**General Certificate of Secondary Education**
**2017**

# Mathematics

Unit T6 Paper 1
**(Non-calculator)**
Higher Tier

**MV18**

**[GMT61]**
**FRIDAY 2 JUNE, 9.15am–10.30am**

## 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 black ink only.
Answer **all fourteen** questions.
All working should be clearly shown in the spaces provided.
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 Question **9**.
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)**

**3**

# Formula Sheet

**Volume of prism** = area of cross section × length
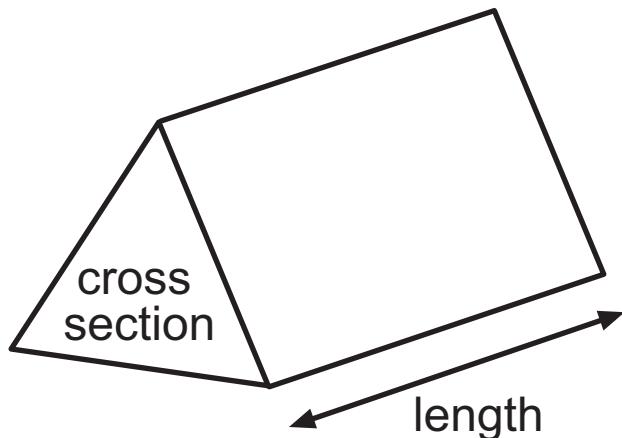


**Volume of sphere** $= \frac{4}{3}\pi r^3$

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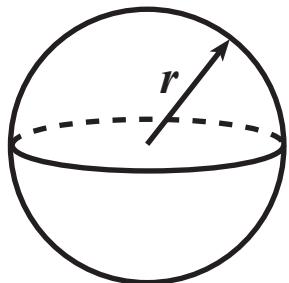


### Quadratic Equation

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** $= \frac{1}{2}(a+b)h$
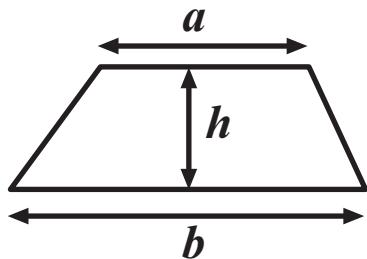


**Volume of cone** $= \frac{1}{3}\pi r^2 h$

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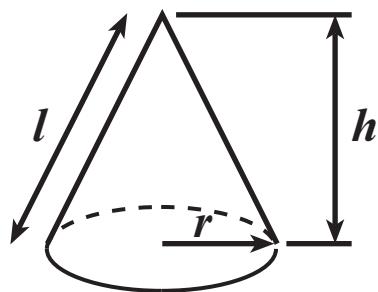


**In any triangle *ABC***
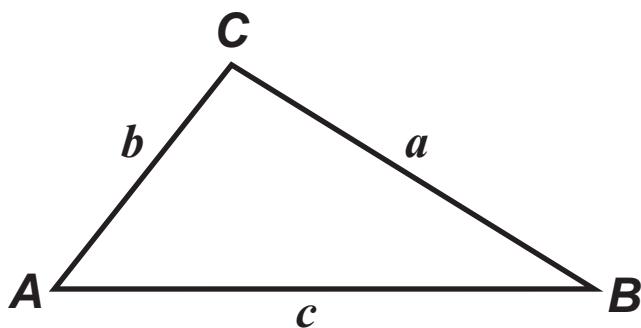


**Sine Rule:** $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

**1** $W = 5X - 2Y^2Z$

Work out the value of $W$ for $X = 5$, $Y = -3$, $Z = 4$
[3 marks]

Answer $W =$ _____

**2** Explain why two of the shapes below have an area of $66\,cm^2$ while the other shape does not. [4 marks]

15 cm · 5 cm · 4 cm · 18 cm · Shape A

11 cm · 6 cm · 6 cm · 11 cm · Shape B
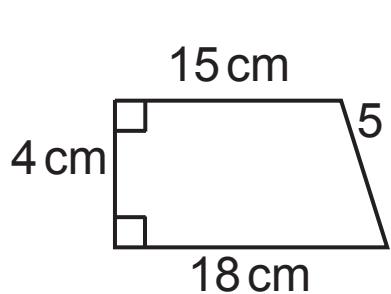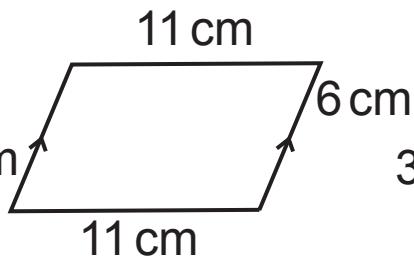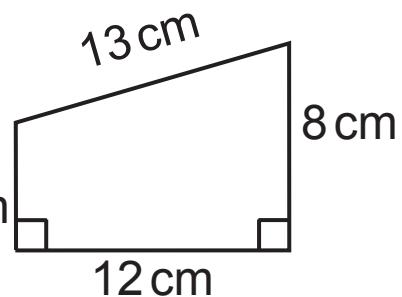
13 cm · 8 cm · 3 cm · 12 cm · Shape C

**3**
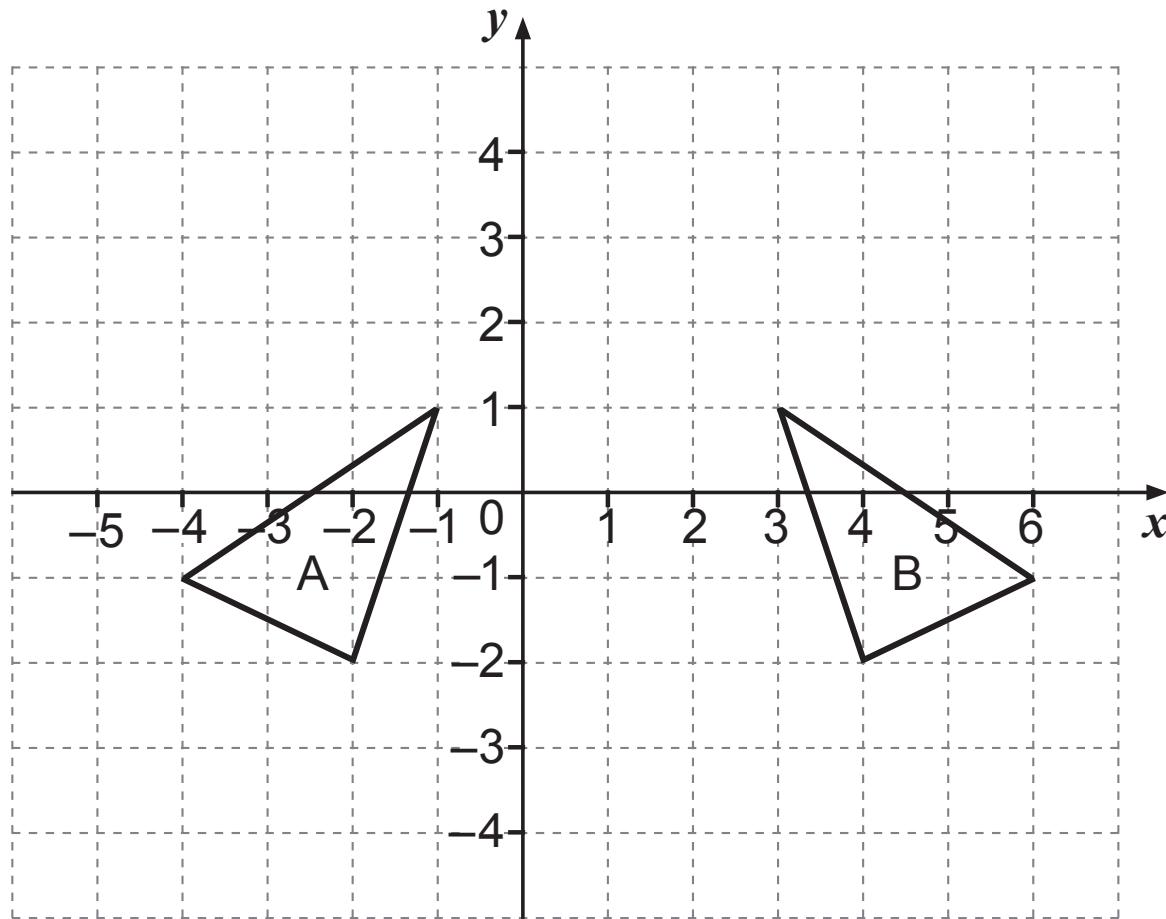


**(a)** Describe fully the single transformation which maps triangle A to triangle B.     [2 marks]

Answer _____

**(b)** Draw the image of triangle A after a rotation of 90° anticlockwise about the point (–1, 3).     [3 marks]

**4**   The diagram shows a pointer which spins about the centre
of a circular disc.
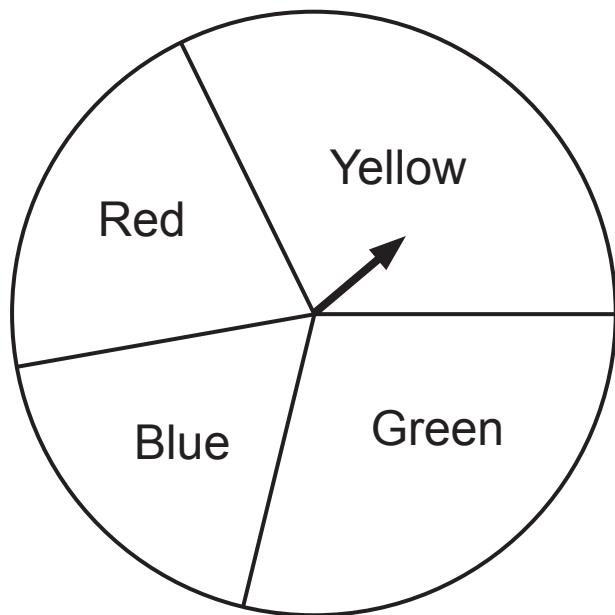


The disc is divided into sectors which are coloured Yellow,
Green, Red and Blue.

When the pointer is spun, it stops on one of the colours.

The probability that it will stop on Red, Blue or Green is given in the table.

| Red | Blue | Green | Yellow |
|-----|------|-------|--------|
| 0.19 | 0.22 | 0.27 | |

Jonathan is going to spin the pointer once.

**(a)** Work out the probability that the pointer will stop on Yellow.     [2 marks]

Answer _____

**(b)** Work out the probability that the pointer will stop on Red or Green.     [2 marks]

Answer _____

**5** **(a)** Lucy has a bag containing only 5p and 20p coins.

The ratio of the number of 5p coins to the number of 20p coins is 5 : 4

Work out the ratio of the total value of the 5p coins to the total value of the 20p coins.

Give your answer in its simplest form.     [2 marks]

Answer _____

**(b)** John and Mark share an amount of money in the ratio 5 : 6

Mark's share is **£**48

What was the total amount shared?     [2 marks]

Answer **£** _____

**6** The length of a rectangle is 3 times its width.

The width is $w$ cm



**(a)** Write down a formula for the area A of the rectangle in terms of $w$.   [1 mark]

Answer _____

**(b)** The area of the rectangle is 48 cm$^2$

Calculate the width of the rectangle.   [2 marks]

Answer _____ cm

**7** Complete the boxes   [2 marks]

$$\frac{2xy}{3y} \times \frac{\boxed{\phantom{xxx}}}{\boxed{\phantom{xxx}}} = \frac{4xy^2}{9xy}$$

**8**   Find the reciprocal of 2.5     [2 marks]



Answer _____



**Quality of written communication will be assessed in this question.**

**9**   Rearrange $p = 2q - 5r^2t$ to make $r$ the subject of the formula.     [3 marks]



Answer $r =$ _____

**10**
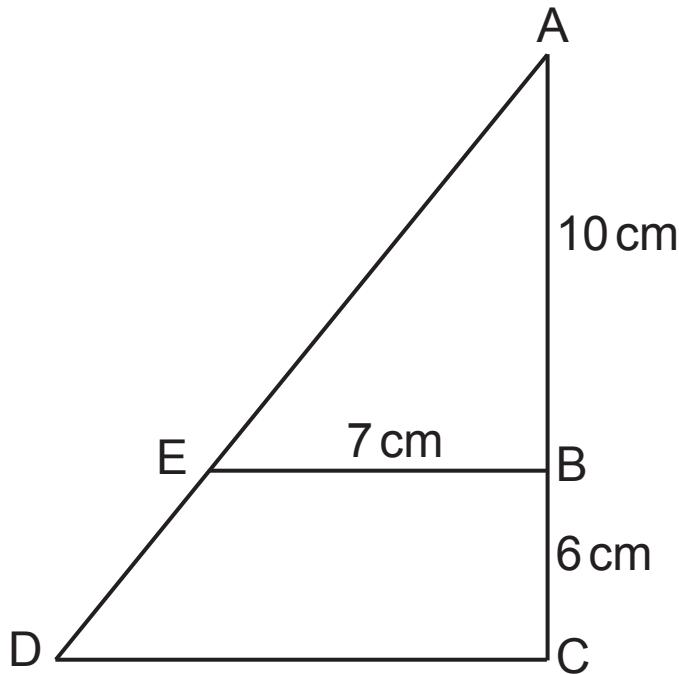


In the diagram above ABC and AED are straight lines.

EB is parallel to DC.

AB = 10 cm

BC = 6 cm

EB = 7 cm

Work out the length of DC.     [2 marks]

Answer _____ cm

**13**

**11** There are 12 socks in a drawer.

7 of the socks are black.

5 of the socks are white.

Stephen takes at random two socks from the drawer one after another without replacement.

**(a)** Complete the probability tree diagram below.
[3 marks]

1st sock          2nd sock

$$\begin{array}{ccc}
 & \text{- - - -} & \text{Black} \\
\text{- - - -}\quad\text{Black} & < & \\
 & \text{- - - -} & \text{White} \\
 & \text{- - - -} & \text{Black} \\
\text{- - - -}\quad\text{White} & < & \\
 & \text{- - - -} & \text{White}
\end{array}$$
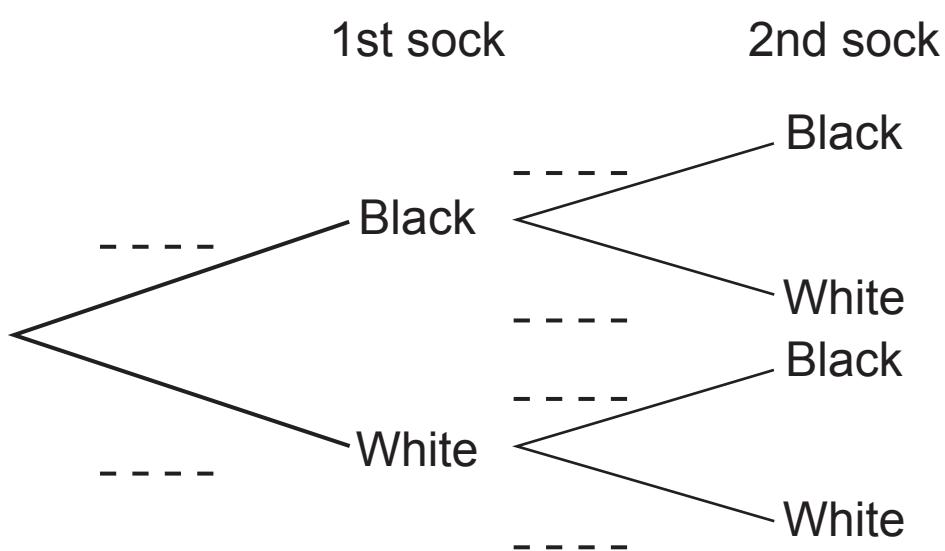
**(b)** Work out the probability that Stephen takes two socks of the same colour.     [3 marks]

Answer _____

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**(Questions continue overleaf)**

**12** The graph of $y = 2x^2 - x - 3$ for $-2.5 \leqslant x \leqslant 3$ is shown below.
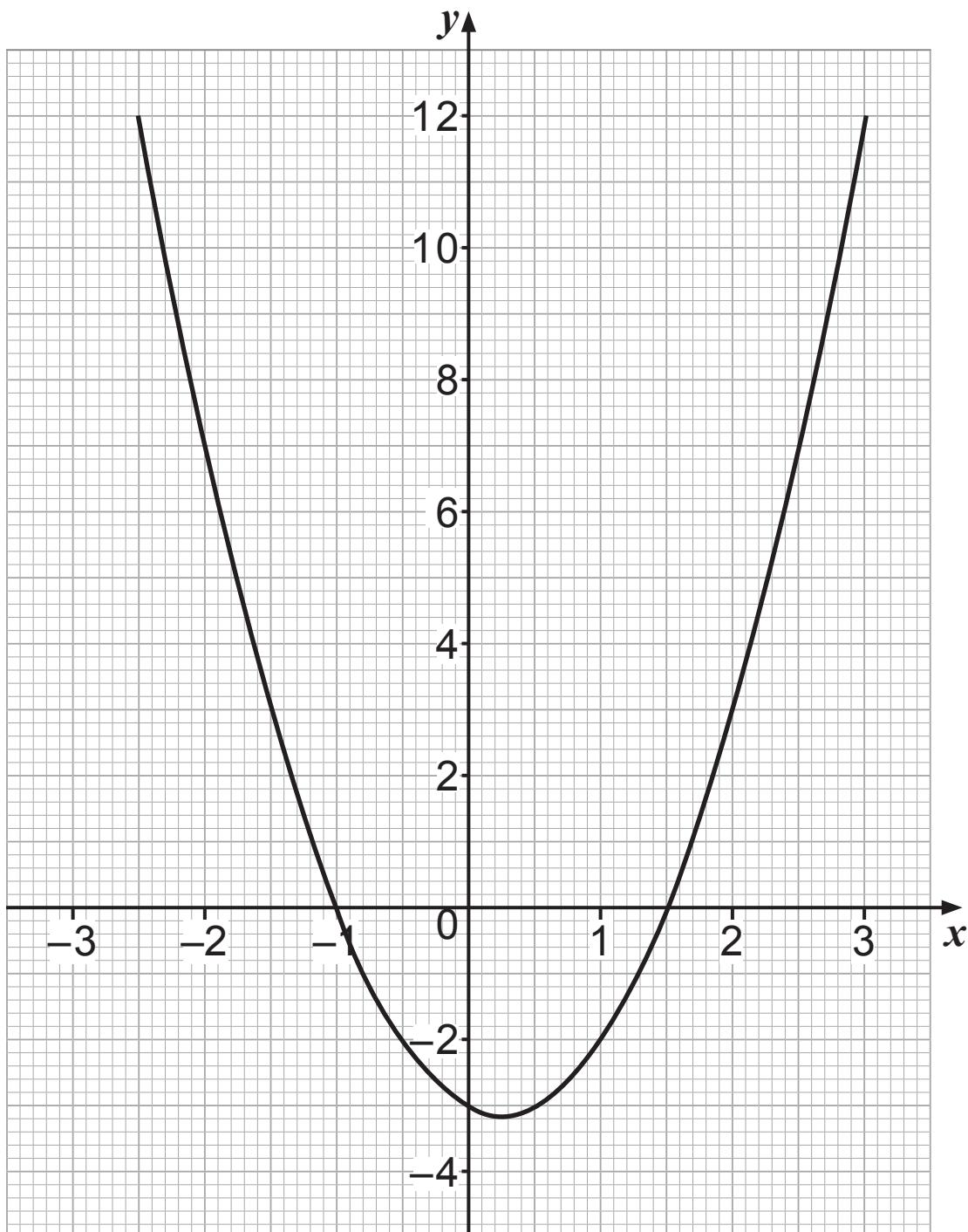
Use the graph to solve the equation

$$2x^2 - x - 3 = 3 - 1.5x \qquad \text{[3 marks]}$$

Answer $x = $ _____

**17**

**13 (a)** Work out and simplify

$(\sqrt{3} + \sqrt{27})^2$    [2 marks]

Answer _____

**(b)** $(6 - \sqrt{5})(3 + 2\sqrt{5}) = a + c\sqrt{5}$

Find the values of $a$ and $c$.    [3 marks]

Answer $a =$ _____ , $c =$ _____

**14** A solid metal cylinder has a base radius of $3x$ and a height of $32x$.

The cylinder is melted down and made into a sphere of radius $r$.

All lengths are in cm.

Find an expression for $r$ in terms of $x$.    [4 marks]

Answer $r = $ _____

_____

**THIS IS THE END OF THE QUESTION PAPER**

_____

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

Examiner Number

10606.04 **MV18**