Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
January 2016

Mathematics

Unit T6 Paper 1
(Non-calculator)
Higher Tier

MV18

[GMT61]

WEDNESDAY 13 JANUARY, 9.15 am–10.30 am

Time

1 hour 15 minutes, plus your additional time allowance.

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.
Complete in blue or black ink only.
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 at the end of each question 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 pages 4 and 5.

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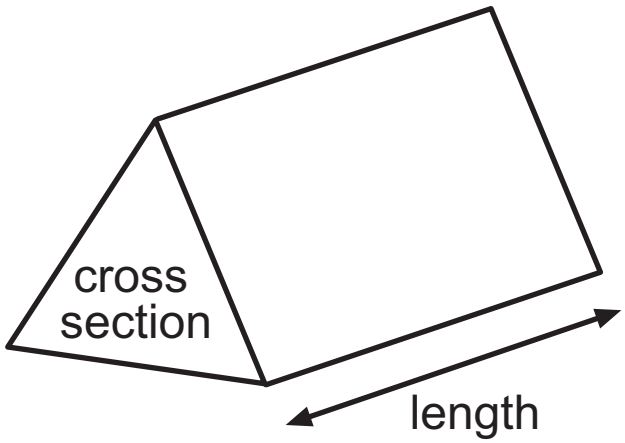
(Questions start on page 6)

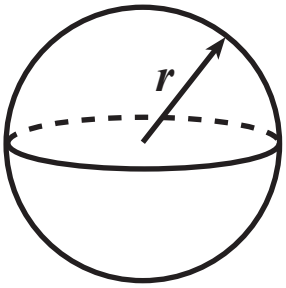
Formula Sheet

Volume of prism = area of cross section × length



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

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



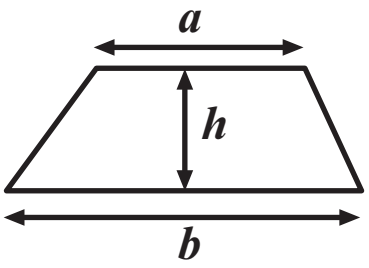
Quadratic Equation

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

where $a \neq 0$, are given by

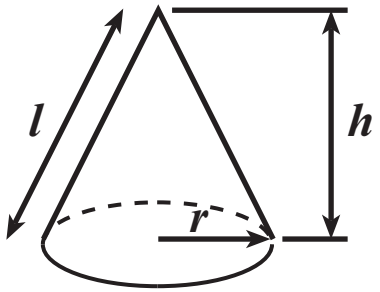
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

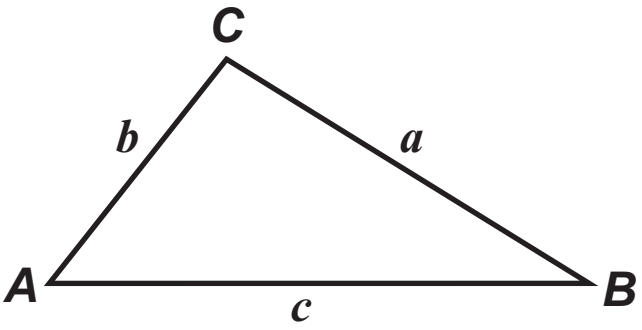


Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$



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

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

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

Answer $d =$ _____

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

(a) $\frac{54036}{7.9}$ [1 mark]

Answer _____

(b) $\frac{540.36}{68.4}$ [1 mark]

Answer _____

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. [1 mark]

Answer _____ because _____

_____

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

Is Mandy correct?

Give a reason for your answer. [1 mark]

Answer _____ because _____

_____

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

Show all your working. [2 marks]

Answer _____

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? [2 marks]

Answer **£** _____

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? [2 marks]

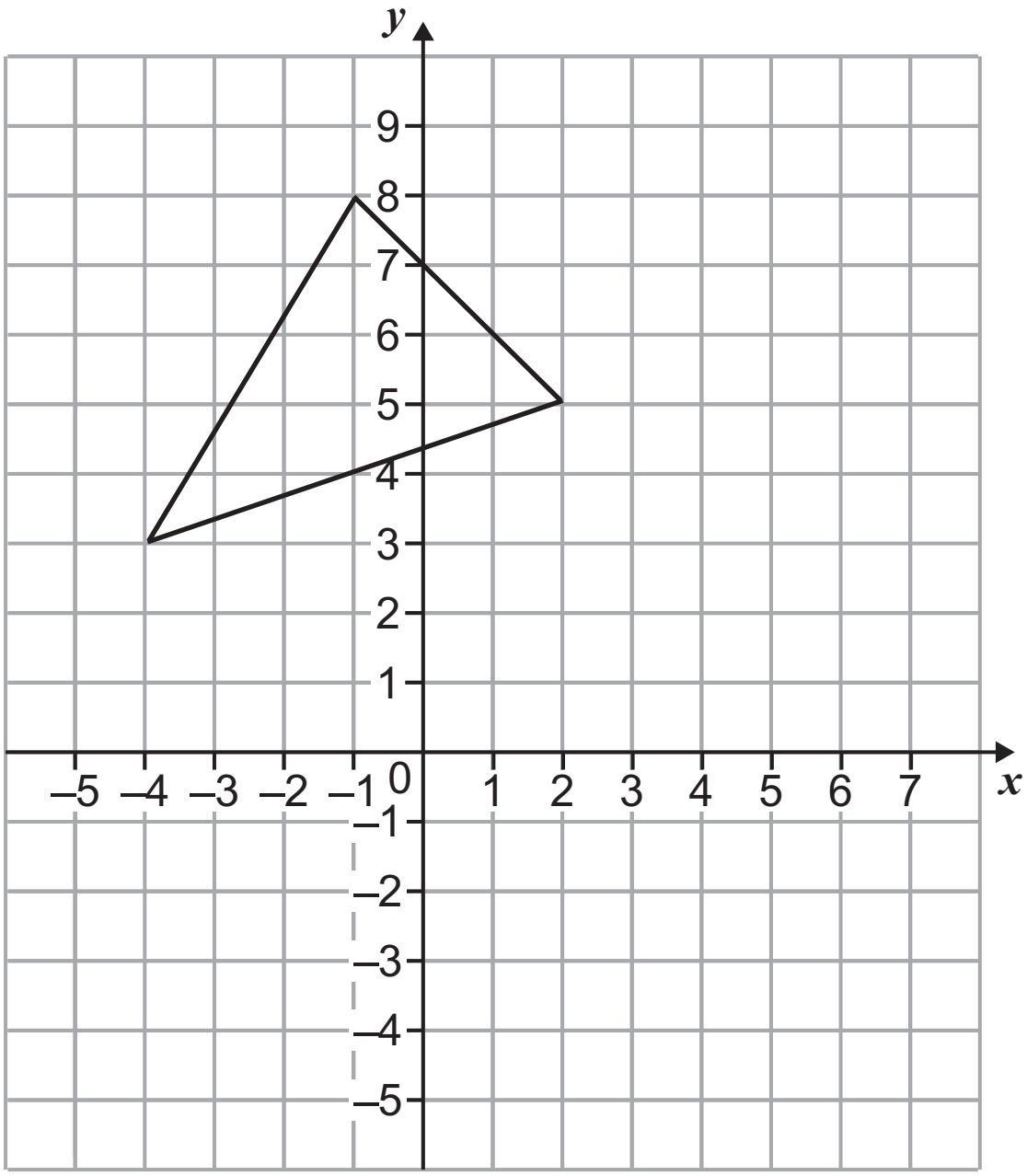
Answer _____

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. [3 marks]

Answer _____ mph

8



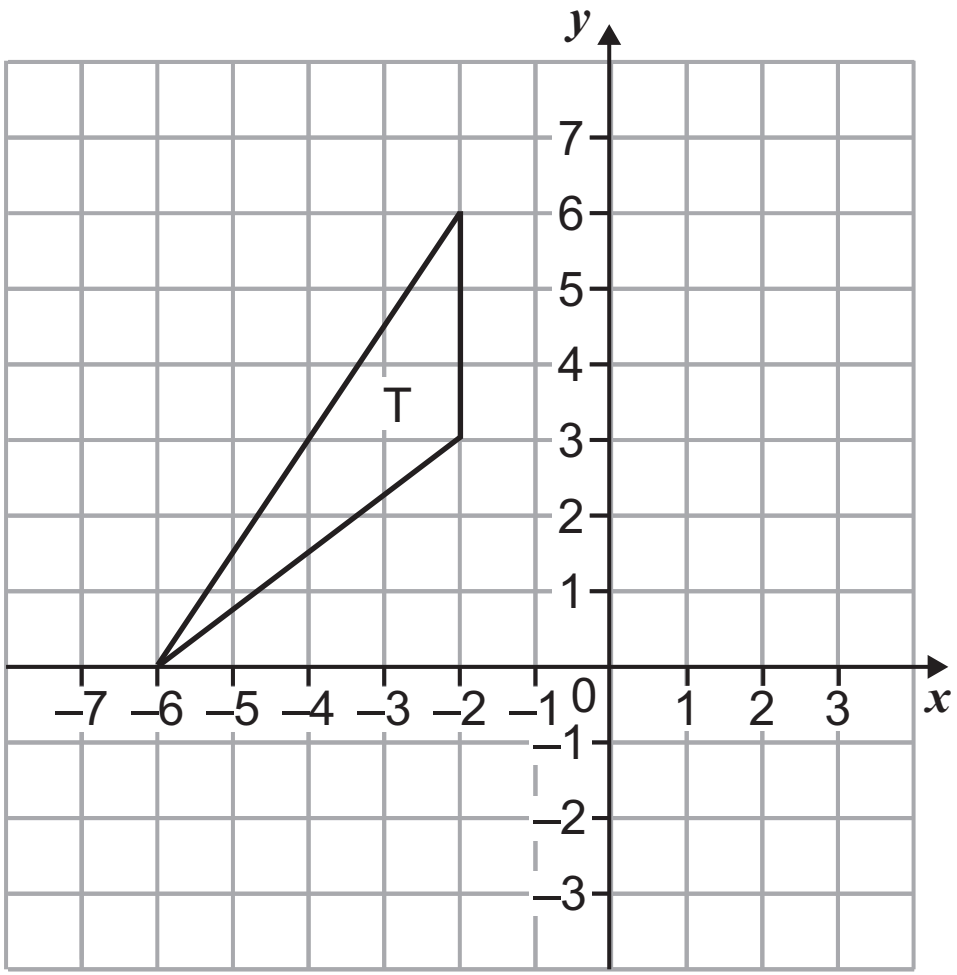
(a) On the diagram above, reflect the given triangle in the line $y = 2$

Label your answer A. [2 marks]

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

Label your answer B. [2 marks]

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



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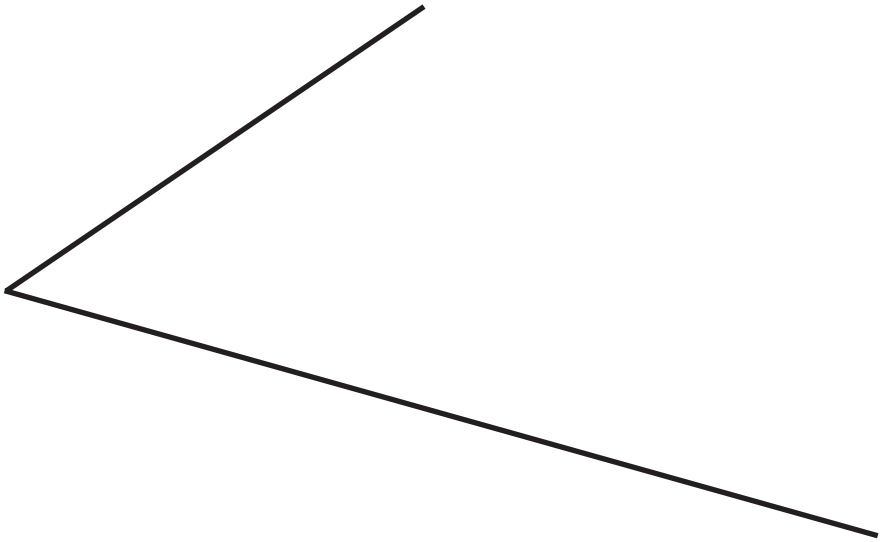
10 Using a ruler and compasses only, construct the bisector of the angle below.

You must show all construction lines. [2 marks]



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. [1 mark]

Answer _____ because _____

_____

(b) Simplify

$\frac{p^3}{p^7}$ [1 mark]

Answer _____

(c) Solve the inequality $-7 < 5n \leqslant 15$ for **integer** values of n. [3 marks]

Answer $n =$ _____

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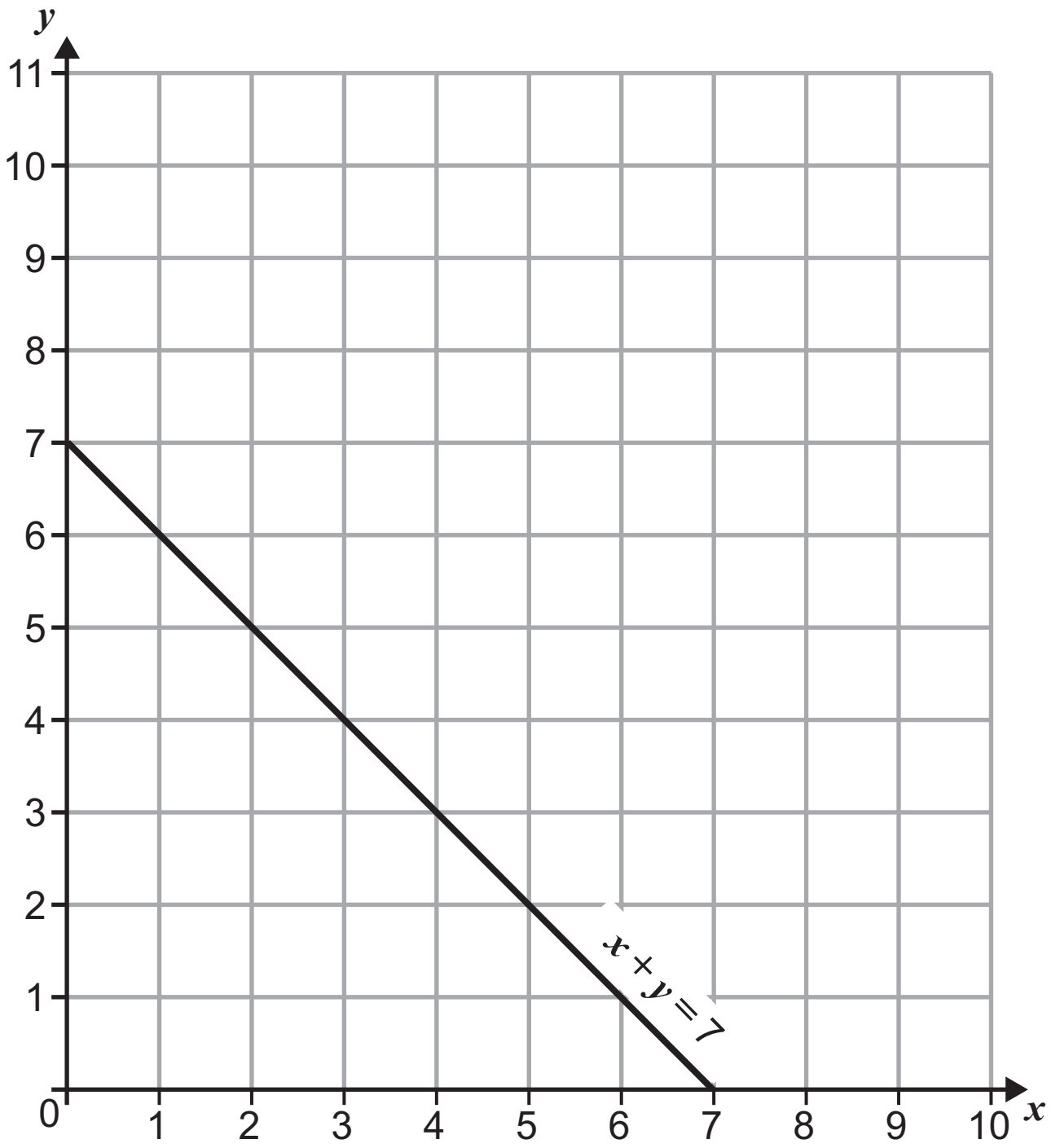
12 A cylinder has a base radius of 8 cm and a height of 36 cm.

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

What is the radius of the sphere? [4 marks]

Answer _____ cm

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



(a) On the diagram opposite 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 marks]

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

Answer _____

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

Give your answer in standard form. [2 marks]

Answer _____

(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. [2 marks]

Answer $x =$ _____ , $y =$ _____

15 Write the recurring decimal $0.2\dot{1}\dot{7}$ as a fraction. [2 marks]

Answer _____

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. [3 marks]

Answer _____

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

Answer _____

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 marks]

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	**Marks**
1	
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Examiner Number