

**Tuesday 8 November 2016 – Morning**

**GCSE METHODS IN MATHEMATICS**

**B391/02** Methods in Mathematics 1 (Higher Tier)

Candidates answer on the Question Paper.

**OCR supplied materials:**

None

**Other materials required:**

- Geometrical instruments
- Tracing paper (optional)

**Duration:** 1 hour 15 minutes



Candidate forename		Candidate surname	
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Centre number							Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- Quality of written communication will be assessed in questions marked with an asterisk (\*).
- The total number of marks for this paper is **60**.
- This document consists of **12** pages. Any blank pages are indicated.

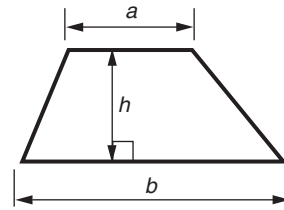
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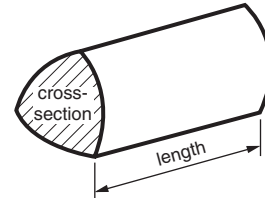
No calculator can be used for this paper

## Formulae Sheet: Higher Tier

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



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

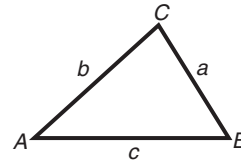


**In any triangle ABC**

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

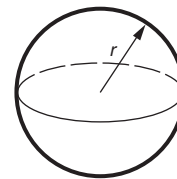
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



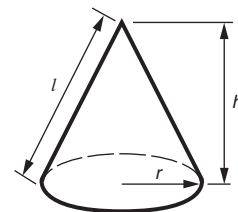
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



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

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



**The Quadratic Equation**

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

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

**PLEASE DO NOT WRITE ON THIS PAGE**

Answer **all** the questions.

1 (a) Work out.

(i)  $0.0378 \times 1\,000\,000$

(a)(i) ..... [1]

(ii)  $53.67 \div 10^5$

(ii) ..... [1]

(iii)  $6 + 3 \times 5 - 2$

(iii) ..... [1]

(b) Put brackets in this statement to make it correct.

$$5 + 3 \times 2 - 6 - 3 = 13 \quad [1]$$

2 Find the value of  $P$  in each of the following when  $a = 3$ ,  $b = -7$  and  $c = 1\frac{1}{2}$ .

(a)  $P = a + 2b^2$

(a) ..... [2]

(b)  $P = \frac{a+b}{2} \times c$

(b) ..... [2]

- 3 Janet is playing a game where she tosses two fair cubical dice.  
 The sides on the red dice are numbered 1 to 6.  
 The sides on the blue dice are numbered 3 to 8.

Janet's score is the positive difference between the numbers showing on the two dice.

- (a) Complete the grid showing Janet's possible scores.

		Number on red dice					
		1	2	3	4	5	6
Number on blue dice	3			0		2	
	4						
	5			2			
	6						0
	7						
	8						

[2]

- (b) Find the probability that Janet's score is

(i) 2,

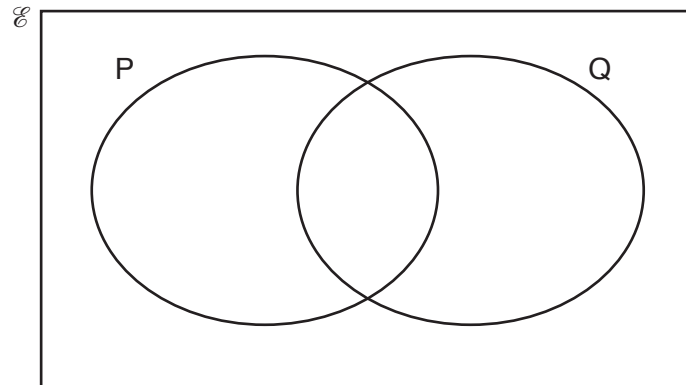
(b)(i) ..... [2]

(ii) less than 2.

(ii) ..... [1]

- 4  $\mathcal{E} = \{\text{letters in the word NUMERICAL}\}$   
 $P = \{\text{letters in the word CLEAR}\}$   
 $Q = \{\text{letters in the word REMAIN}\}$

(a) Complete the Venn diagram to show all the elements of the set  $\mathcal{E}$ .



[3]

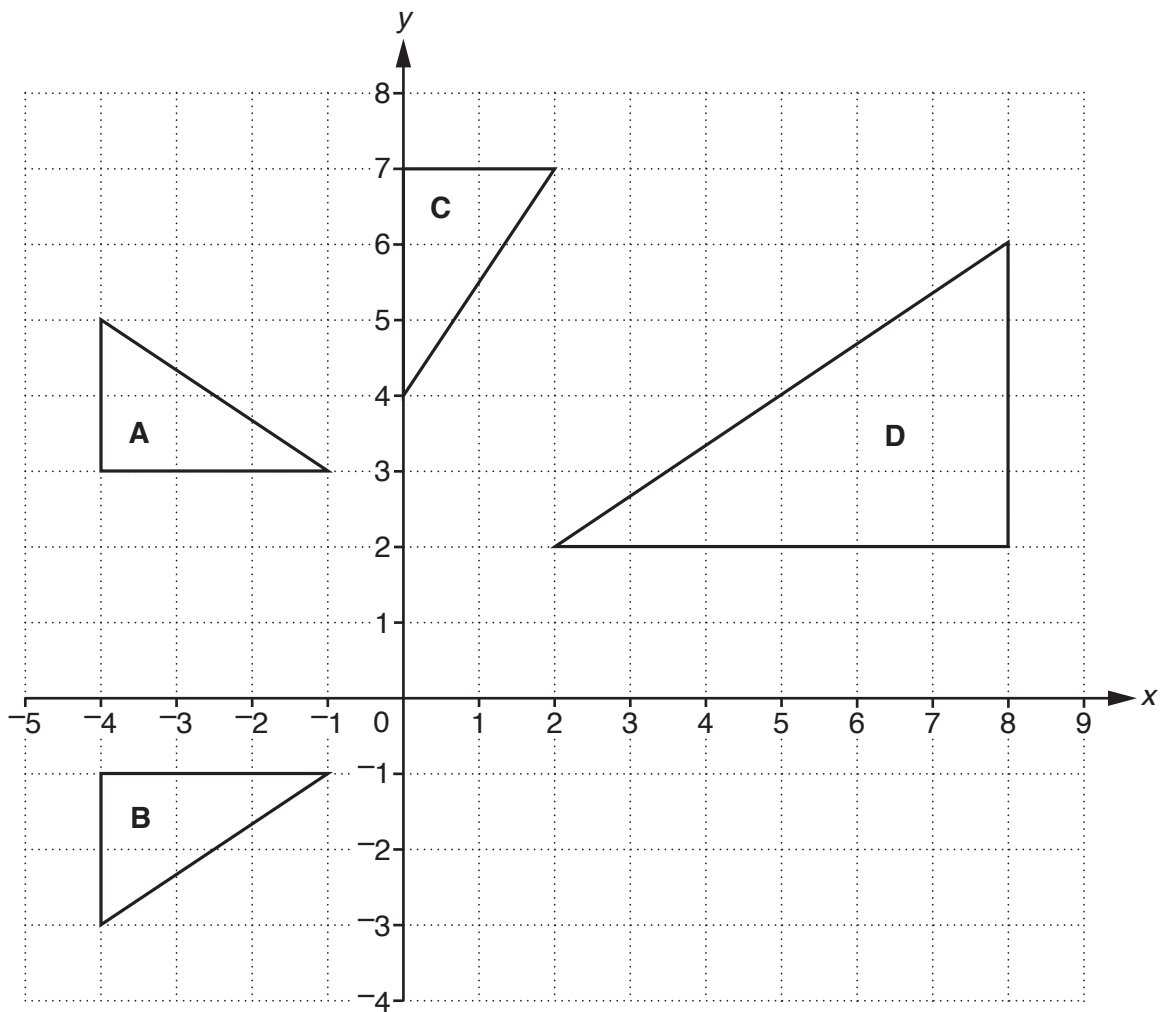
(b) List the members of  $P \cap Q$ .

(b) ..... [1]

(c) Find  $n(P' \cap Q')$ .

(c) ..... [1]

5 Triangles A, B, C and D are drawn on the grid.



Describe fully the **single** transformation that maps

(a) triangle **A** onto triangle **B**,

.....  
 ..... [2]

(b) triangle **A** onto triangle **C**,

.....  
 ..... [3]

(c) triangle **B** onto triangle **D**,

.....  
 ..... [3]

6\* Matt is decorating a room.

The room is 5 m long, 3.8 m wide and 3 m high.

The walls and ceiling are rectangular.

He needs to paint the four walls and the ceiling.

The total area of the door and windows is  $8.2 \text{ m}^2$  and they do not need painting.

Paint is sold in 5 litre tins and costs £20 per tin.

Each litre covers  $12 \text{ m}^2$  in one coat.

Brushes and cleaning materials cost him a total of £18.

Find the **total** cost of decorating the room with **two** coats of paint.

..... [5]

- 7 The length of a rectangle is 3 cm more than the width.  
The perimeter of the rectangle is 28 cm.

Find the length and width of the rectangle.

length ..... cm, width ..... cm [3]

- 8 When they are written as products of their prime factors,  $500 = 2^2 \times 5^3$  and  $N = 2^r \times 5^s \times 7^t$ .

The highest common factor of 500 and  $N$  is  $2^2 \times 5^2$ .

The lowest common multiple of 500 and  $N$  is  $2^3 \times 5^3 \times 7$ .

Find  $r$ ,  $s$  and  $t$ .

$r =$  .....

$s =$  .....

$t =$  ..... [3]



9 (a) Solve.

$$4(3 - x) = 2(x + 1)$$

(a) ..... [3]

(b) Factorise completely.

$$4x^2y^3 - 6x^3y^2$$

(b) ..... [2]

10 (a) (i) Write 0.00000568 in standard form.

(a)(i) ..... [1]

(ii) Write  $5.32 \times 10^7$  as an ordinary number.

(ii) ..... [1]

(b) You are given that  $7.6 \times 10^{-12} = f \times 10^{-8}$ .

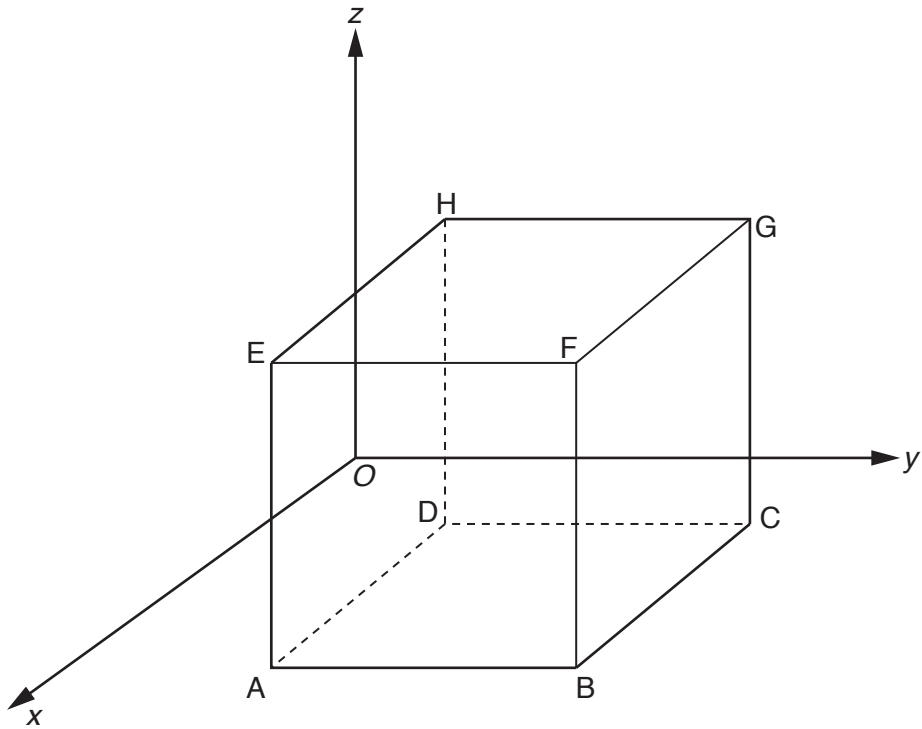
Find the value of  $f$ .

(b)  $f =$  ..... [1]

(c) A population of bacteria doubles every 10 days.  
On a certain day the population is  $5 \times 10^7$ .

Find the population 40 days later.  
Give your answer in standard form.

(c) ..... [2]



The diagram shows a cube, ABCDEFGH, of side 6 units.  
 All of the sides are parallel to one of the coordinate axes.  
 A is the point  $(2, 0, -3)$ .

Find the coordinates of these points.

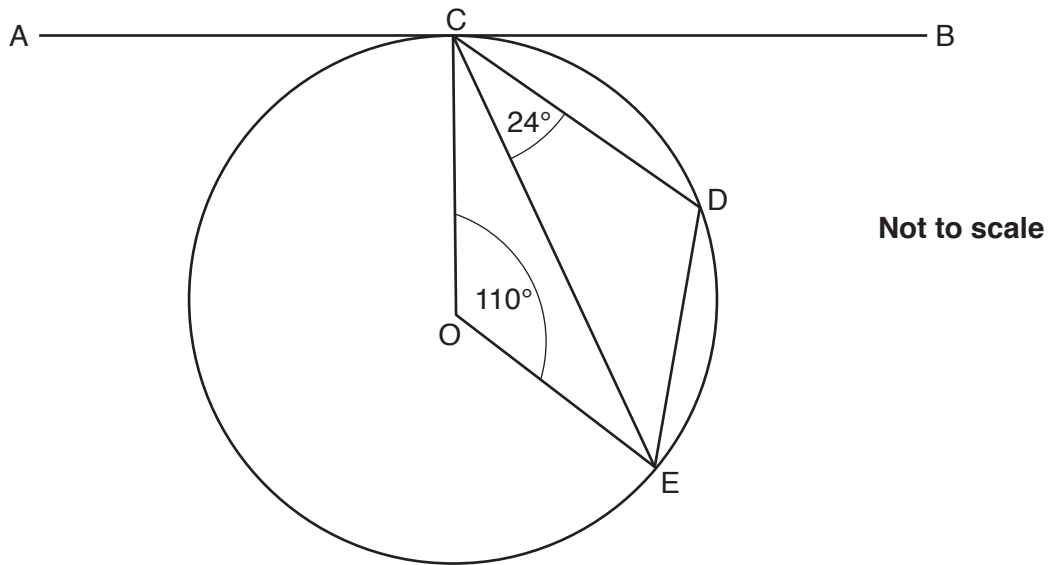
(a) B

(a) (....., ....., .....) [1]

(b) G

(b) (....., ....., .....) [2]

12 AB is a tangent at C to the circle centre O.



Angle COE =  $110^\circ$  and angle DCE =  $24^\circ$ .

Find

(a) angle BCD,

(a) ..... [2]

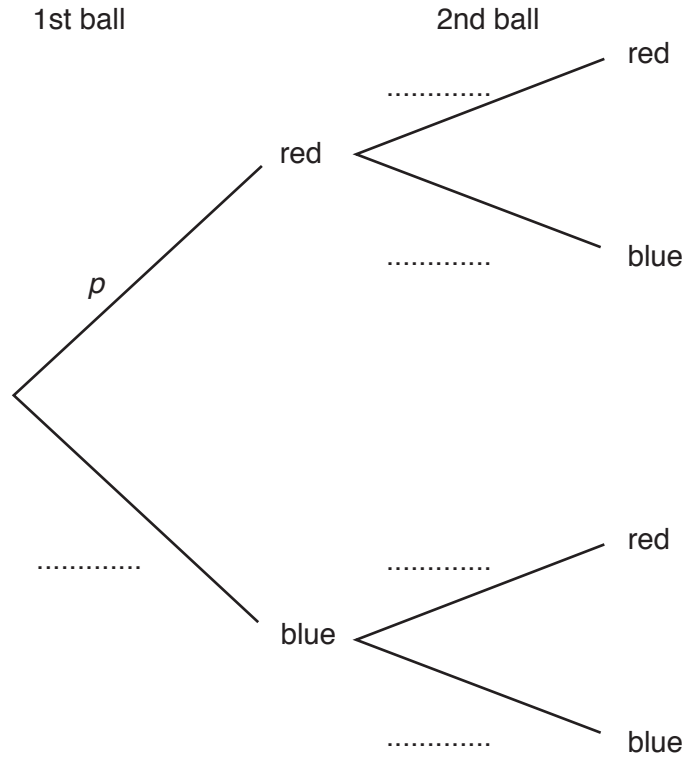
(b) angle CDE.

(b) ..... [2]

Question 13 is printed on the next page.

**13** A bag contains some balls. All of them are either red or blue.  
 The probability that a ball picked at random from the bag is red is  $p$  where  $0 < p < 1$ .  
 Muna takes a ball from the bag at random, records the colour, and replaces it.  
 She then picks another ball at random from the bag.

**(a)** Complete the tree diagram to show the probabilities of the colours of Muna's two picks.



[2]

**(b)** The probability of getting a red and blue ball in any order is the same as the probability of getting 2 blue balls.

**(i)** Form an equation in  $p$ .

.....  
 .....  
 ..... [3]

**(ii)** Hence or otherwise show that  $p = \frac{1}{3}$ .

.....  
 .....  
 ..... [1]

**END OF QUESTION PAPER**