71

Candidate Number

![cea Rewarding Learning logo]

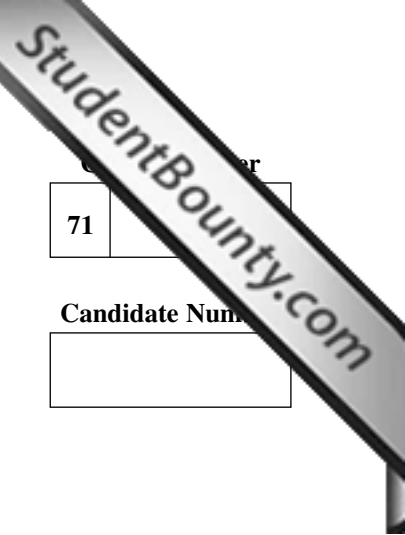**General Certificate of Secondary Education**

January 2010

Mathematics

Module N6 Paper 1
(Non-calculator)
Higher Tier

[GMN61]

GMN61

FRIDAY 15 JANUARY

9.15 am – 10.30 am

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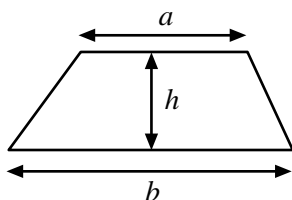You **must not** use a calculator for this paper.

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.
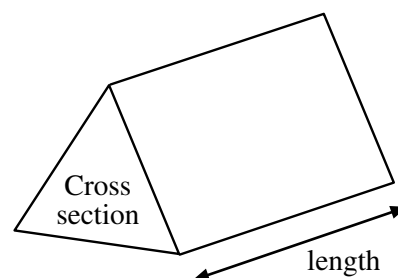The Formula Sheet is on page 2.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
Total Marks	

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Formula Sheet

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

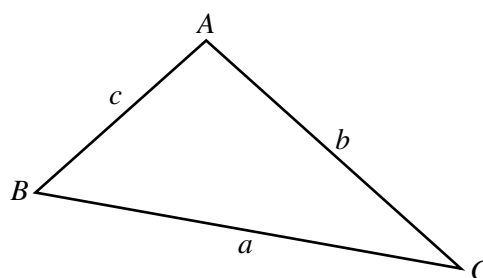**Volume of prism** = area of cross section × length

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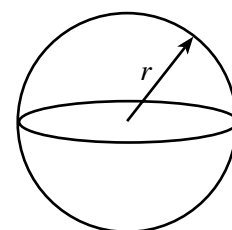
Area of triangle $= \frac{1}{2}ab\sin C$

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

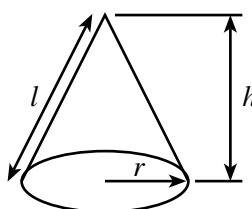**Cosine rule:** $a^2 = b^2 + c^2 - 2bc\cos A$

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

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

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1 **(a)** Jill takes 120 steps to cover 72 metres.
What distance will she cover in taking 90 similar sized steps?

Answer _____ m [2]

(b) A recipe for 2 medium glasses of Apple and blackcurrant smoothie uses

250 ml   Apple and blackcurrant juice
2 tablespoons   Natural yoghurt
180 ml   Milk
3 scoops   Vanilla ice cream

Complete the recipe for 5 medium glasses.

Answer

_____ ml   Apple and blackcurrant juice

5 tablespoons   Natural yoghurt

_____ ml   Milk

_____ scoops   Vanilla ice cream   [2]

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2 Complete the identities

(a) $\dfrac{x}{4} \equiv \dfrac{3x}{\_\_\_\_}$ [1]

(b) $3(y + 2) - 2y \equiv y \_\_\_\_$ [1]

3 In a fairground game of chance, 120 people buy one ticket each.
The cost of a ticket is 50p.
The probability that a person wins a prize is $\frac{1}{12}$
Each winning ticket gets a prize of £1.50
What profit is made by the fairground?

Answer £ _____ [2]

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4 Given that $49 \times 123 = 6027$

Find

   (a) 4.9×12.3 Answer _____ [1]

   (b) $602.7 \div 4.9$ Answer _____ [1]

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5   **(a)** Use the formula $P = 3R - 4(Q - 2)$ to find the value of P when $Q = -8$ and $R = -6$

Answer $P =$ _____ [3]

  (b) Use the formula $L = \dfrac{M(N + 8)}{6}$ to find the value of L when $M = 9$ and $N = -30$

Answer $L =$ _____ [3]

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6 **(a)** Rearrange $2p - 3 = 6 - q$ to make q the subject.
Simplify your answer.

Answer $q = $ _____ [2]

(b) Simplify

(i) $d^3 \times d^4$

Answer _____ [1]

(ii) $\dfrac{e^8}{e^4}$

Answer _____ [1]

(iii) $\dfrac{f \times f^3}{f^9}$

Answer _____ [1]

(c) "If a and b are prime numbers, then $a \times b$ is always an odd number."
Is this statement true or false? Explain your answer.

Answer _____ because _____

_____[1]

7 Jill and Joan both work in the same office.
The probability that Jill is late for work on a given day is 0.15
The probability that Joan is late for work on a given day is 0.2

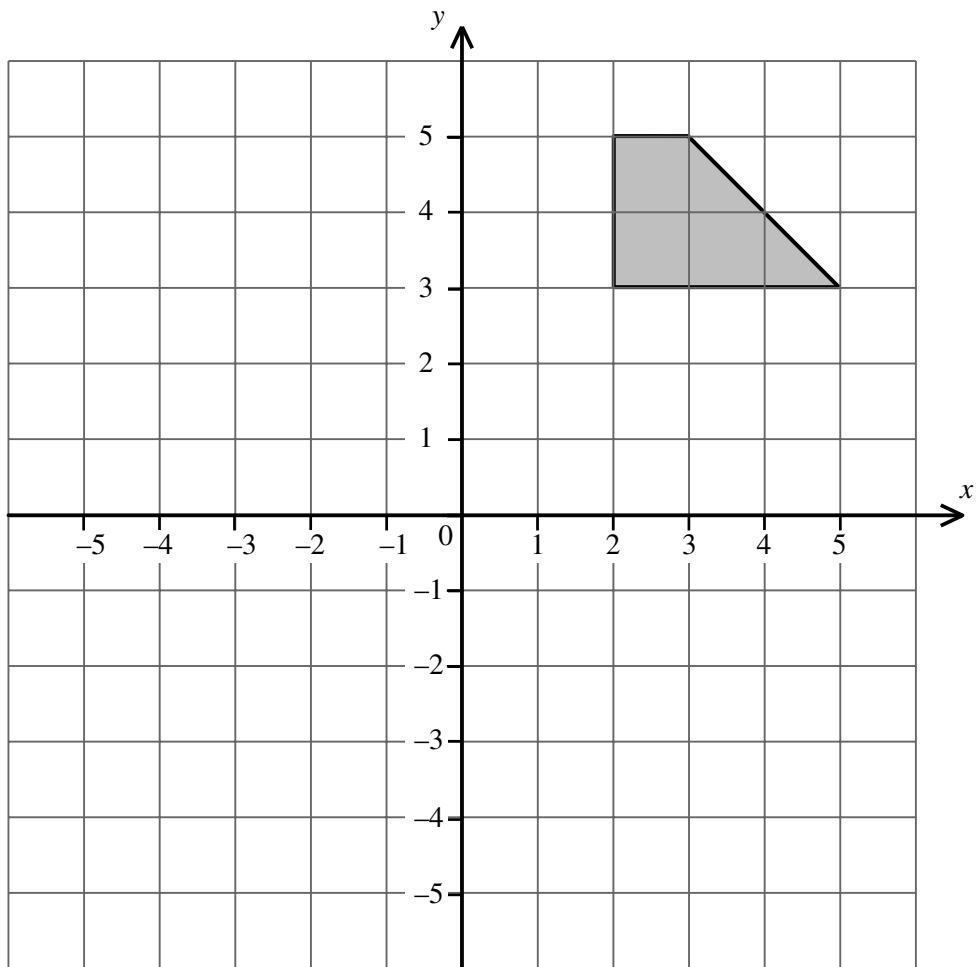**(a)** What is the probability that both of them are late for work on the same day?

Answer _____ [2]

(b) What assumption did you make in answering part **(a)**?

Answer _____[1]

[Turn over

8 **(a)** Reflect the shape below in the line $y = 1$

[2]

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(b)
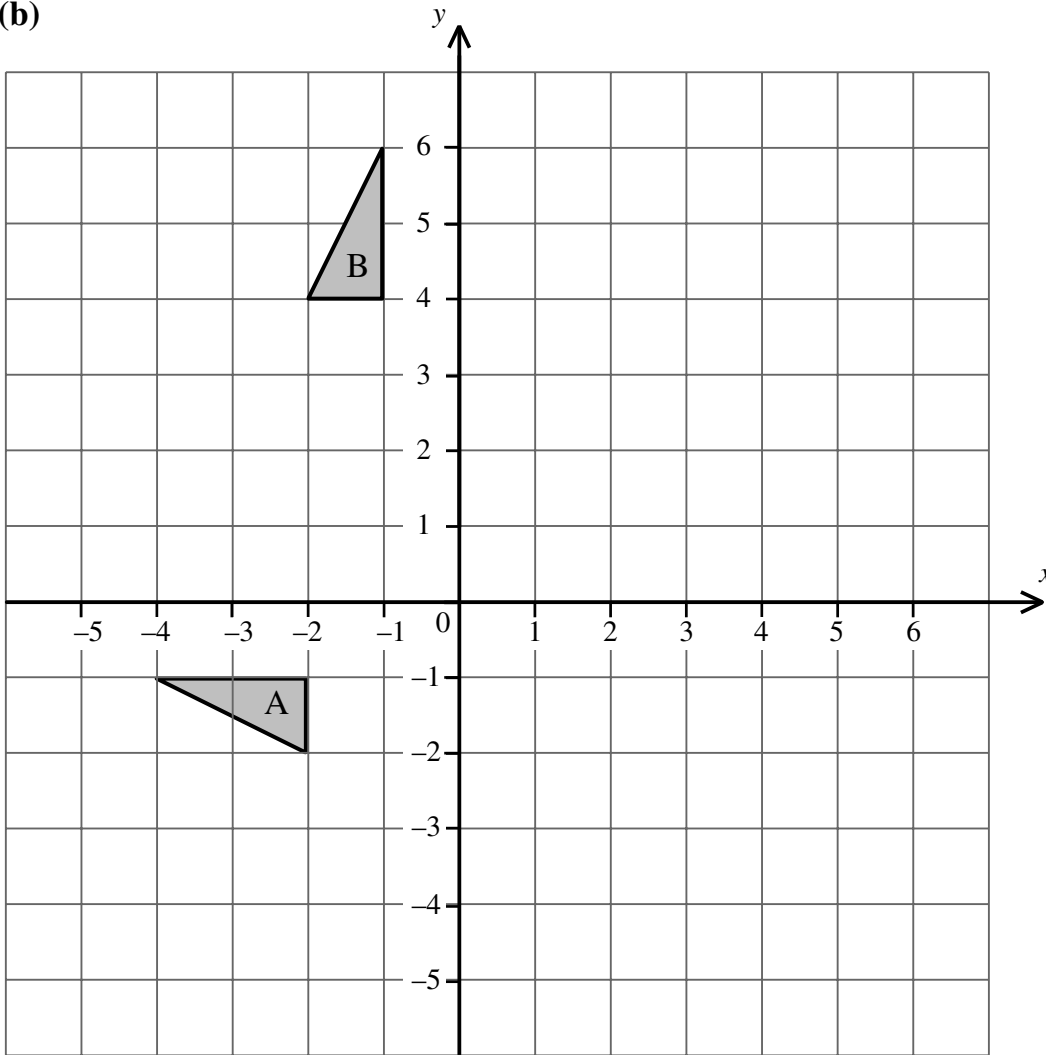
(i) Draw the image of triangle A after a translation $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ [2]

(ii) Describe fully the **single** transformation which maps triangle A onto triangle B.

Answer _____

_____ [3]

[Turn over

9 Opposite faces of a dice add up to give seven.
As shown, the total of the numbers on the front faces is $3 + 2 + 5 = 10$
In one move, **each** dice below is rotated in the direction shown one face at a time (a quarter turn).
After two moves, what will be the total of the numbers on the **front** faces?
Show your working.
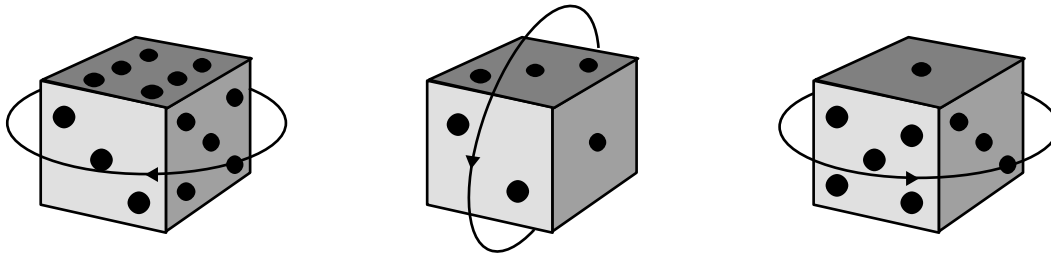
Answer **Total** = _____ [2]

10 In a survey of 200 cars crossing a bridge, 45 had no passengers.
On a day when 4000 cars cross the bridge, how many cars would you expect to have no passengers?

Answer _____ [2]

11 Brenda knows that one of the following formulae can be used to find the correct area of a shape. Each letter a, b, c, d represents a length.

Which is the correct formula? Give a reason for your answer.

A $\pi ac^2 + ab^2$ B $\pi a^2 b + bc^2$

C $\frac{1}{3}b + \pi c$ D $\frac{1}{4}cd + a^2$

Answer _____

because _____ [2]

12 Show that $(n + 2)^2 - (n - 2)^2 \equiv 8n$

[2]

13 (a) Which of the following is closest to $\sqrt{0.91}$?
Circle your answer.

0.45   0.3   0.9   [1]

(b) Write $0.1\dot{7}$ correct to 3 decimal places.
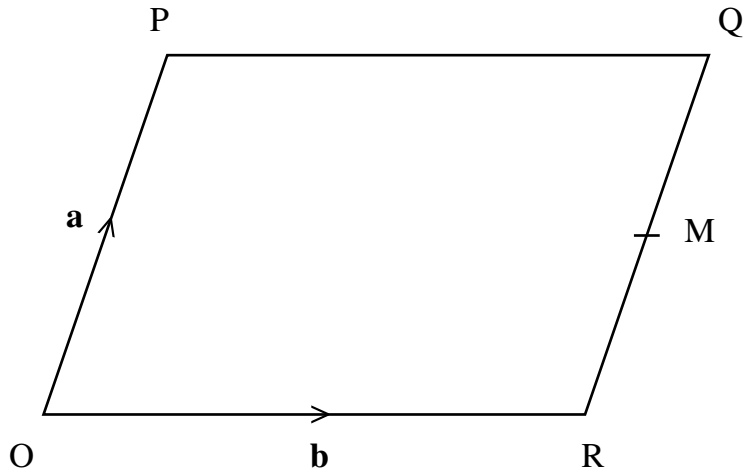
Answer _____ [1]

(c) Write the recurring decimal $0.2\dot{1}\dot{5}$ in fraction form.

Answer _____ [2]

14 Simplify $(3x^2y^3)^4$

Answer _____ [2]

[Turn over

15

OPQR is a parallelogram. M is the mid-point of RQ.

$\overrightarrow{OP}$ = **a** and $\overrightarrow{OR}$ = **b**

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

(a) $\overrightarrow{QP}$,   Answer _____ [1]

(b) $\overrightarrow{OM}$,   Answer _____ [1]

(c) $\overrightarrow{PM}$.   Answer _____ [1]

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16 $(x - 4)^2 + e \equiv x^2 - dx + 21$

(a) Find values for d and e.

               Answer d = _____ e = _____ [2]

(b) Hence write down the minimum value of the expression
$x^2 - dx + 21$ from part **(a)**.

               Answer _____ [1]

17 At a party each child is given a balloon at random.
There are 20 red balloons and 40 yellow balloons.
What is the probability that the first two children receive the same colour
of balloon?

Answer _____ [4]

THIS IS THE END OF THE QUESTION PAPER

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