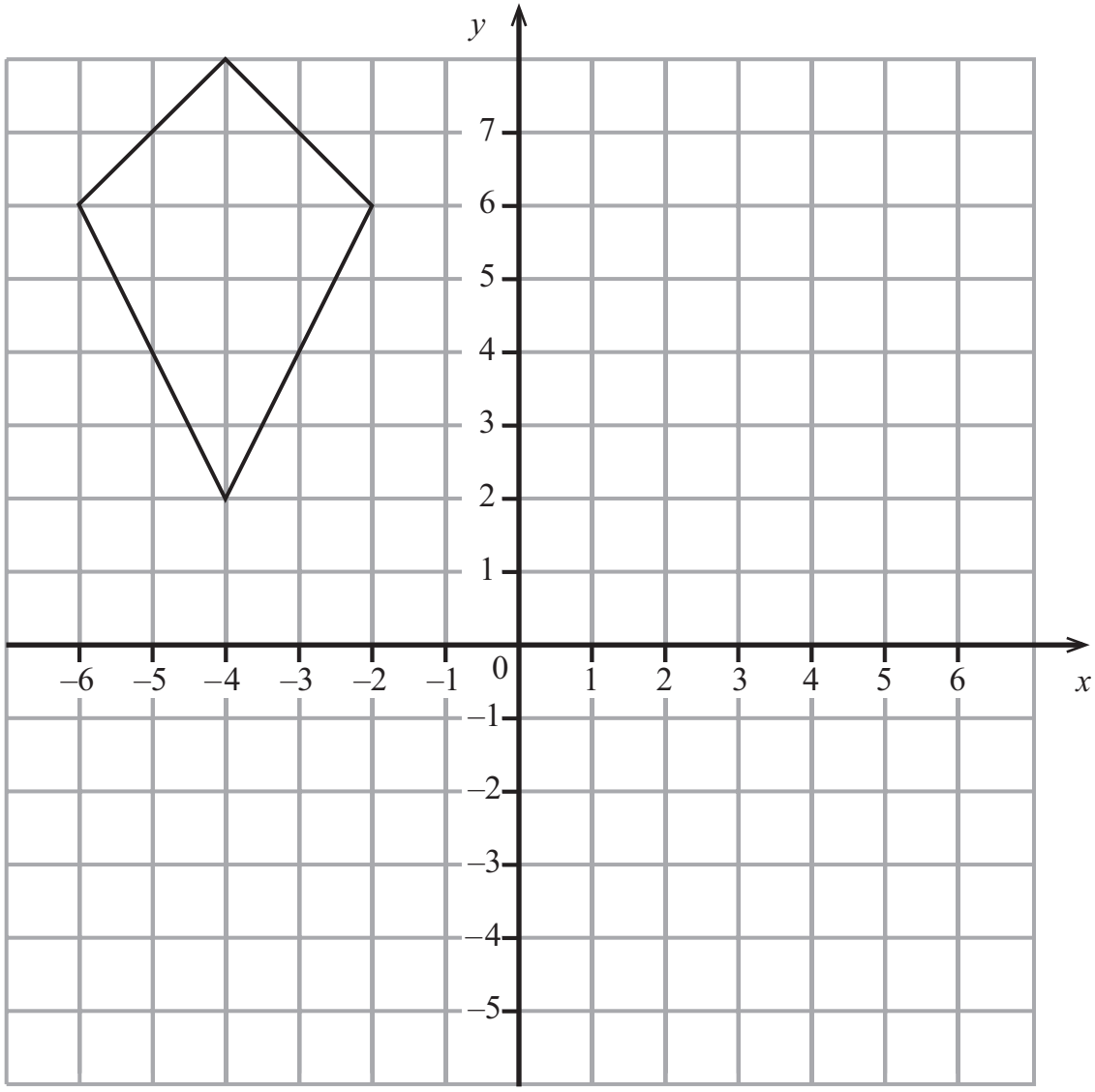
(c) Draw the image of shape A after a rotation of 90° anti-clockwise about the point (–1, 0). [2]

Examiner Only	
Marks	Remark
Total Question 8	

[Turn over

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9 Enlarge the shape by scale factor $\frac{1}{2}$ using the centre (0, 0).



[2]

Examiner Only	
Marks	Remark
Total Question 9	

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10 Find the value of $(3.46 \times 10^{-3}) \times (2.5 \times 10^{-6})$, giving your answer in standard form.

Examiner Only	
Marks	Remark

Answer _____ [2]

Total Question 10

[Turn over

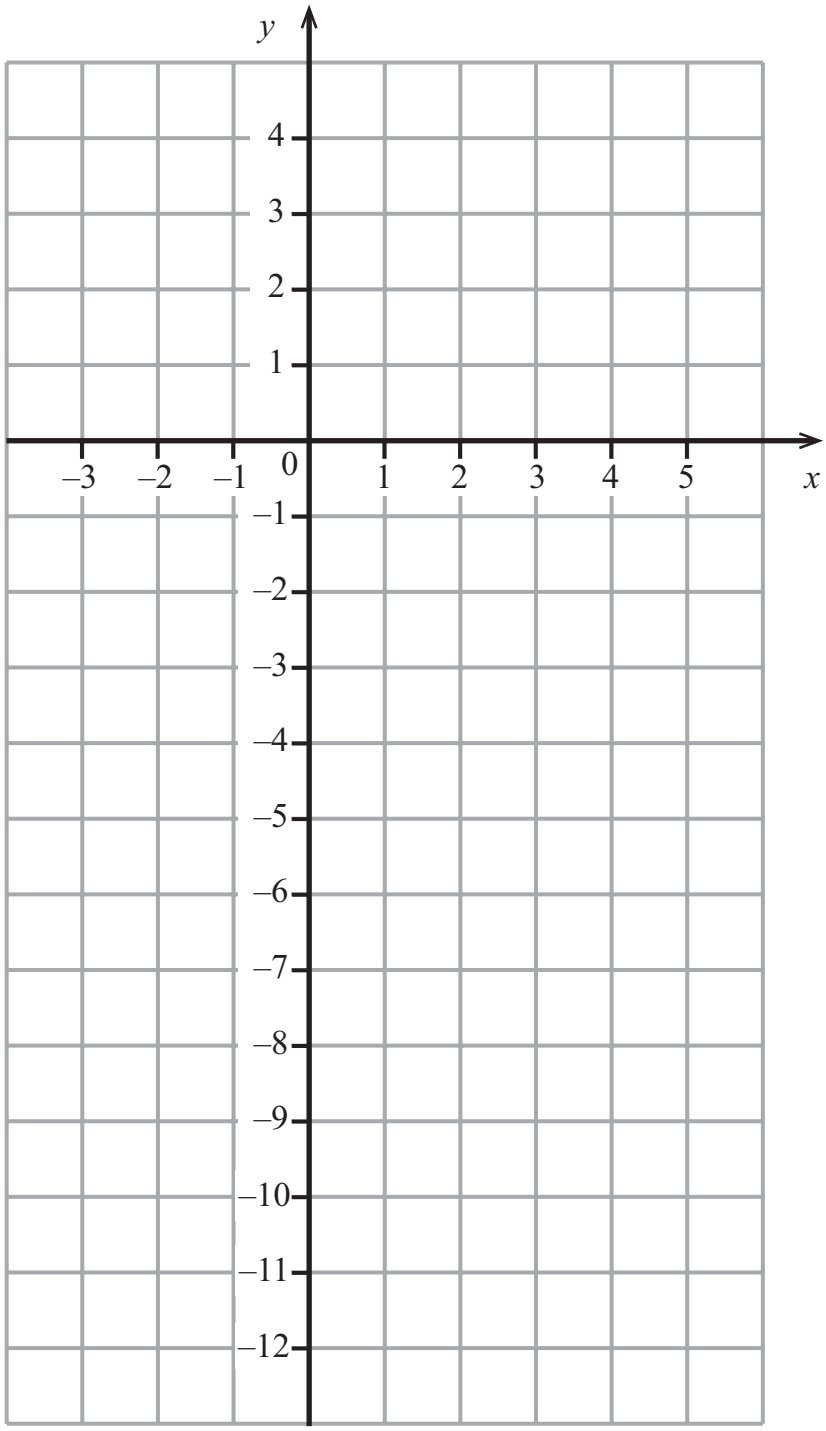
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11 **(a)** Complete the table of values for $y = 3x - x^2 - 1$

x	–2	–1	0	1	2	3	4
y		–5	–1	1	1		–5

[2]

(b) On the grid below, draw the graph of $y = 3x - x^2 - 1$ between $x = -2$ and $x = 4$



[2]

Examiner Only	
Marks	Remark

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(c) Use your graph to work out the values of x for which $y = -3$

Answer $x =$ _____ [2]

Total Question 11

12 Simplify $(5y^3)^2$

Answer _____ [2]

Total Question 12

13 A wooden spear of length 130 cm is made from a cylinder and a cone. The cylinder has radius 3 cm and length 120 cm.
Calculate the volume of the spear, giving your answer in terms of π.



Answer _____ cm^3 [5]

Total Question 13

Examiner Only

Marks	Remark

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Quality of written communication will be assessed in this question.

Examiner Only	
Marks	Remark

14 Martha has a bag of fruit sweets. There are 5 red, 4 green and 3 yellow sweets.

(a) Martha says, "I hate green sweets. If I take a green sweet, I am going to put it back in the bag and try again."

What is the probability that Martha takes two green sweets in succession?

Answer _____ [2]

(b) If Martha had said, "I hate green sweets. If I take a green sweet, I am going to throw it out and try again," would the probability of taking two green sweets in succession increase or decrease?
Justify your answer.

Answer _____ because _____

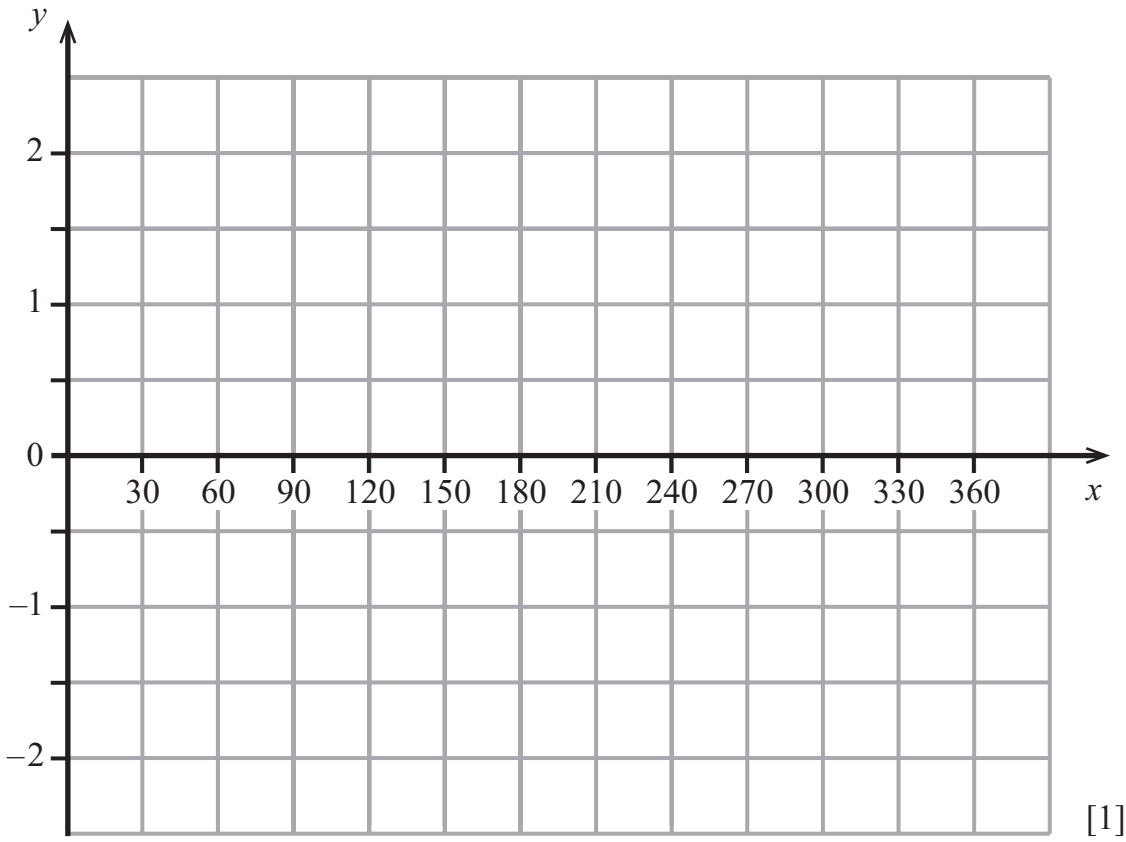
_____

_____ [2]

Total Question 14

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15 **(a)** Sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$ on the axes below.



[1]

(b) Use your graph from part **(a)** to solve the equation $\cos x = -0.75$

Answer $x =$ _____ [2]

Examiner Only	
Marks	Remark
Total Question 15	

[Turn over

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Quality of written communication will be assessed in this question.

16 Emer says she has worked out that $3 - \sqrt{5}$ is a square root of $14 - 6\sqrt{5}$

Showing all your work clearly prove that Emer is correct.

[2]

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 1
Higher Tier

[GMT61]

WEDNESDAY 15 JANUARY
9.15 am–10.30 am

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.

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

In particular, candidates must:

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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	Milk = $16 \times \frac{50}{20} = 40$	MA1	
	Sandwiches = $24 \times \frac{50}{20} = 60$	MA1	
	Chocolate = $10 \times \frac{50}{20} = 25$	MA1	3
2	$\frac{330}{0.5}$ or $\frac{331}{0.5}$ or $\frac{332}{0.5}$	M1	
	660 or 662 or 664	A1	2
3	**(a)** $\frac{1}{2}(4 + 6)11$ or $(4 \times 11) + (\frac{1}{2} \times 11 \times 2)$ or $(6 \times 11) - (\frac{1}{2} \times 11 \times 2)$	M1	
	55	A1	
	(b) $55 - (\frac{1}{2} \times 5 \times 4)$ follow through from **(a)**	M1	
	45	A1	4
	SC. Award MA1 for $5 \times 4 \div 2 = 10$		
4	$\frac{-3(12 - 2)}{5}$	MA1	
	$\frac{-30}{5}$	MA1	
	-6 follow through for M1AO and negative numerator only	A1	3
5	"Could be even or odd"	A1	
	Numerical examples	A1	2
6	P (not red) = $\frac{9}{10} = \frac{18}{20}$	MA1	
	2 red pens	MA1	2
7	$\frac{1}{1.2}$	MA1	
	$= \frac{10}{12}$ $\left(= \frac{5}{6}\right)$	A1	2
8	**(a)** reflection in the line $y = -1$	A1 A1	
	(b) translation $\begin{pmatrix} 0 \\ -6 \end{pmatrix}$	A1 A1	
	(c) correct rotation about given centre (Allow A1 for 3 points correct)	A2	

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			AVAILABLE MARKS
9	correct enlargement (allow A1 for 3 points correct)	A2	2
10	8.65×10^{-9} (Allow [1] for 0.000 000 00865)	A1 A1	2
11	**(a)** $-11, -1$	A1 A1	
	(b) Points plotted correctly Smooth curve	A1 A1	
	(c) $-0.6, 3.6$	A1 A1	6
12	$25y^6$	A1 A1	2
13	$\pi \times 3^2 \times 120$ 1080π	MA1 A1	
	$\frac{1}{3} \times \pi \times 3^2 \times 10$	MA1	
	30π	A1	
	1110π	A1	5
14	**(a)** $\frac{4}{12} \times \frac{4}{12}$ $= \frac{1}{9}$	MA1 A1	
	(b) Decrease because $\frac{4}{12} \times \frac{3}{11} = \frac{1}{11}$ which is less than $\frac{1}{9}$ (**or** prob of first green same; prob of 2nd green changes from $\frac{4}{12} = \frac{1}{3} = \frac{3}{9}$ to $\frac{3}{11}$ so less likely to get 2nd green)	C2	4
15	**(a)** Correct sketch drawn	A1	
	(b) Angles from graph	A1 A1	3
16	$\left(3-\sqrt{5}\right)^2 = 9 - 6\sqrt{5} + 5$ $= 14 - 6\sqrt{5}$	C1 C1	2
		Total	**50**

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Centre Number

Candidate Number

Rewarding Learning

General Certificate of Secondary Education
2013

Mathematics

Unit T6 Paper 1

(Non-calculator)
Higher Tier



[GMT61]

GMT61

FRIDAY 14 JUNE, 09.15 am–10.30 am

TIME

1 hour 15 minutes.

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You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

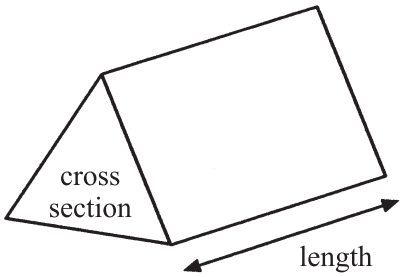
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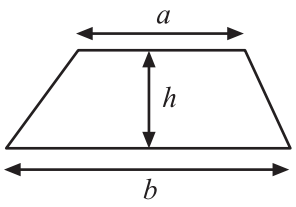
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Formula Sheet

Volume of prism = area of cross section × length

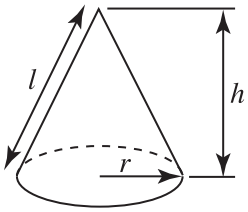


Area of trapezium $= \frac{1}{2}(a+b)h$



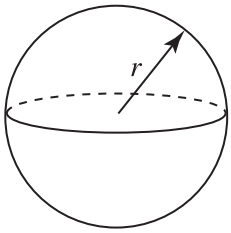
Volume of cone $= \frac{1}{3}\pi r^2 h$

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

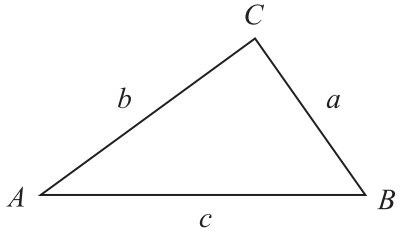


Volume of sphere $= \frac{4}{3}\pi r^3$

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

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

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

1 **(a)** Given that $76 \times 219 = 16644$ work out the value of

(i) $16644 \div 21.9$

Answer _____ [1]

(ii) 75×219

Answer _____ [1]

(b) $\frac{1}{3}$ of the pupils in a class are boys.
What is the ratio of boys to girls in the class?

Answer _____ [1]

Examiner Only	
Marks	Remark
Total Question 1	

[Turn over

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2 A fair red dice has faces marked 1, 2, 3, 4, 5, 6
A fair blue dice has faces marked 1, 1, 3, 3, 6, 7

The table below shows all possible outcomes when the dice are thrown together.

Red Dice

Blue Dice	1	2	3	4	5	6
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)
7	(7, 1)	(7, 2)	(7, 3)	(7, 4)	(7, 5)	(7, 6)

(a) Calculate the probability of getting a larger score on the blue dice than on the red dice.

Answer _____ [1]

(b) If the two dice are thrown together 360 times how many times would you expect to get a **total** score of 6?

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 2	

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3 Find the value of the following expressions when $a = 3$ $b = -2$ $c = -1$

(a) $b(c - a)$

Answer _____ [2]

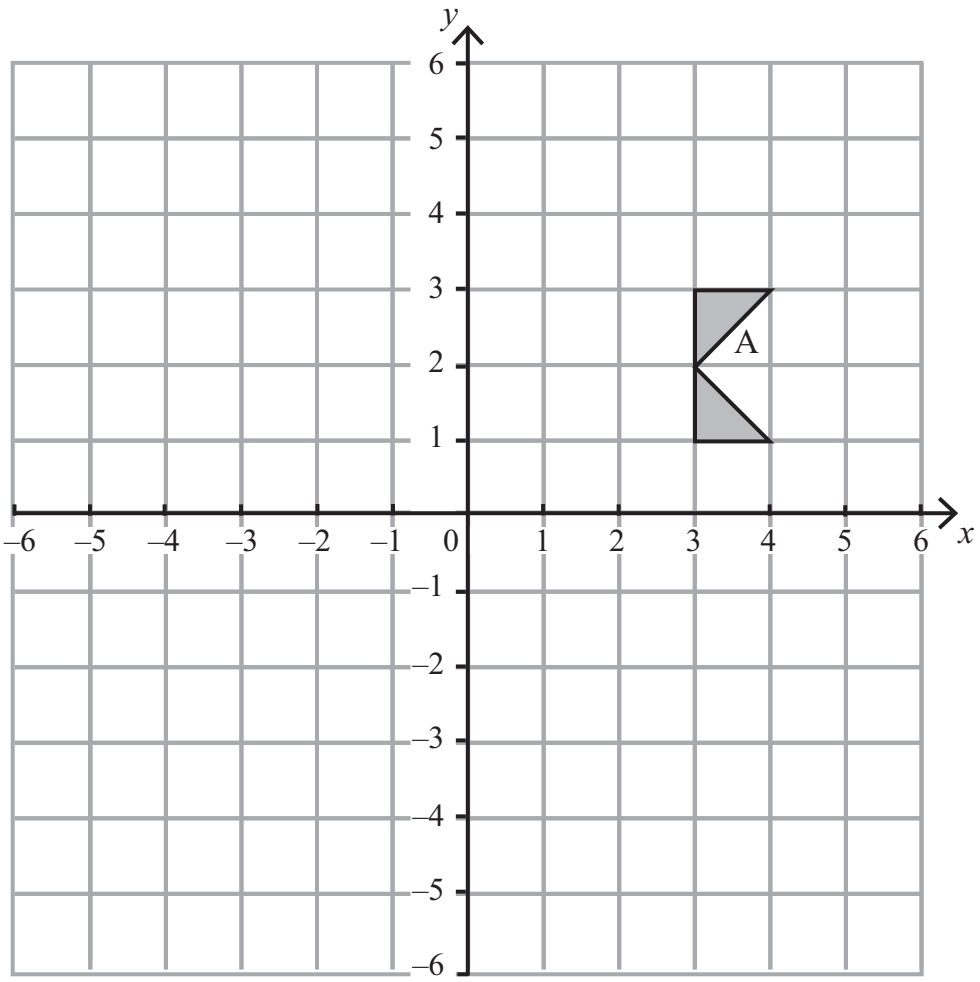
(b) $\frac{a^2 + c^2}{b}$

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 3	

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4



(a) Reflect the shape A in the diagram in the line $x = 2$
Label the new shape B. [2]

(b) Enlarge the shape A by a scale factor of 2 with centre of enlargement at (2, 1). [3]

(c) Rotate the shape A through 90° anticlockwise about the point (0, –2).
Label the new shape C. [2]

Examiner Only	
Marks	Remark
Total Question 4	

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5 John discovered that the probability that a girl has blue eyes is 0.6

John asks 20 girls their eye colour. He writes some probabilities in the following table.

Colour of eyes	Brown	Green	Blue	Other
Probability	0.35	0.05		0.05

(a) Complete John's table. [2]

(b) Why do you think that John's calculated probability for blue eyes is not 0.6?

_____

_____ [1]

Examiner Only	
Marks	Remark
Total Question 5	

[Turn over

6 **(a)** Simplify

(i) $p^3 \times p^4$ Answer _____ [1]

(ii) $(h^8 \div h^5) + h^3$

Answer _____ [1]

(iii) $\frac{e^3}{e^5}$ Answer _____ [1]

(b) Gary states; "When y is a prime number, y^2 is always odd".
Give a counter example to this statement.

[1]

(c) Fill in the box to complete the identity

$2x^2(x-2) \equiv \square - 4x^2$ [1]

Examiner Only	
Marks	Remark
Total Question 6	

7 Lyla tosses an ordinary dice twice. What is the probability that she gets a 5 both times?

Show clearly all your working.

Answer _____ [2]

Total Question 7	

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8 **(a)** Work out the reciprocal of 1.8

Answer _____ [2]

(b) Express $\frac{7}{11}$ as a recurring decimal.

Answer _____ [1]

Examiner Only	
Marks	Remark
Total Question 8	

[Turn over

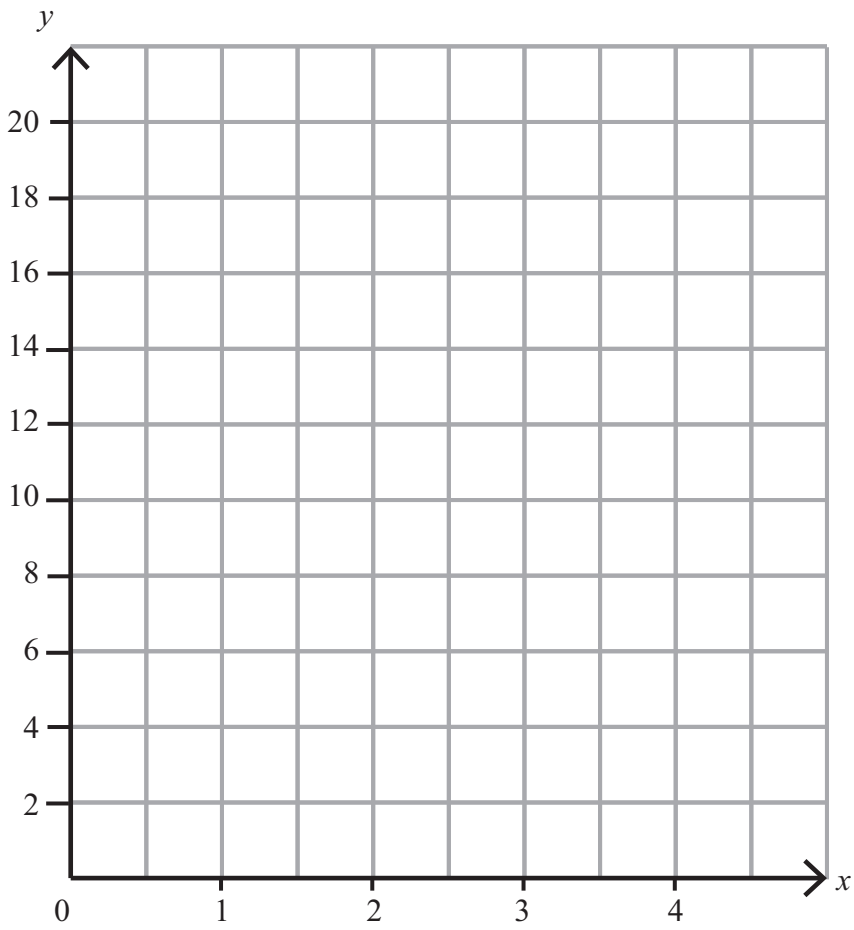
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9 **(a)** Complete the table for $y = 2^x + 1$

x	0	1	2	3	4
$y = 2^x + 1$		3	5		17

[2]

(b) Draw the graph of $y = 2^x + 1$



[2]

Examiner Only

Marks	Remark

Total Question 9

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10 a, b, c, d, g and r represent lengths.
By considering the dimensions of the following formulae decide which formula measures length and which one measures volume.

(i) $W = a^2b - 2ab$ **(ii)** $Q = \pi c\,(a + 2b + d)^2$

(iii) $Z = ag - \pi r^2$ **(iv)** $P = \sqrt{(a^2 + b^2 + c^2)}$

Answer _____ measures length [1]

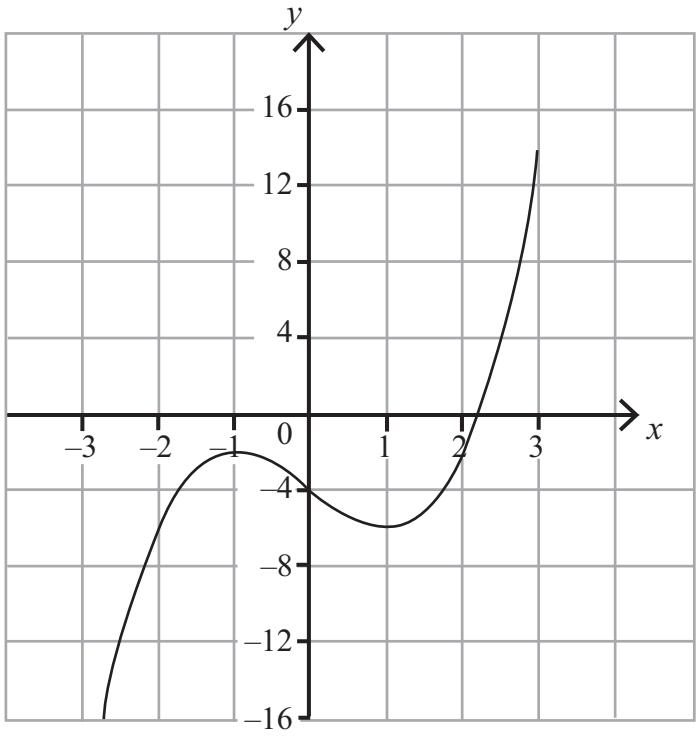
Answer _____ measures volume [1]

Examiner Only	
Marks	Remark
Total Question 10	

[Turn over

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11 The graph of $y = x^3 - 3x - 4$ is shown.



(a) By drawing an appropriate straight line, find solutions to the equation

$$x^3 - 3x - 4 = 3x - 5$$

Answer _____ [3]

(b) What line would you draw on the graph above to solve the equation $x^3 - 4x + 1 = 0$?

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 11	

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12 Two cylinders A and B are similar.
Cylinder A has a base radius of 5 cm and cylinder B has a base radius of 10 cm.
The volume of cylinder A is 60 cm^3.
Calculate the volume of cylinder B.

Answer _____ cm^3 [2]

Examiner Only	
Marks	Remark
Total Question 12	

Quality of written communication will be assessed in this question.

13 Show that the recurring decimal $0.1\dot{8}\dot{2}$ can be written as the fraction $\frac{181}{990}$

[2]

Total Question 13

[Turn over

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14 A bag contains 12 lettered tiles. 6 tiles have E, 4 tiles have P and 2 tiles have T.

Morris takes three tiles one after the other without replacement.

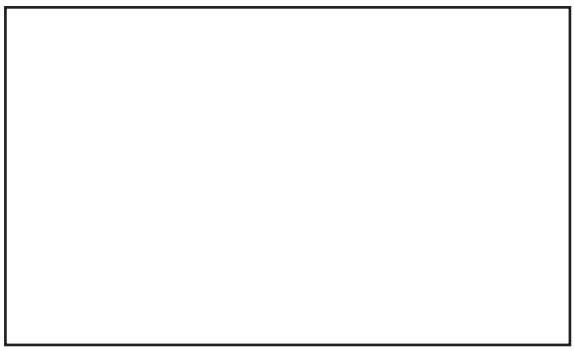
Calculate the probability that he can spell the word PET with his three tiles.

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 14	

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15 The area of the rectangle below is $60\,\text{cm}^2$.



Find the value of x in the form $a\sqrt{b}$ where a and b are integers.

Answer $x =$ _____ [2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark
Total Question 15	

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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 1
Higher Tier

[GMT61]

FRIDAY 14 JUNE

9.15 am – 10.30 am

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.
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 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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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)**	**(i)** 760	A1	
		(ii) 16425	A1	
	(b)	1 : 2	A1	3
2	**(a)**	$\frac{15}{36}$	A1	
	(b)	$\frac{4}{36} \times 360$ **ft** for candidate's "36" from part **(a)**	MA1	
		40	MA1	3
		NB. $\frac{40}{360}$ on answer line with no work earns 1 mark.		
3	**(a)**	$-2(-1-3)$	MA1	
		$= 8$	A1	
	(b)	$\frac{(3)^2+(-1)^2}{-2}$	MA1	
		$= -5$	A1	4
4	**(a)**	Correct reflection (correct reflection in any other vertical line, A1)	A2	
	(b)	Correct enlargement (one vertex in wrong position, A2) (correct enlargement about wrong centre, A1)	A3	
	(c)	Correct rotation (correct rotation about wrong centre, A1) For 90° clockwise rotation about (0, –2), award [1]	A2	7
5	**(a)**	$1 - [0.35 + 0.05 + 0.05]$ **oe**	M1	
		$= 0.55$	A1	
	(b)	only used 20 people, too small sample	A1	3
6	**(a)**	**(i)** p^7	A1	
		(ii) $2h^3$	A1	
		(iii) e^{-2} or $\frac{1}{e^2}$	A1	
	(b)	$(2)^2 = 4$ which is even	A1	
	(c)	$2x^3$	A1	5
7		$P(5, 5) = \frac{1}{6} \times \frac{1}{6}$	M1	
		$= \frac{1}{36}$	A1	2

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			AVAILABLE MARKS
8	**(a)** $\frac{1}{1.8}$	A1	
	$\frac{5}{9}$ or $\frac{10}{18}$ **oe**	A1	
	(b) $0.\dot{6}\dot{3}$	A1	3
9	**(a)** 2 9	A1, A1	
	(b) all points plotted correctly from table in part **(a)**	A1	
	smooth curve drawn through the points from the table	A1	4
10	**(iv)** or P measures length	A1	
	(ii) or Q measures volume	A1	2
11	**(a)** line $y = 3x - 5$ drawn correctly	MA1	
	$x \approx -2.5, 0.2, 2.4$	A2	
	(allow A1 for 2 answers correct)		
	NB no follow through for incorrect straight line		
	(b) $x^3 - 4x + 1 \equiv x^3 - 3x - 4 - x + 5$ (oe)	MA1	
	$y = x - 5$	A1	5
12	vol $= 2^3 \times 60$	MA1	
	$= 480\,\text{cm}^3$	A1	2
13	$x = 0.18282\ldots$		
	$10x = 1.82828\ldots$ or $100x = 18.28282\ldots$		
	$1000x = 182.82828\ldots$ $99x = 18.1$	C1	
	$990x = 181$ $x = \frac{18.1}{99} = \frac{181}{990}$	C1	2
14	$\frac{4}{12} \times \frac{6}{11} \times \frac{2}{10}$ **oe** or $\frac{2}{55}$ or $\frac{48}{1320}$	MA1	
	by $\underline{6} \rightarrow 6 \times \frac{4}{12} \times \frac{6}{11} \times \frac{2}{10}$ **oe**	MA1	
	$= \frac{12}{55}$ or equivalent, e.g. $\frac{288}{1320}$	A1	3
15	$x = \frac{60}{4\sqrt{3}}$		
	$= \frac{60}{4\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$	MA1	
	$= 5\sqrt{3}$	A1	2
		Total	**50**

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Centre Number

Candidate Number

Rewarding Learning

General Certificate of Secondary Education
January 2013

Mathematics

Unit T6 Paper 1

(Non-calculator)
Higher Tier



[GMT61]

GMT61

TUESDAY 15 JANUARY, 1.30 pm–2.45 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 in pencil or with a gel pen**.
Answer **all eighteen** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

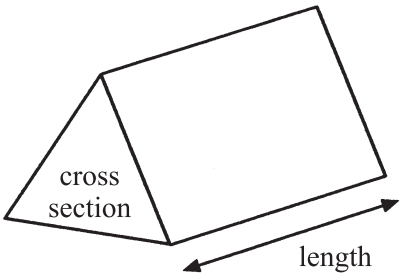
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **question 4**
You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

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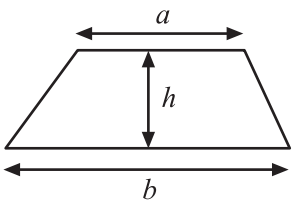
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Formula Sheet

Volume of prism = area of cross section × length

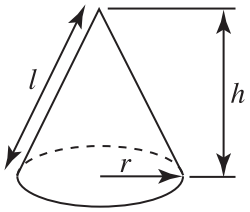


Area of trapezium $= \frac{1}{2}(a+b)h$



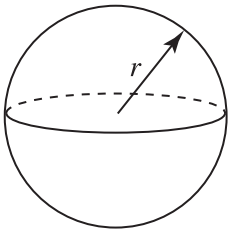
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

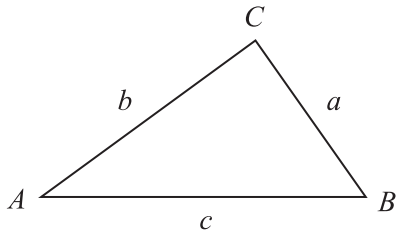


Volume of sphere $= \frac{4}{3}\pi r^3$

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

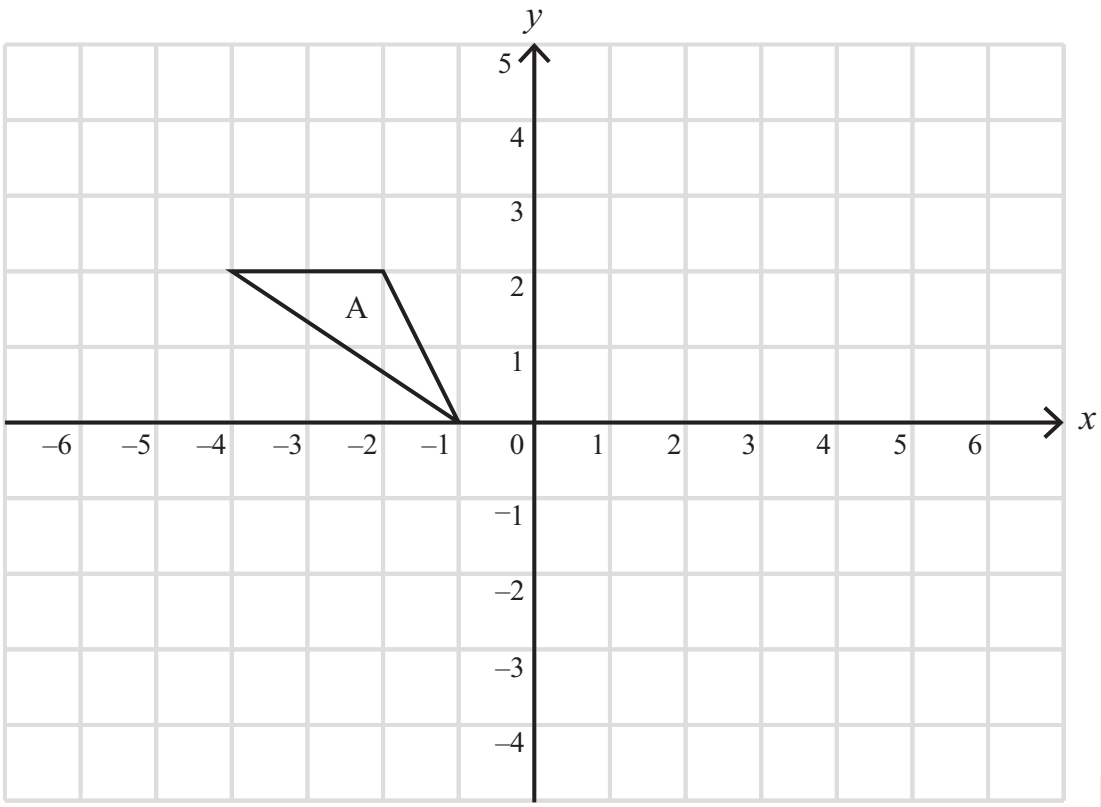
Cosine Rule: $a^2 = b^2 + c^2 - 2bc\cos A$

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

8127

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1 **(a)** Reflect triangle A in the line $x = 1$



[2]

(b) Translate triangle A by $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$. [2]

Total Question 1

2 $W = \dfrac{Y(X - 2)}{4}$

Find the value of W when X = 8 and Y = –2

Answer W = _____ [3]

Total Question 2

Examiner Only

Marks	Remark

[Turn over

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Examiner Only	
Marks	Remark

3 **(a)** Given that $72 \times 451 = 32472$, find $\frac{32472}{7.2}$

Answer _____ [1]

(b) Write down the two numbers which are the square roots of $\frac{1}{9}$

Answer _____ , _____ [1]

Total Question 3

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

4 **(a)** Jayne says, "When you multiply any number by 10, the answer is always greater than or equal to 10."

Is Jayne correct? Give a reason for your answer.

Answer _____

because _____ [1]

(b) Linda says, "When you add any number to 3 the answer is always greater than or equal to 3."

Is Linda correct? Give a reason for your answer.

Answer _____

because _____ [1]

Total Question 4

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5 n is an integer.
Write an **expression in terms of n**, for

(a) an integer which will always be odd, Answer _____ [1]

(b) an integer which could be odd or even. Answer _____ [1]

Examiner Only	
Marks	Remark

Total Question 5

6 Calculate the area of this shape.

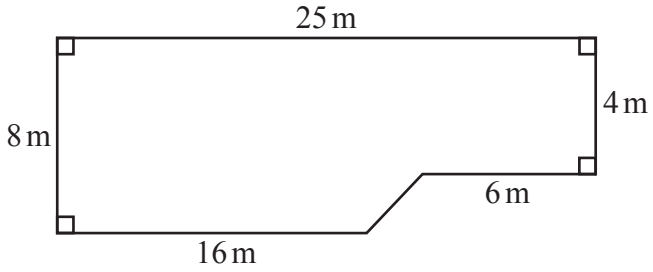


Diagram not drawn accurately

Answer _____ m^2 [3]

Total Question 6

7 Simplify

(a) $(p^4)^2$

Answer _____ [1]

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

Answer _____ [2]

Total Question 7

[Turn over

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8 **Estimate** $\dfrac{703 \times 3.82}{0.91 - 0.69}$

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 8	

9 560 tickets are sold in a club raffle with a car as first prize.

Rachel buys some tickets.

The probability that she wins the car is $\dfrac{1}{140}$

How many tickets does Rachel buy?

Answer _____ [2]

Total Question 9

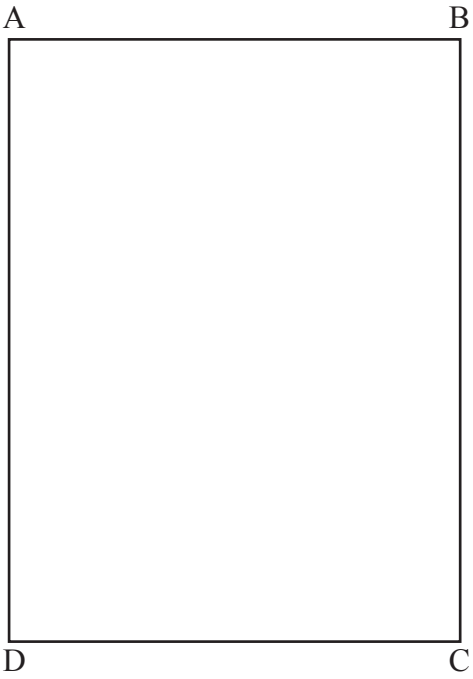
10 Solve $-5 \leqslant 3n < 9$, **where *n* is an integer**.

Answer _____ [3]

Total Question 10

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11 The diagram shows a scale drawing of a corn field using a scale of 1 cm to 50 m.



A scarecrow is positioned in the field 325 m from corner A and 200 m from corner B

Using a ruler and compasses, find and mark the position of the scarecrow.

Leave all construction lines. [2]

Examiner Only	
Marks	Remark
Total Question 11	

[Turn over

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12 Roy has been given 4 formulae, one of which is correct and will allow him to calculate the volume of a pyramid. a, b, c represent lengths. Which of the following is correct?
Explain your choice.

Formula W = $\frac{\sqrt{(ab)}\,c}{3}$ Formula X = $\frac{1}{3}ab^2c$ Formula Y = $\frac{abc}{3}$

Formula Z = $\frac{\pi ab}{3c}$

Answer: Formula _____

because _____ [2]

Examiner Only	
Marks	Remark
Total Question 12	

13 **(a)** Write 0.0000000719 in standard form.

Answer _____ [1]

(b) Which of the following numbers is a recurring decimal?

$\frac{7}{8}$, $\frac{3}{16}$, $\frac{5}{11}$, $\frac{3}{15}$

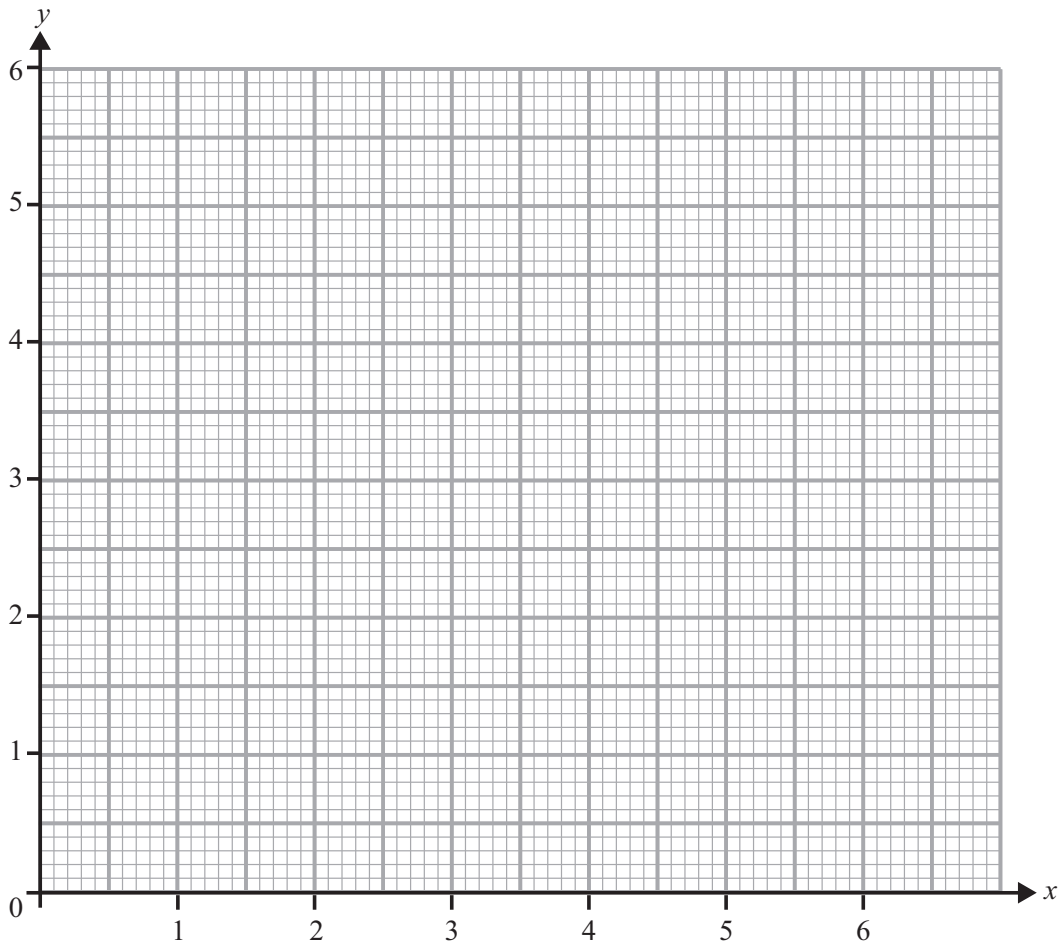
Answer _____ [1]

Examiner Only	
Marks	Remark
Total Question 13	

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14 **(a)** On the grid below show by shading **and the letter R**, the region represented by the inequalities.

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



[3]

(b) Find the maximum value of $2x + 3y$, where x and y are integers, from a point in the region R.

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 14	

[Turn over

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15 Rewrite $\frac{ax - c}{x} = b$ to make x the subject.

Answer $x =$ _____ [4]

Total Question 15

16 Simplify $3\sqrt{5} + 2\sqrt{45} + \sqrt{125}$

Answer _____ [2]

Total Question 16

17 Solve $\frac{2}{7} = \frac{3}{x^2}$ giving your answer in the form $a\sqrt{b}$, where b is an integer.

Answer $x =$ _____ [3]

Total Question 17

Examiner Only

Marks	Remark

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18 The volume V of a cone is 200 cm^3.

Another cone has a height 6 times bigger with a base radius half as long.

What is the volume of this cone?

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 18	

THIS IS THE END OF THE QUESTION PAPER

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Question Number	**Marks**
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18	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
January 2013

Mathematics

Unit T6 Paper 1
Higher Tier

[GMT61]

TUESDAY 15 JANUARY
1.30 pm–2.45 pm

MARK SCHEME

STEMUP.CO.UK

Introduction

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(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)** Correct reflection (A1 for 2 vertices correct or for correct reflection in any vertical line or in line $y = 1$)	A2	
	(b) Shape moved 3 right and 5 down	A1, A1	4
2	$\frac{(-2)\times(8-2)}{4}$	MA1	
	$\frac{-12}{4}$	MA1	
	$= -3$ f.t. only for negative value in numerator	A1	3
3	**(a)** 4510	A1	
	(b) $\frac{1}{3}, \frac{-1}{3}$	A1	2
4	**(a)** No because $0.5 \times 10 = 5$ or similar reason	C1	
	(b) No because $3 + (-1) = 2$ or similar reason	C1	2
5	**(a)** example such as $2n + 1$	A1	
	(b) example such as n^2, $n + 1$, $n - 1$, n	A1	2
6	Calculating the area of one shape which is part of a complete method or for dividing the shape up correctly Using a complete and correct method to find total area 170	MA1 M1 A1	3
7	**(a)** p^8	A1	
	(b) $\frac{r^6}{r^2}$ or $r^3 \times r$	A1	
	$= r^4$	A1	3
8	$\frac{700\times 4}{0.9-0.7}$	MA1	
	$\frac{2800}{0.2} = 14000$	A1, A1	3
9	$\frac{1}{140}\times 560 = 4$	M1, A1	2
10	$n = -1, 0, 1, 2$ (–1 for each extra, missing or wrong answer) If AO scored then $-\frac{5}{3} \leqslant n < 3$ gets MA1	A3	3

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			AVAILABLE MARKS
11	Arc drawn, centre A and radius 6.5 (± 0.2) cm	MA1	
	Arc drawn, centre B and radius 4 (± 0.2) cm and point of intersection marked	MA1	2
12	Formula **Y**	A1	
	because there are 3 lengths multiplied	A1	2
13	**(a)** 7.19×10^{-8}	A1	
	(b) $\frac{5}{11}$	A1	2
14	**(a)** A1 for each correct line and side identified by region R	A3	
	(b) 16 (allow 1 for (2, 4) chosen) f.t. for candidate's region in part **(a)**	MA2	5
15	$ax - c = bx$	MA1	
	$ax - bx = c$	MA1	
	$x(a - b) = c$	MA1	
	$x = \frac{c}{a - b}$	MA1	4
16	$3\sqrt{5} + 6\sqrt{5} + 5\sqrt{5}$	MA1	
	$14\sqrt{5}$	A1	2
17	$x^2 = \frac{21}{2}$	MA1	
	$x = \frac{\sqrt{21}}{\sqrt{2}}$ **or** $\sqrt{\frac{21}{2}}$	MA1	
	$x = \frac{\sqrt{42}}{2}$ **or** $\frac{1}{2}\sqrt{42}$ or $0.5\sqrt{42}$	MA1	3
18	$\frac{1}{3} \times \pi \times (\frac{1}{2}r)^2 \times 6h$	MA1	
	$\frac{1}{3} \times \pi \times \frac{1}{4}r^2 \times 6h$		
	$\frac{1}{3}\pi r^2 h \times \frac{6}{4}$	MA1	
	$= 200 \times \frac{6}{4}$		
	$= 300\,\text{cm}^3$	A1	
	or		
	V × 6 × $\frac{1}{4}$	MA1	
	$= 200 \times \frac{6}{4}$	MA1	
	= 300	A1	3
	s. c. 600 gets A1		
		Total	**50**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2012

Mathematics

Unit T6 Paper 1
(Non-calculator)
Higher Tier



[GMT61]

GMT61

MONDAY 11 JUNE 1.30 pm–2.45 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 fifteen** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

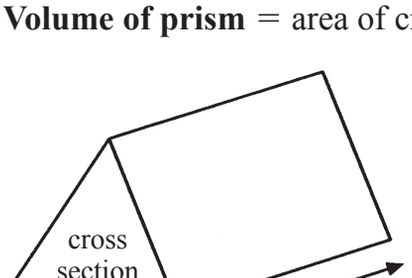
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in Question **14**.
You should have a ruler, compasses and protractor.
The Formula Sheet is on page 2.

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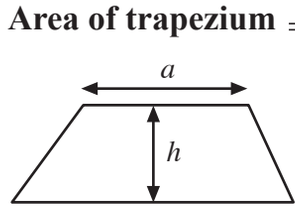
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Formula Sheet

Volume of prism = area of cross section × length

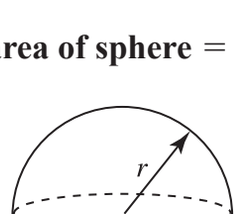


Area of trapezium = $\frac{1}{2}(a+b)h$



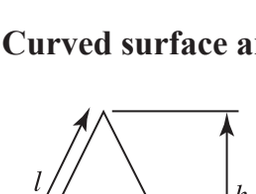
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = πrl

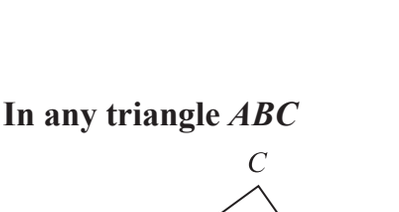


Quadratic equation

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 A letter is taken at random from the word

G E O G R A P H I C A L

Write down the probability that the letter is **not** in the word GRAPH.

Answer _____ [2]

Total Question 1	

[Turn over

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2 **(a)** Share 72 sweets in the ratio 8:1

Answer _____ , _____ [2]

(b) Given that $689 \times 537 = 369993$, write down the value of

(i) $\dfrac{369993}{53700}$

Answer _____ [1]

(ii) $\dfrac{36.9993}{0.0689}$

Answer _____ [1]

Examiner Only	
Marks	Remark
Total Question 2	

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3 Find the area of the trapezium.

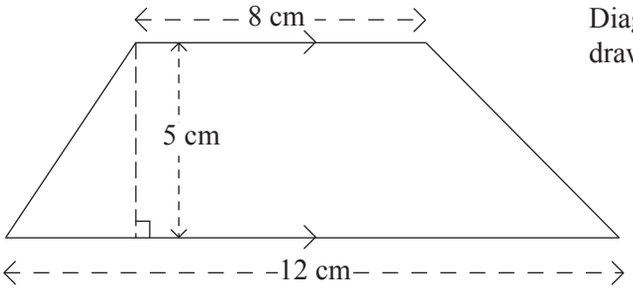


Diagram not drawn accurately

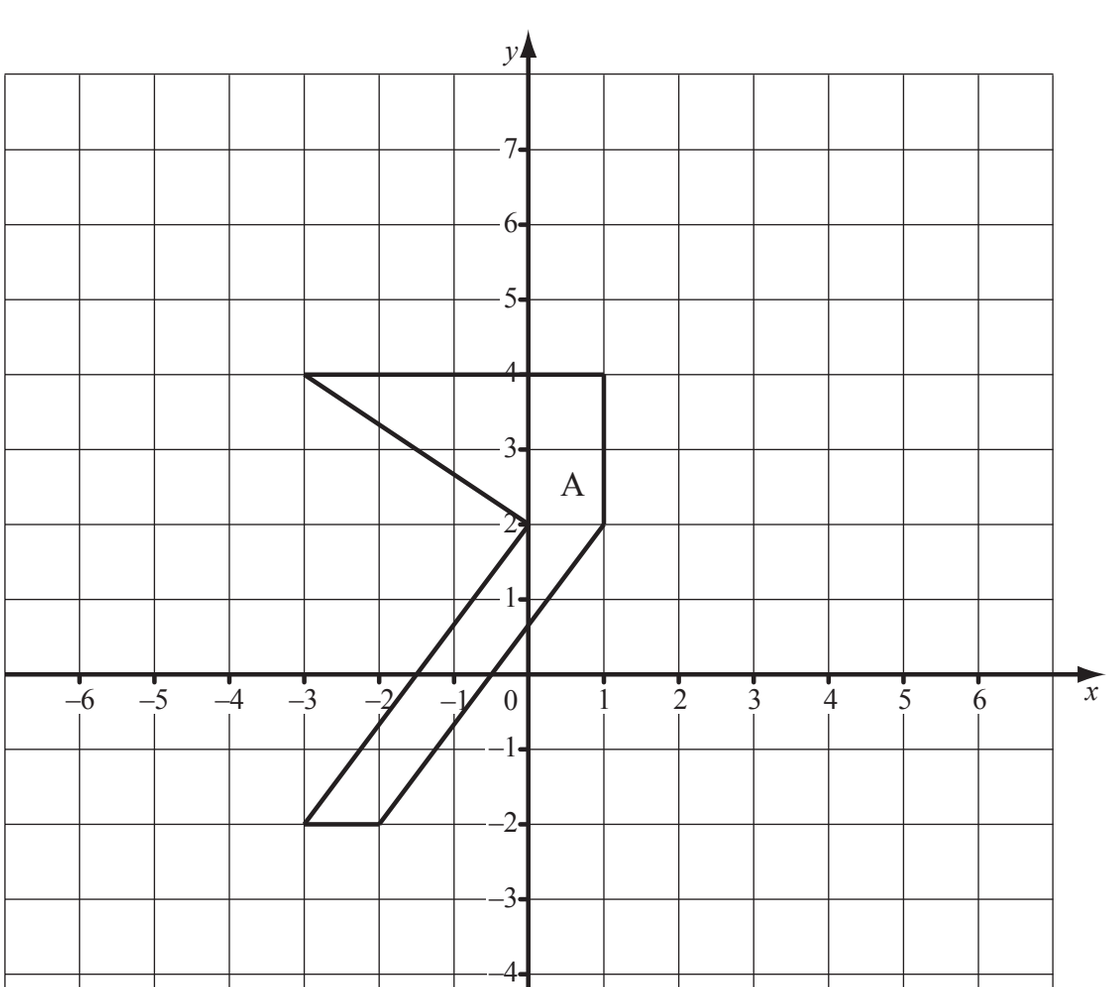
Answer _____ cm^2 [2]

Examiner Only	
Marks	Remark
Total Question 3	

[Turn over

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4 **(a)** Enlarge the shape A by scale factor 2 from the centre C(−4, 1).

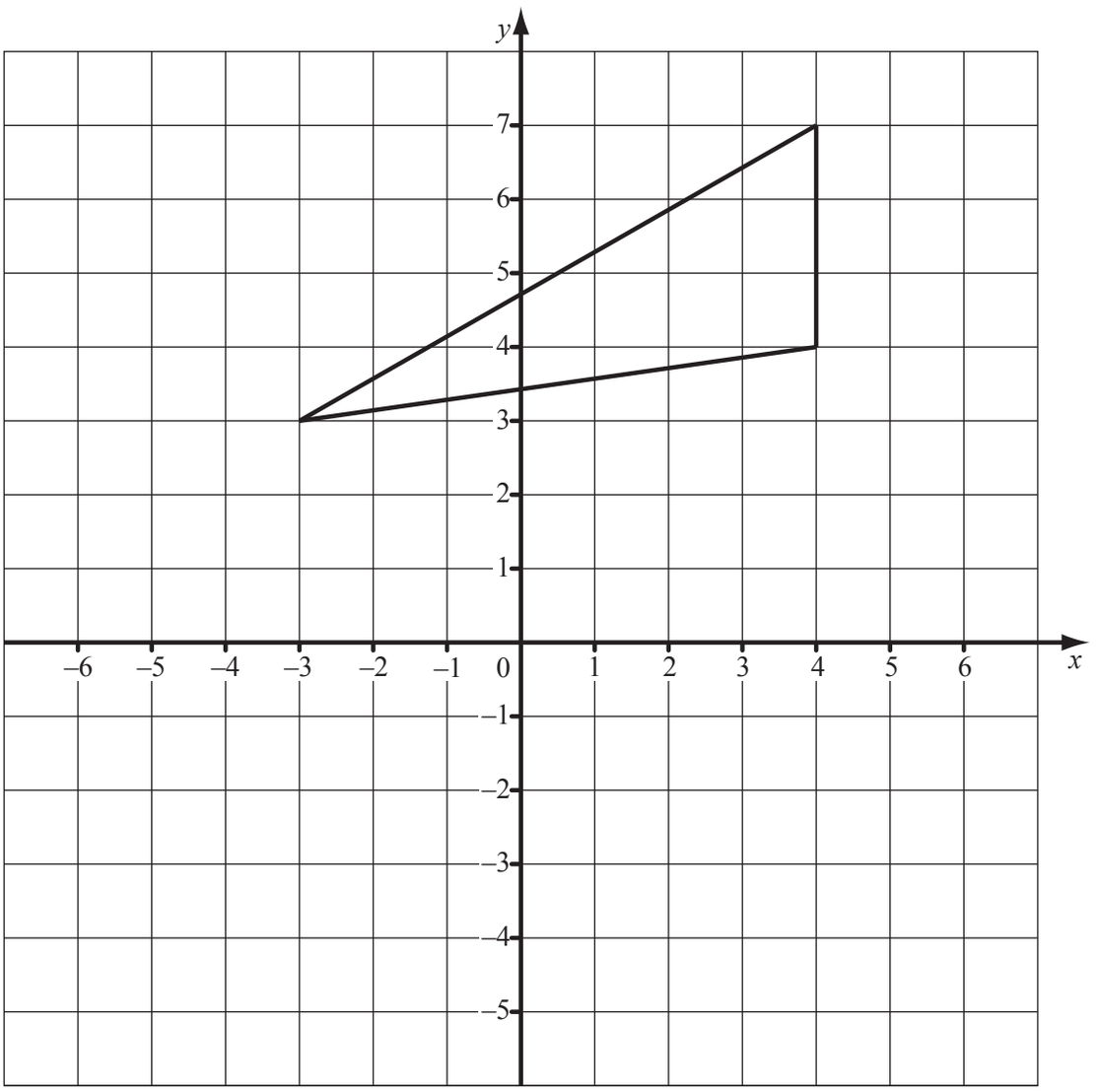


[3]

Examiner Only	
Marks	Remark

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(b) Reflect the triangle below in the line $y = 1$



[2]

Examiner Only	
Marks	Remark
Total Question 4	

5 A bag contains 4 toffee sweets, 6 nut sweets and some fruit sweets.

(a) The probability of me taking a fruit sweet from the bag is $\frac{1}{2}$

How many fruit sweets are in the bag?

Answer _____ [1]

(b) I eat 2 toffee sweets. What is the probability that the next sweet I take is toffee?

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 5	

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6 **(a)** Write down all the values of n, where n is an integer, such that $-9 \leqslant 3n < 3$

Answer _____ [2]

(b) Work out the value of $\dfrac{a(5b+6)}{c}$ when $a = -3$, $b = 2$ and $c = 4$

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 6	

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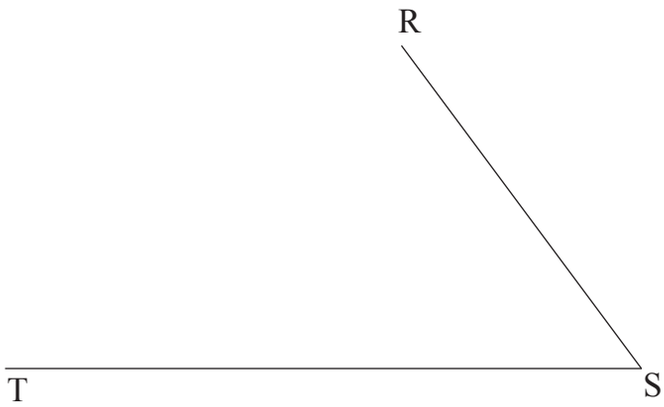
7 Work out the reciprocal of 1.5

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 7	

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8 Using ruler and compasses only, construct the bisector of the angle RST.



[2]

Examiner Only	
Marks	Remark
Total Question 8	

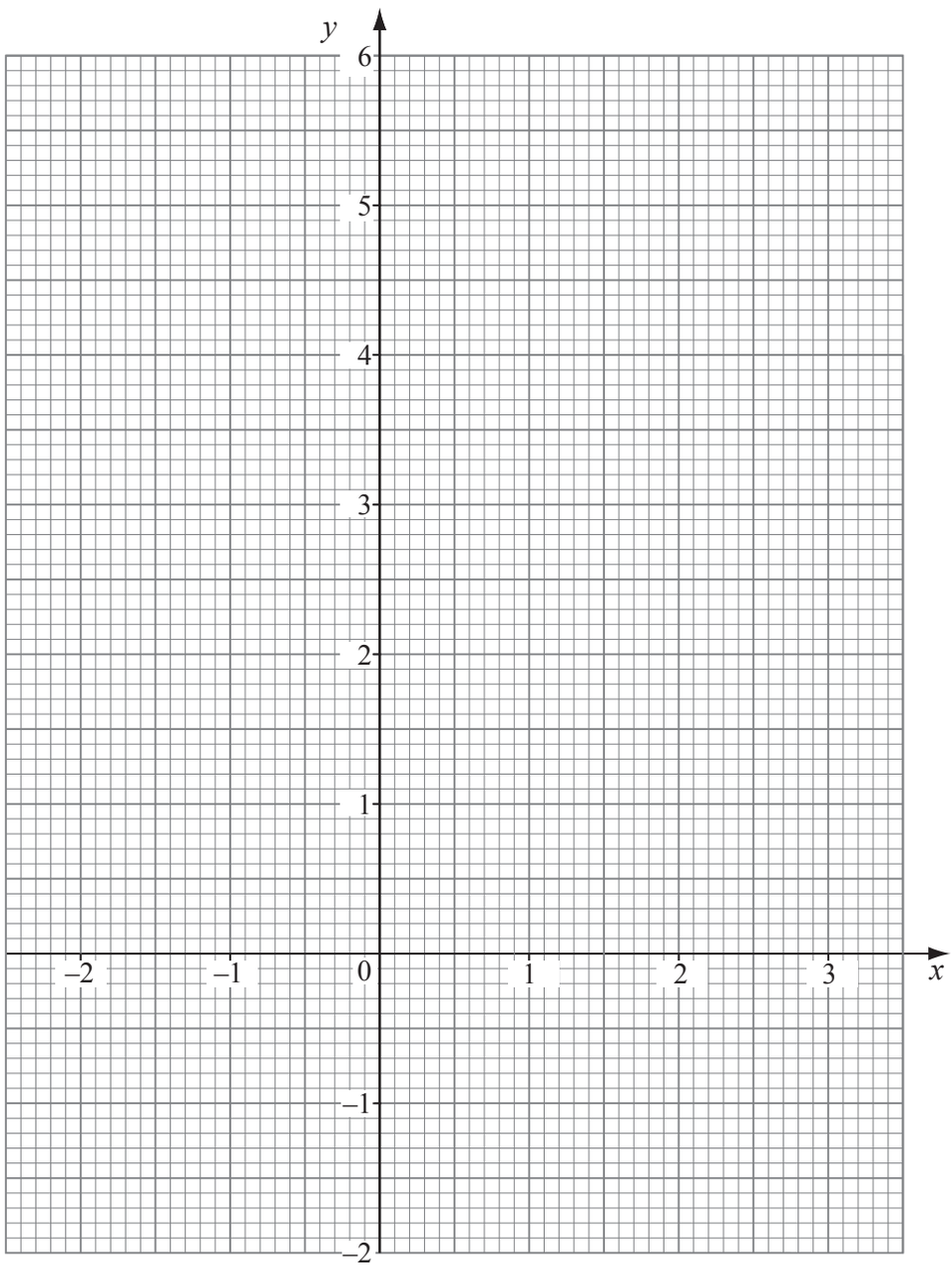
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9 **(a)** Complete the table of values for $y = x^2 - x - 1$

x	-2	-1	0	1	2	3
y		1	-1		1	5

[1]

(b) On the axes below, draw the graph of $y = x^2 - x - 1$ for values of x from -2 to 3 [2]



Examiner Only	
Marks	Remark

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(c) Use your graph to solve the equation

$$x^2 - x - 1 = 0$$

Answer $x =$ _____ [2]

(d) Use your graph to find the value of y when $x = -1.7$

Answer $y =$ _____ [1]

(e) From your graph estimate the minimum value of y.

Answer $y =$ _____ [1]

(f) By drawing an appropriate straight line on the grid opposite, find the positive solution of the equation $x^2 + x - 3 = 0$

Answer $x =$ _____ [3]

Examiner Only	
Marks	Remark
Total Question 9	

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10 Rearrange the formula $V = \frac{4}{3}\pi r^3$ to make r the subject.

Answer $r =$ _____ [2]

Examiner Only	
Marks	Remark
Total Question 10	

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11 **(a)** Work out the value of $\sqrt{5} \times \sqrt{5}$

Answer _____ [1]

(b) Write the number 0.000000567 in standard form.

Answer _____ [1]

Examiner Only	
Marks	Remark
Total Question 11	

[Turn over

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12 Rationalise the denominator of $\frac{30}{\sqrt{6}}$

Give your answer in its simplest form.

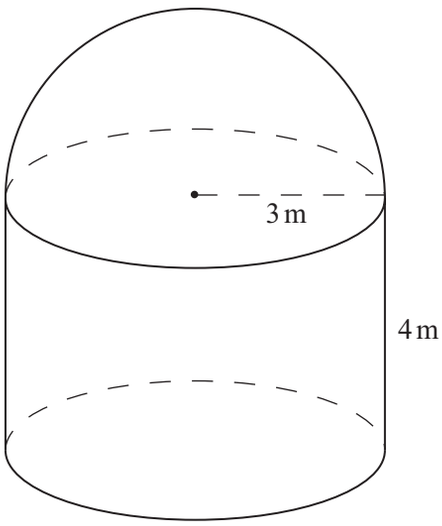
Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 12	

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13 The diagram shows an oil-tank made from a cylinder of radius 3 metres and height 4 metres with a hemisphere on top.

Calculate the volume of the oil-tank, giving your answer in terms of π.



Answer _____ m^3 [5]

Examiner Only	
Marks	Remark
Total Question 13	

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Quality of written communication will be assessed in this question.

14 Explain why $(n + 1)^2 + (n - 1)^2$ is always even for any integer value of n.

[2]

Examiner Only	
Marks	Remark
Total Question 14	

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15 What is the area of a square of side $(5+\sqrt{3})$ cm?

Give your answer in the form $a+b\sqrt{3}$

Answer _____ cm^2 [2]

Examiner Only	
Marks	Remark
Total Question 15	

THIS IS THE END OF THE QUESTION PAPER

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Question Number	**Marks**
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QWC	
Total Marks	

Examiner Number

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New Specification

Rewarding Learning

General Certificate of Secondary Education
2012

Mathematics

Unit T6 Paper 1
Higher Tier

[GMT61]

MONDAY 11 JUNE
1.30 pm–2.45 pm

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(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	$\frac{5}{12}$	MA2	2
	(allow A1 for identifying E,O,I,C,L)		
2	**(a)** 64, 8	A2	
	(b) **(i)** 6.89	A1	
	(ii) 537	A1	4
3	$\frac{1}{2}(8 + 12)5$	MA1	
	50	A1	2
4	**(a)** Correct enlargement (Allow A1 for 3 points correct)	A2	
	A1 for centre	A1	
	(b) correct reflection	A2	5
5	**(a)** 10	A1	
	(b) $\frac{2}{18}$ $\left(\frac{1}{9}\right)$	MA2	3
6	**(a)** $-3 \leqslant n < 1$	MA1	
	$-3,\ -2,\ -1,\ 0$	A1	
	(b) $\frac{-3(10 + 6)}{4}$	MA1	
	$\frac{-48}{4}$ **or** -3×4	MA1	
	-12	A1	5

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			AVAILABLE MARKS
7	$\frac{1}{1.5}$	MA1	
	$\frac{2}{3}$	A1	2
8	arcs	M1	
	line	A1	2
9	**(a)** 5 and –1	A1	
	(b) All points plotted accurately	A1	
	Smooth curve through all points	A1	
	(c) –0.6, 1.6	A1, A1	
	(d) 3.6	A1	
	(e) from graph	A1	
	(f) $x^2 - x - 1 = -2x + 2$	MA1	
	Draw straight line $y = -2x + 2$	A1	
	1.3	A1	10
10	$\frac{3V}{4\pi} = r^3$	MA1	
	$\sqrt[3]{\frac{3V}{4\pi}}$	A1	2
11	**(a)** 5	A1	
	(b) 5.67×10^{-7}	A1	2
12	$\frac{30}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$	MA1	
	$5\sqrt{6}$	A1	2
13	$\pi \times 3^2 \times 4$	MA1	
	36π	A1	
	$\frac{2\pi}{3} \times 3^3$	MA1	
	18π	A1	
	54π	A1	5

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				AVAILABLE MARKS
14	$n^2 + 2n + 1 + n^2 - 2n + 1$ **or** n odd $\quad$ even^2 + even^2 = even	MA1		
	$2n^2 + 2 = 2(n^2 + 1)$ which is even $\quad$ n even odd^2 + odd^2 = even	MA1		2
15	$(5 + \sqrt{3})(5 + \sqrt{3}) = 25 + 5\sqrt{3} + 5\sqrt{3} + 3$	MA1		
	$28 + 10\sqrt{3}$	A1		2
		Total		**50**

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