![cea Rewarding Learning logo]

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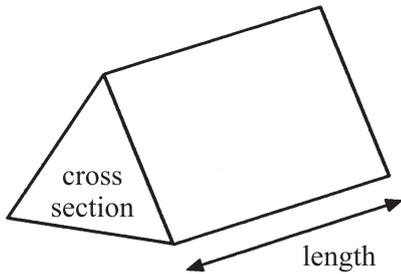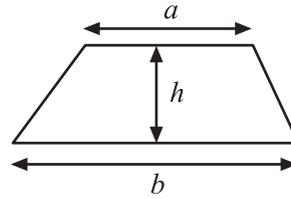You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

9316

Formula Sheet

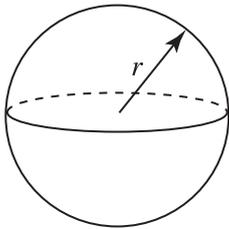**Volume of prism** $=$ area of cross section $\times$ length

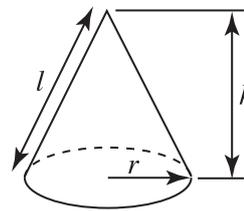
Area of trapezium $= \frac{1}{2}(a+b)h$

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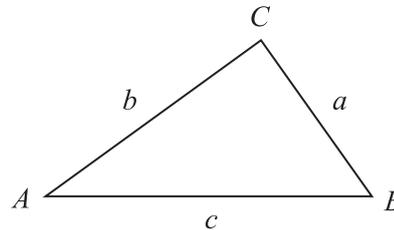
Curved surface area of cone $= \pi r l$

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

9316

16GMT6102

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

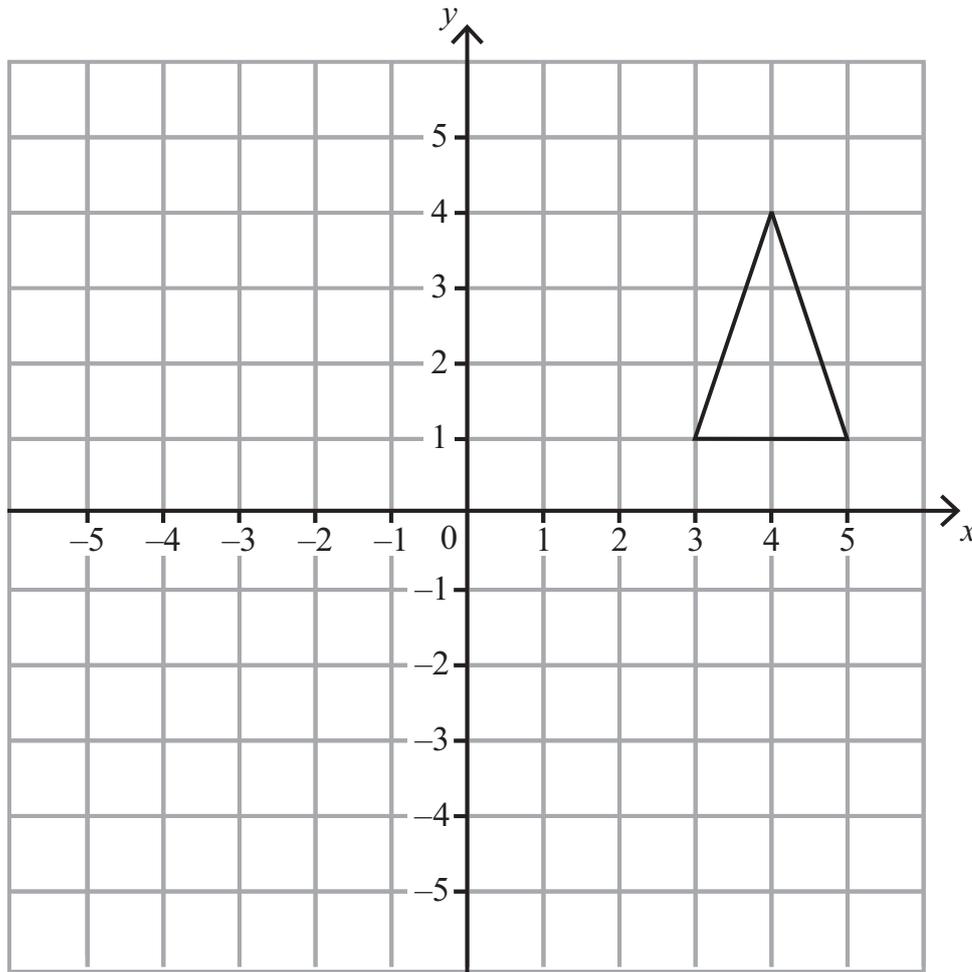Answer V = _____ m/s [3]

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

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

Answer T = _____ [3]

[Turn over

9316

4 Rotate the triangle 90° anticlockwise about the origin.

[3]

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.
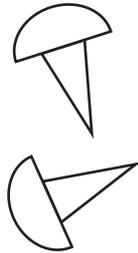How much profit did this game make?

Answer £ _____ [6]

[Turn over

9316

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]

9316

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]

9316

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.
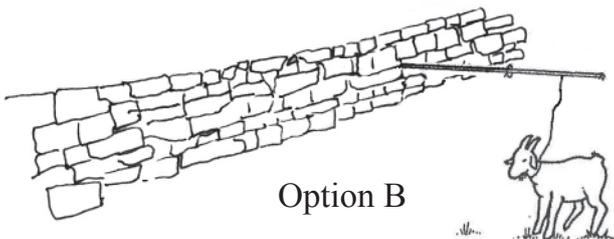Option A: the rope is attached to a pole.
Option B: the rope is attached to (and can slide along and rotate around) a horizontal pole which extends 6 m at right angles from a very long wall.
Option C: the rope is attached to the corner of a shed which is 8 m long and 6 m wide.

Option A

Option C

Option B

9316

16GMT6108

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

9316

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]

9316

16GMT6110

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
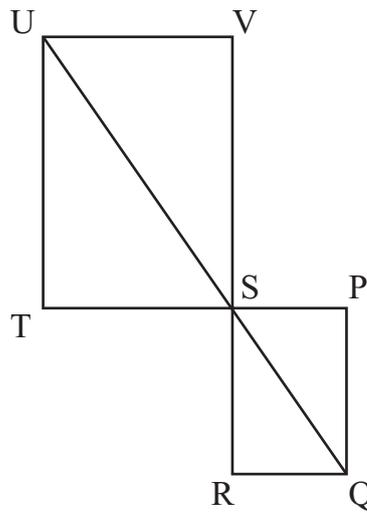   If it doesn't snow the first day, the probability of it snowing the following day is 0.15

   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]

9316

16GMT6112

(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

9316

16GMT6113

12 **(a)** **Show clearly** that the solutions to the equation $2x - \dfrac{12}{x} = \dfrac{x}{2} + 2$

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

$y = 2x - \dfrac{12}{x}$ to solve the equation $4x^2 - 2x - 12 = 0$

Find the values of a and b.

Answer a = _____ b = _____ [4]

THIS IS THE END OF THE QUESTION PAPER

DO NOT WRITE ON THIS PAGE

9316

16GMT6115

DO NOT WRITE ON THIS PAGE

9316

16GMT6116