



General Certificate of Secondary Education  
January 2010

Centre Number

71

Candidate Number

## Mathematics

Module N6 Paper 1  
(Non-calculator)  
Higher Tier  
[GMN61]



FRIDAY 15 JANUARY

9.15 am – 10.30 am



GMN61

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

### 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 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.

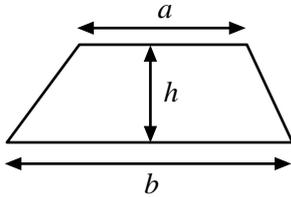
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You should have a ruler, compasses, set-square and protractor.

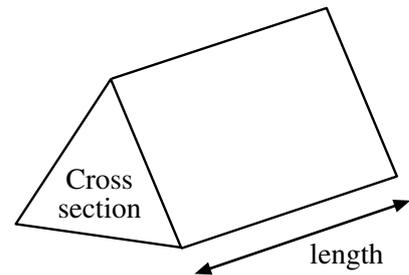
The Formula Sheet is on page 2.

## Formula Sheet

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



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

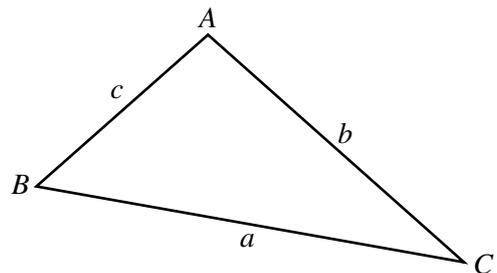


**In any triangle ABC**

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

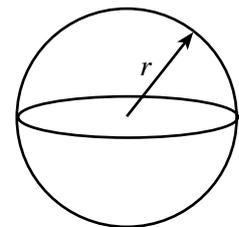
**Sine rule:**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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



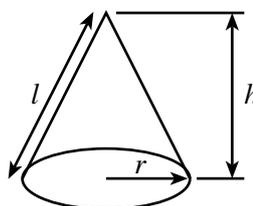
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**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

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





- 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)  $\frac{e^8}{e^4}$

Answer \_\_\_\_\_ [1]

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

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]

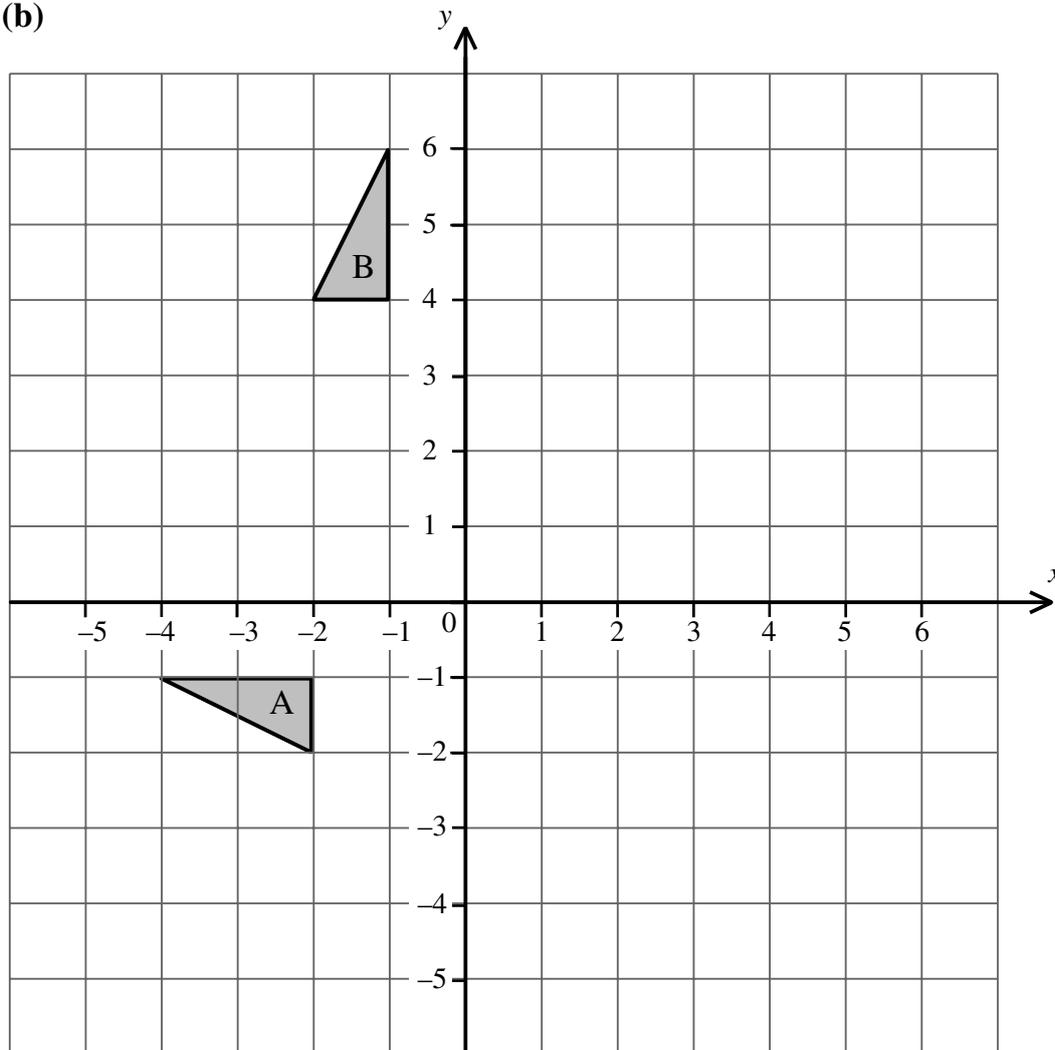
- (b) What assumption did you make in answering part (a)?

Answer \_\_\_\_\_ [1]

Examiner Only	
Marks	Remark



(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]

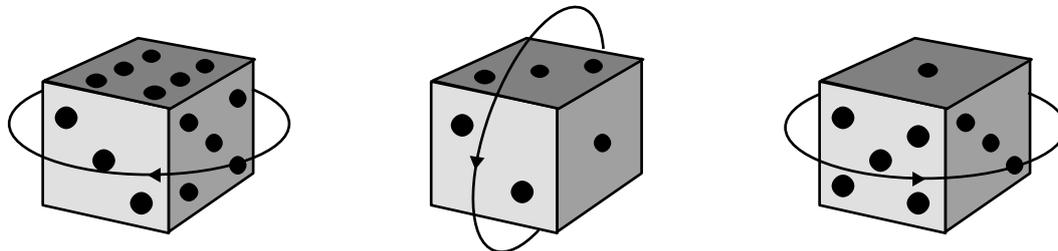
Examiner Only	
Marks	Remark

- 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  $\pi a^2b + bc^2$

C  $\frac{1}{3}b + \pi c$

D  $\frac{1}{4}cd + a^2$

Answer \_\_\_\_\_

because \_\_\_\_\_ [2]

Examiner Only	
Marks	Remark

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

[2]

Examiner Only

Marks	Remark

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]

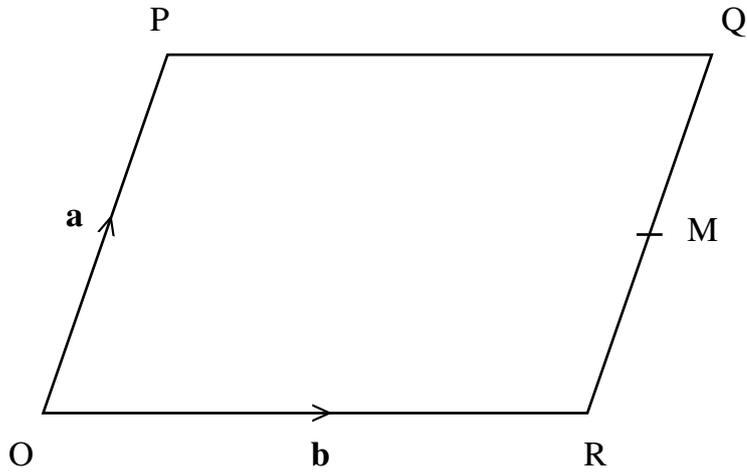
(c) Write the recurring decimal  $0.2\dot{1}\dot{5}$  in fraction form.

Answer \_\_\_\_\_ [2]

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

Answer \_\_\_\_\_ [2]

15



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

$$\vec{OP} = \mathbf{a} \text{ and } \vec{OR} = \mathbf{b}$$

Express in terms of  $\mathbf{a}$  and/or  $\mathbf{b}$

- (a)  $\vec{QP}$ , Answer \_\_\_\_\_ [1]
- (b)  $\vec{OM}$ , Answer \_\_\_\_\_ [1]
- (c)  $\vec{PM}$ . Answer \_\_\_\_\_ [1]

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]

Examiner Only	
Marks	Remark

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?

Examiner Only	
Marks	Remark

Answer \_\_\_\_\_ [4]

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

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