Centre Number

71

Candidate Number

cea

Rewarding Learning

General Certificate of Secondary Education
January 2012

Mathematics

Module N6 Paper 1
(Non-calculator)
Higher Tier

[GMN61]

MONDAY 16 JANUARY
9.15 am–10.30 am

GMN61

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 this question paper.
Answer **all thirteen** 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 56.
Figures in brackets printed down the right-hand side of pages indicate
the marks awarded to each question or part question.
  You should have a ruler, compasses, set-square and protractor.
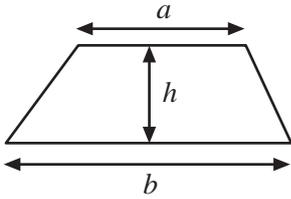The Formula Sheet is on page 2.

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

7277
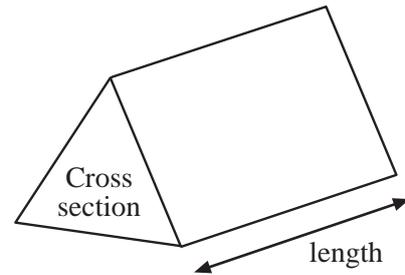
Formula Sheet

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

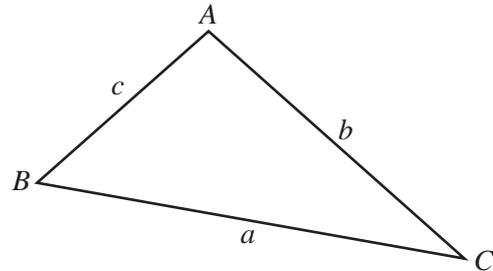**Volume of prism** = area of cross section × length

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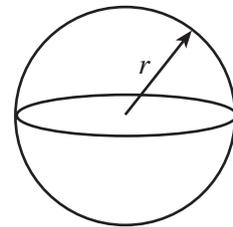
Area of triangle $= \frac{1}{2}ab \sin C$

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

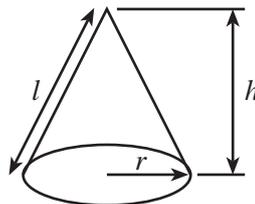**Cosine rule:** $a^2 = b^2 + c^2 - 2bc \cos A$

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

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

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

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

Quadratic equation:

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

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

1 **(a)** Given that $\dfrac{1560}{24} = 65$ write down the answer to

(i) $\dfrac{1560}{240}$

Answer _____ [1]

(ii) 2.4×6.5

Answer _____ [1]

(b) Write 0.45555… as a recurring decimal.

Answer _____ [1]

(c) **(i)** Estimate $\dfrac{42 \times 596}{78}$

Show your working.

Answer _____ [2]

(ii) Estimate $\dfrac{213}{0.39}$

Show your working.

Answer _____ [2]

3

[Turn over

2   A six-sided dice is biased.

(a) The table below gives the probability of some outcomes when the dice is rolled once.

Outcome	1	2	3	4	5	6
Probability	0.1		0.15		0.22	0.25

(i) The probability of getting a 2 is the same as the probability of getting a 4. Complete the table above for the missing probabilities.

[2]

(ii) The dice is rolled 500 times. How many times would you expect to get a 5?

Answer _____ times [2]

(b) Boris plays a game of chess with his friend Gary.

He states, "I can win, draw or lose, so the probability that I will win must be $\frac{1}{3}$ ".

Explain why Boris is wrong.

_____

_____ [2]

4

3 $a = \dfrac{b-c}{d}$

Calculate the value of a when $b = -6$, $c = 10$ and $d = 4$

Answer $a = $ _____ [2]

---

4 Ruth has a bag containing 27 white balls and some black balls.

If a ball is taken at random from the bag, the probability that it will be white is $\frac{3}{5}$

(a) Work out the number of black balls that are in the bag.

Answer _____ black balls [2]

Ruth now puts some more black balls into the bag.

If a ball is now taken at random from the bag, then the probability that it will be black is $\frac{2}{3}$

(b) How many black balls did Ruth add to the bag?

Answer _____ black balls [2]

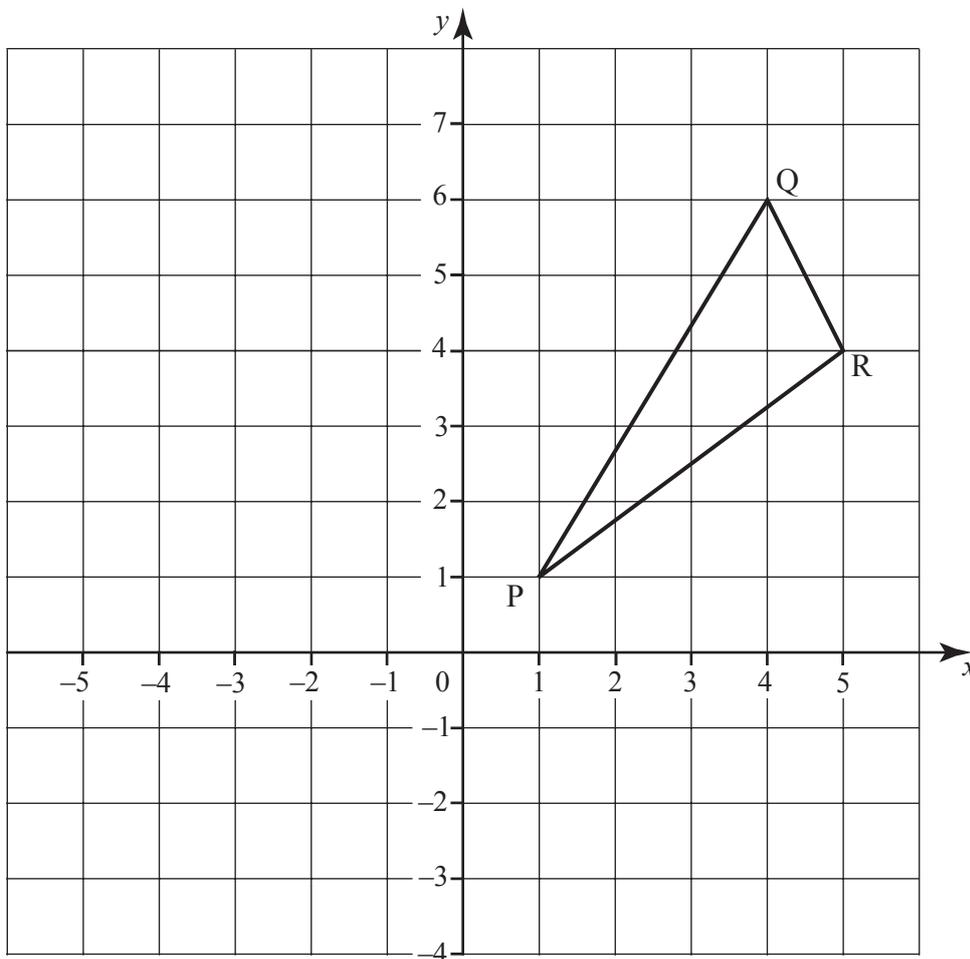**5** **(a)** Reflect the shape in the line $x = 3$.
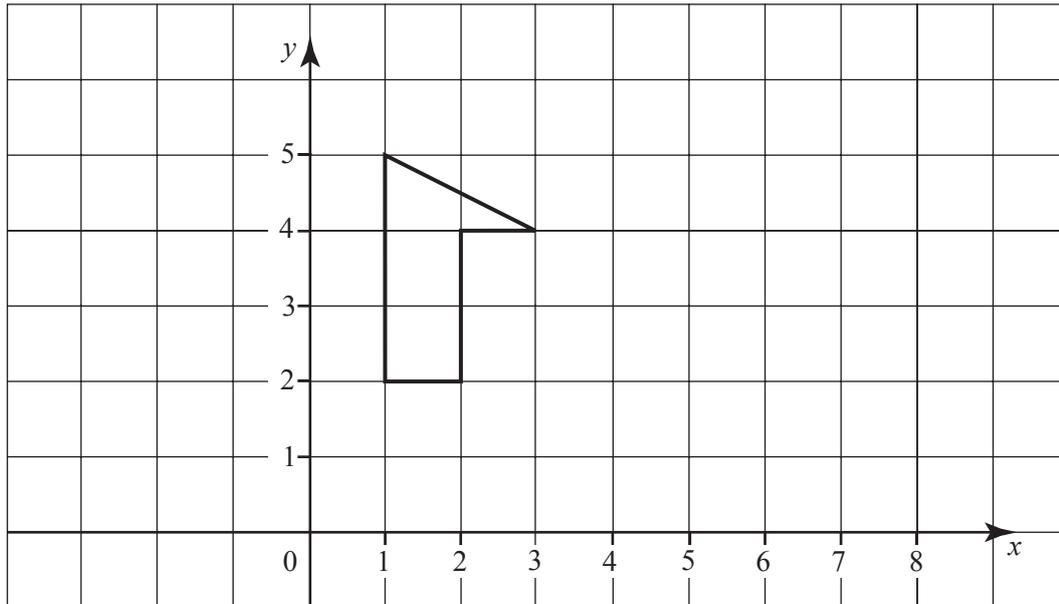
[2]

(b) Rotate the triangle PQR 90° anticlockwise about the point $(2, -1)$.

[2]

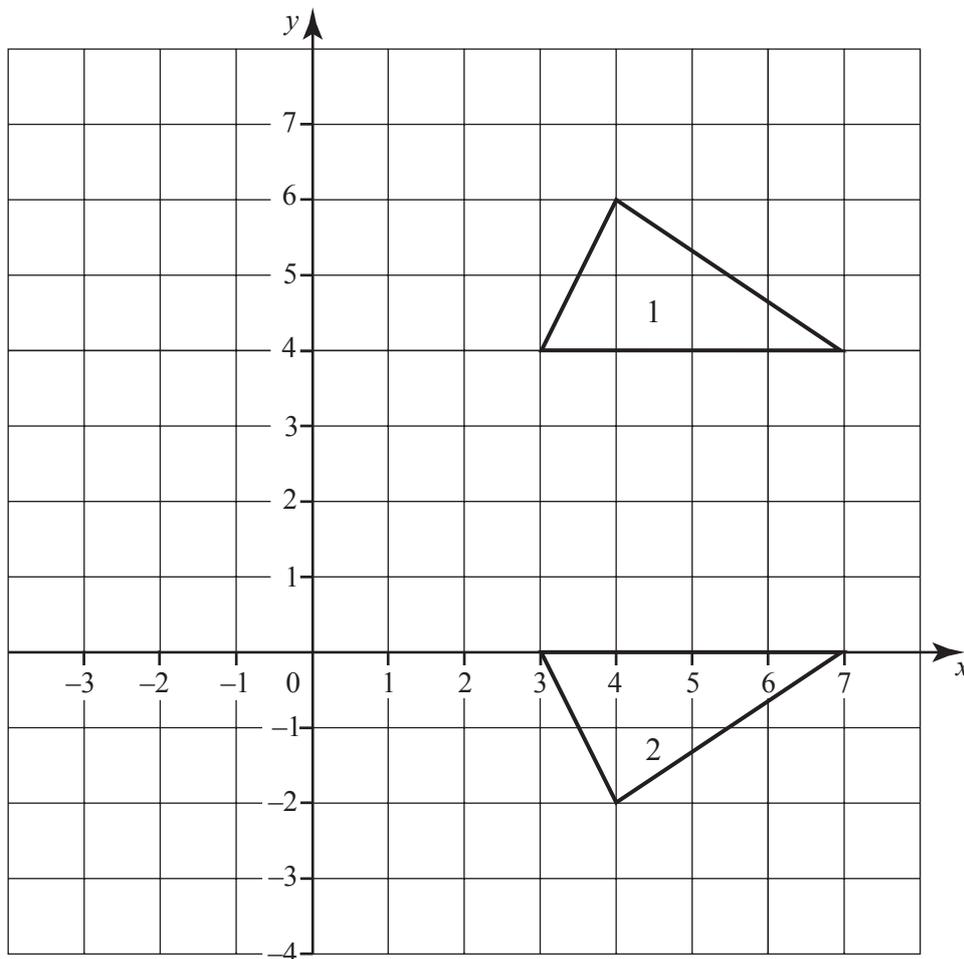**(c) (i)** Describe fully the single transformation which maps triangle 1 onto triangle 2

Answer _____ [2]

(ii) Draw the image of **triangle 1** after a translation 6 left and 1 up. [2]

[Turn over

6 **(a)** "If a and b are square numbers, then the product of a and b is **always** an even number." Is this statement true or false? Explain your answer.

Answer _____ because _____

_____ [1]

(b) Simplify

(i) $\dfrac{t^3}{t^8}$

Answer _____ [1]

(ii) $\dfrac{t^2 \times t^7}{t^3}$

Answer _____ [1]

(c) Solve the inequality $-5 < 3n \leq 9$ for **integer** values of n.

Answer $n = $ _____ [3]

(d) Complete the identity $x(x + 4) \equiv x^2$ [1]

7 Calculate $(4 \times 10^9) \times (3 \times 10^{-6})$ giving your answer in standard form.

Answer _____ [2]

8

8   A bag contains a number of coloured counters. Some of them are green.

A counter is taken at random from the bag.

Its colour is recorded and the counter is put back into the bag.

This is repeated 300 times.

The total number of green counters taken from the bag and replaced is recorded after 100 trials, 200 trials and 300 trials as shown in the table.

Number of trials	Number of green counters	Relative Frequency
100	45	
200	105	
300	144	

(a) Complete the table to show the relative frequencies.   [1]

(b) If a counter is picked at random from the bag, estimate the probability of it being green.

Answer _____ [1]

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9   **(a)** Expand and simplify $(n + 3)^2 - (n - 3)^2$

Answer _____ [2]

(b) Rearrange $P = \sqrt{QR}$ to make R the subject.

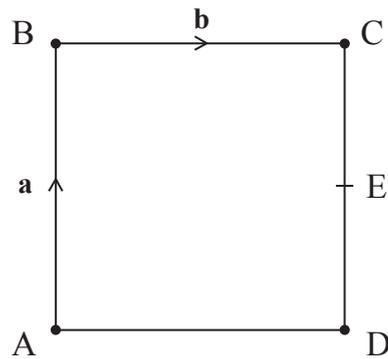Answer $R =$ _____ [2]

[Turn over

10   y is inversely proportional to the square of x and $y = 5$ when $x = 3$

(a) Express y in terms of x.

Answer $y =$ _____ [3]

(b) Hence find the value of y when $x = \frac{1}{2}$

Answer $y =$ _____ [1]

11   Write the recurring decimal $0.1\dot{4}\dot{5}$ as a fraction.

Answer _____ [2]

12   $w = \sqrt{40}$ $x = \sqrt{2}$ $y = \sqrt{5}$

Simplify fully $\dfrac{w}{xy}$

Answer _____ [2]

13 In the square ABCD, $\overrightarrow{AB}$ represents the vector **a** and $\overrightarrow{BC}$ represents the vector **b**.

E is the midpoint of CD. F is a point on AE such that $AF : FE = 2 : 1$

Express the following in terms of **a** and/or **b**

(a) (i) $\overrightarrow{BD}$

Answer _____ [1]

(ii) $\overrightarrow{AE}$

Answer _____ [1]

(iii) $\overrightarrow{AF}$

Answer _____ [1]

(b) Using vectors find the ratio $BF : FD$
Show your working.

Answer _____ [3]

_____

THIS IS THE END OF THE QUESTION PAPER

_____

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