OCR
Oxford Cambridge and RSA

H

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	

Centre number						Candidate number				

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.

WARNING

No calculator can be used for this paper

OCR is an exempt Charity

Turn over

2

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a+b)h$
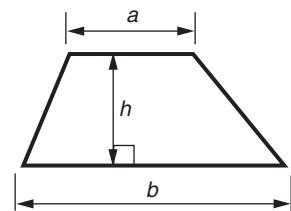
Volume of prism = (area of cross-section) × length
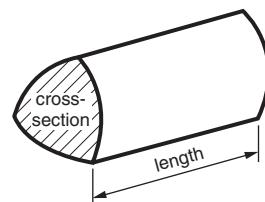
In any triangle _ABC_

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

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

Area of triangle $= \frac{1}{2}ab \sin C$
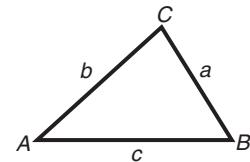
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$
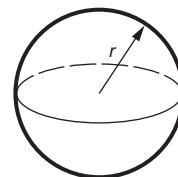
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
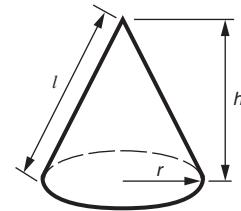
The Quadratic Equation

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

3

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.

$$5 \; + \; 3 \; \times \; 2 \; - \; 6 \; - \; 3 \; = \; 13$$

[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) $P = \dfrac{a + b}{2} \times c$

(b) .... **[2]**

Turn over

4

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 𝓔 = {letters in the word NUMERICAL}
P = {letters in the word CLEAR}
Q = {letters in the word REMAIN}

(a) Complete the Venn diagram to show all the elements of the set 𝓔.

𝓔

P   Q
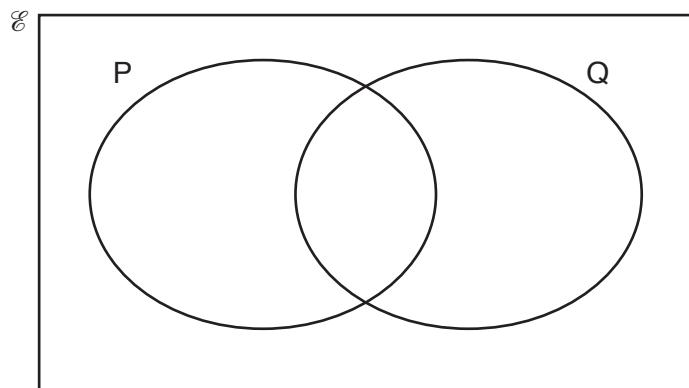
[3]

(b) List the members of P ∩ Q.

(b) .... **[1]**

(c) Find n (P′ ∩ Q′).

(c) .... **[1]**

5   Triangles A, B, C and D are drawn on the grid.
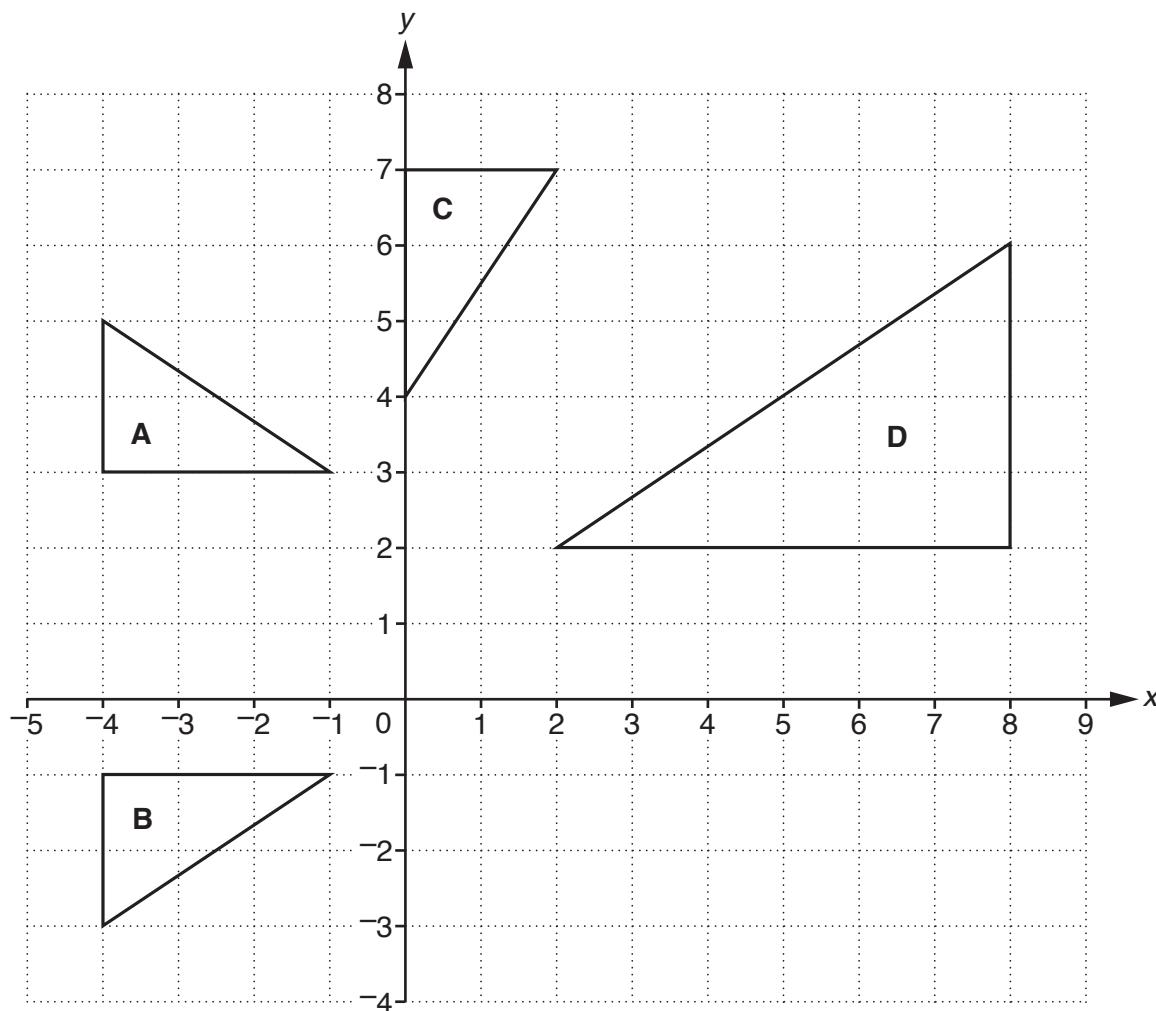
Describe fully the **single** transformation that maps

(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 $8.2\,m^2$ and they do not need painting.

Paint is sold in 5 litre tins and costs £20 per tin.
Each litre covers $12\,m^2$ 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]**

Turn over

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

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 0.000 005 68 in standard form.

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

(ii) Write 5.32×10^7 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 5×10^7.

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

(c) .... **[2]**

Turn over

11
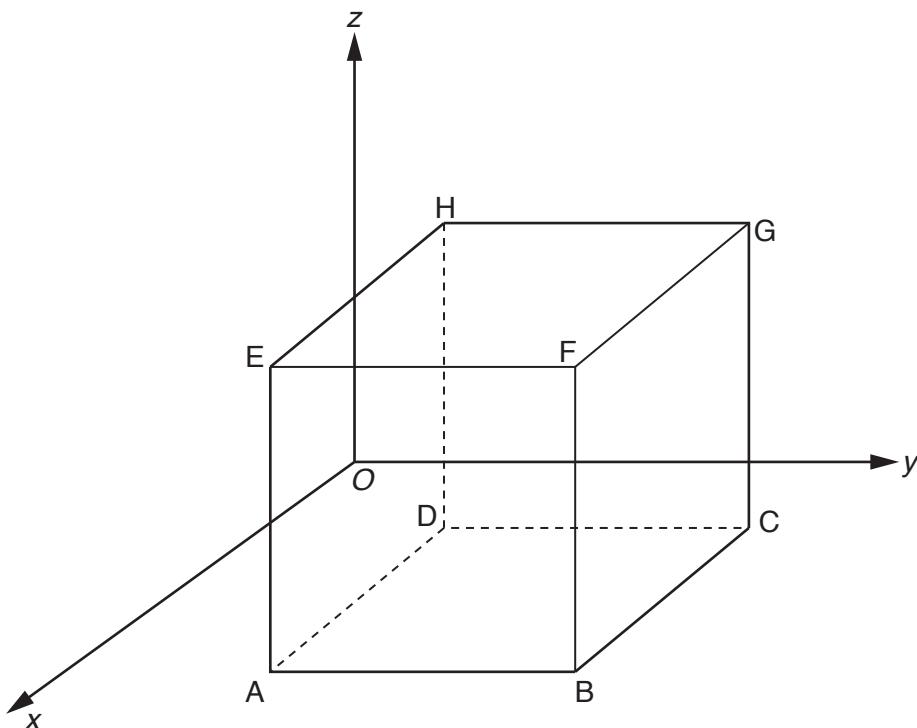
The diagram shows a cube, ABCDEFGH, of side 6 units.
All of the sides are parallel to one of the coordinate axes.
A is the point (2, 0, –3).

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.

Not to scale
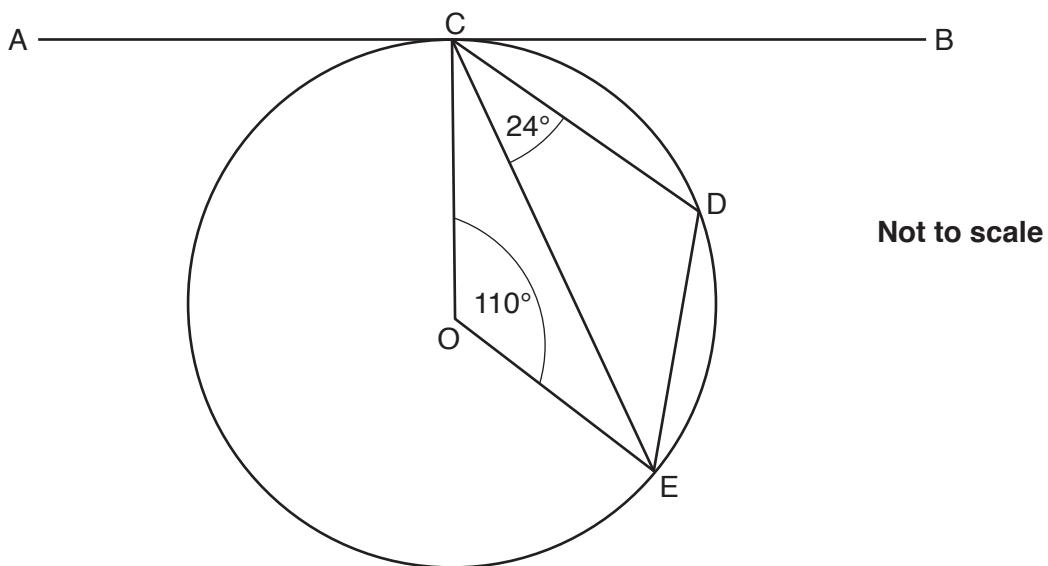
Angle COE = 110° and angle DCE = 24°.

Find

(a) angle BCD,

(a) .... **[2]**

(b) angle CDE.

(b) .... **[2]**

Question 13 is printed on the next page.

Turn over

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.

1st ball   2nd ball
                                        red
                          ....
              red
            ⟨
   p ....   blue

                                        red
   ....
              blue
            ⟨
                          ....   blue
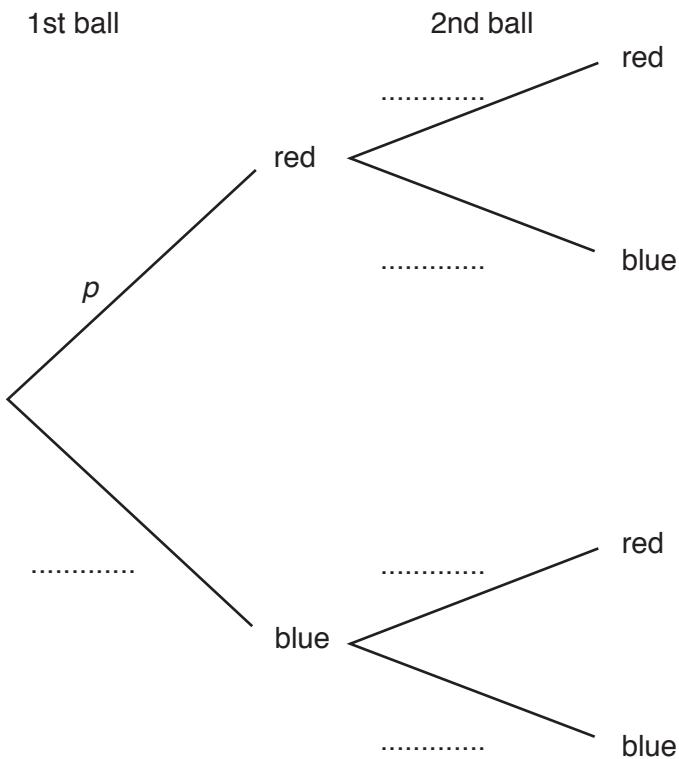
[2]

(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 $p = \dfrac{1}{3}$.

....

....

.... **[1]**

END OF QUESTION PAPER