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**Tuesday 17 June 2014 – Morning**

**GCSE METHODS IN MATHEMATICS**

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

3054265467\*

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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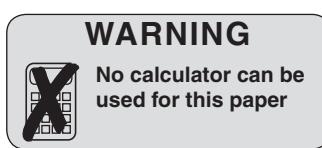
Centre number						Candidate number			
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**INSTRUCTIONS TO CANDIDATES**

- 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.

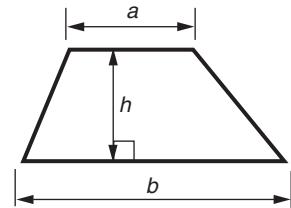
**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- Your quality of written communication is assessed in questions marked with an asterisk (\*).
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are indicated.

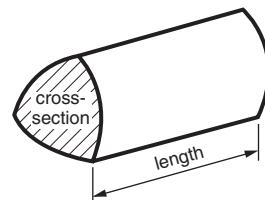


## Formulae Sheet: Higher Tier

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



$$\text{Volume of prism} = (\text{area of cross-section}) \times \text{length}$$

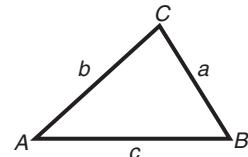


In any triangle  $ABC$

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

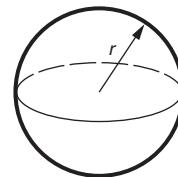
$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$

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



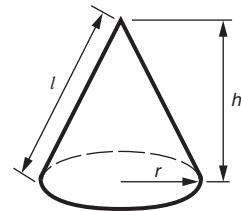
$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

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



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

$$\text{Curved surface area of cone} = \pi r l$$



### The Quadratic Equation

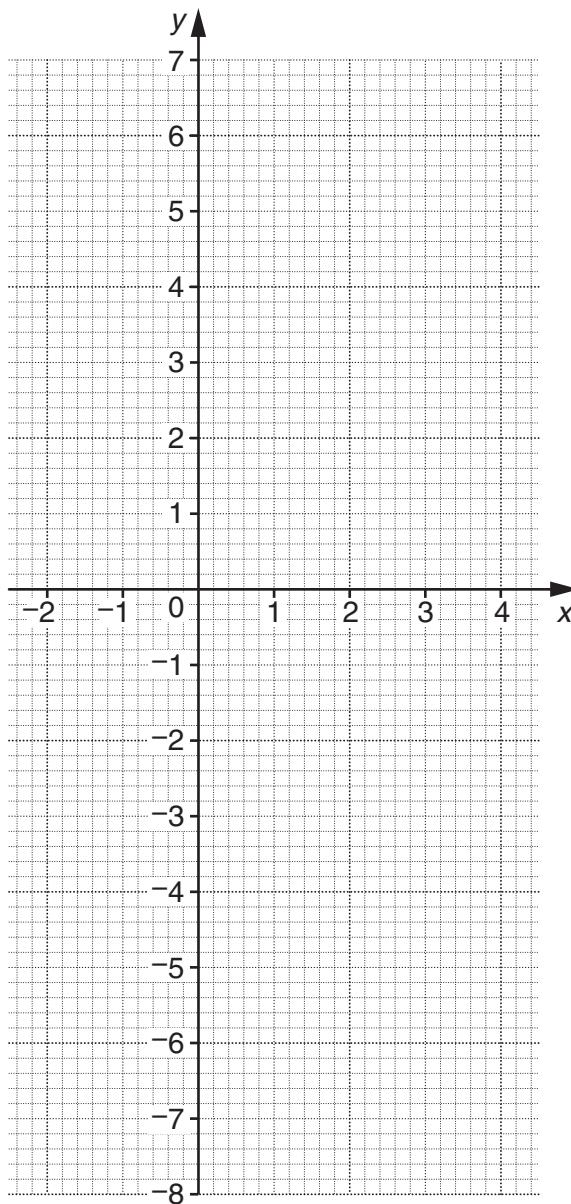
The solutions of  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , are given by

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

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Answer **all** the questions.

1 (a) Draw the graph of  $y = 2x - 3$ .  
Use values of  $x$  from  $-2$  to  $4$ .



[3]

(b) Find the value of  $x$  where the graph crosses the line  $y = -2$ .

(b) \_\_\_\_\_ [1]

2 Work out.

(a)  $6 + 3 \times -4$

(a) \_\_\_\_\_ [1]

(b)  $7 - (5 - 8)$

(b) \_\_\_\_\_ [1]

(c)  $80000 \times 500$

(c) \_\_\_\_\_ [1]

(d)  $54000000 \div 60000$

(d) \_\_\_\_\_ [1]

3 Simplify.

(a)  $5f - 3g + 7(f - g)$

(a) \_\_\_\_\_ [2]

(b)  $y^4 \times y^3$

(b) \_\_\_\_\_ [1]

(c)  $m^8 \div m^2$

(c) \_\_\_\_\_ [1]

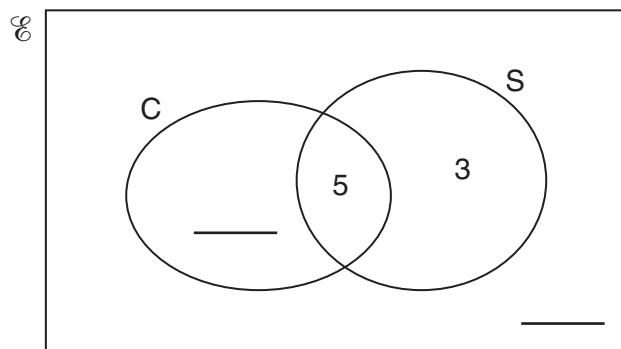
4 Mosna has 25 books in her electronic book reader.

15 are crime books (C).

8 are short story books (S).

5 are short story crime books.

(a) Complete this Venn Diagram showing the number of books of each type in Mosna's reader.



[2]

(b) Mosna chooses one of the books at random.

Find the probability that the book is:

(i) a short story book that is not a crime book,

(b)(i) \_\_\_\_\_ [1]

(ii) neither a crime book nor a short story book,

(ii) \_\_\_\_\_ [1]

(iii) a member of  $C \cap S$ .

(iii) \_\_\_\_\_ [1]

5 (a) Wilson works out this multiplication.

$$5.634 \times 2.28$$

He gets the answer 12.844 556.

How can you tell, without doing the multiplication, that Wilson's answer is wrong?

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[1]

(b) Jessica works out this division.

$$2.034\ 532 \div 0.382$$

She gets the answer 0.5326.

How can you tell, without doing the division, that Jessica's answer is wrong?

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[1]

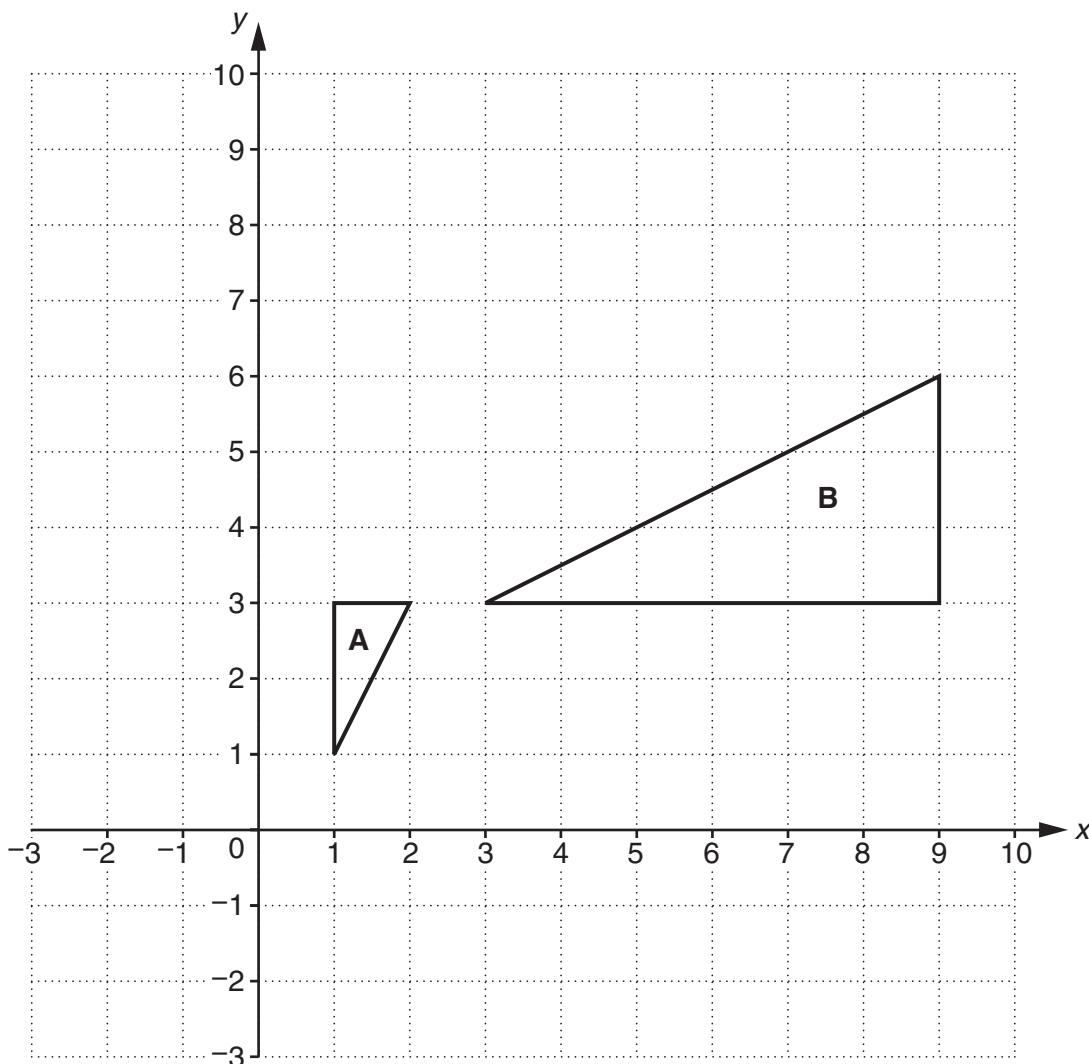
(c) (i) Round 58 367 952 to the nearest thousand.

(c)(i) \_\_\_\_\_ [1]

(ii) Round 0.005 674 8 to 3 significant figures.

(ii) \_\_\_\_\_ [1]

6 Triangles **A** and **B** are shown on this grid.



(a) Translate triangle **A** using the vector  $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ . [2]

(b) Triangle **A** can be mapped onto triangle **B** by an enlargement, centre the origin, followed by a reflection.

(i) Find the scale factor of the enlargement. (b)(i) \_\_\_\_\_ [1]

(ii) Find the equation of the mirror line for the reflection.

(ii) \_\_\_\_\_ [2]

7 (a) Write 60 as the product of its prime factors.

(a) \_\_\_\_\_ [2]

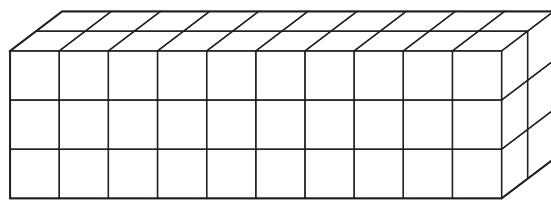
**(b)\*** Jamie has 60 one-centimetre cubes.

He uses them to make cuboids.

Each time he makes a cuboid he uses all 60 cubes.

He makes all the possible cuboids with sides of at least 2 cm.

This is the first one he makes.



Investigate which cuboid has the least surface area.

Show all your working. Continue on the opposite page.

Dimensions of cuboid \_\_\_\_\_ cm by \_\_\_\_\_ cm by \_\_\_\_\_ cm

Minimum surface area = \_\_\_\_\_ cm<sup>2</sup> [6]

8 (a) Factorise.

(i)  $6x + 9$

(a)(i) \_\_\_\_\_ [1]

(ii)  $2ax + 3a$

(ii) \_\_\_\_\_ [1]

(b) Use your answers to part (a) to factorise this expression.

$6x + 9 + 2ax + 3a$

(b) \_\_\_\_\_ [2]

9 (a) Work out.

$$\frac{1}{2} + \frac{1}{3}$$

(a) \_\_\_\_\_ [2]

(b) Ian can dig a trench in 2 hours.  
Bob can dig the same length of trench in 3 hours.

Find how long it takes Ian and Bob to dig the same size trench working together.

(b) \_\_\_\_\_ hours [2]

11

10  $p = 2.4 \times 10^4$        $q = 3 \times 10^7$

Work out the following.  
Give your answers in standard form.

(a)  $p \times q$

(a) \_\_\_\_\_ [2]

(b)  $p \div q$

(b) \_\_\_\_\_ [2]

11 Rationalise the denominator to write  $\frac{12}{\sqrt{3}}$  in the form  $a\sqrt{3}$ .

Give your answer in its simplest form.

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

12

12 Ashraf has 8 cards with these numbers on them.



(a) Ashraf chooses a card at random.

The probability that he chooses a card with a number greater than the integer  $x$  is  $\frac{5}{8}$ .

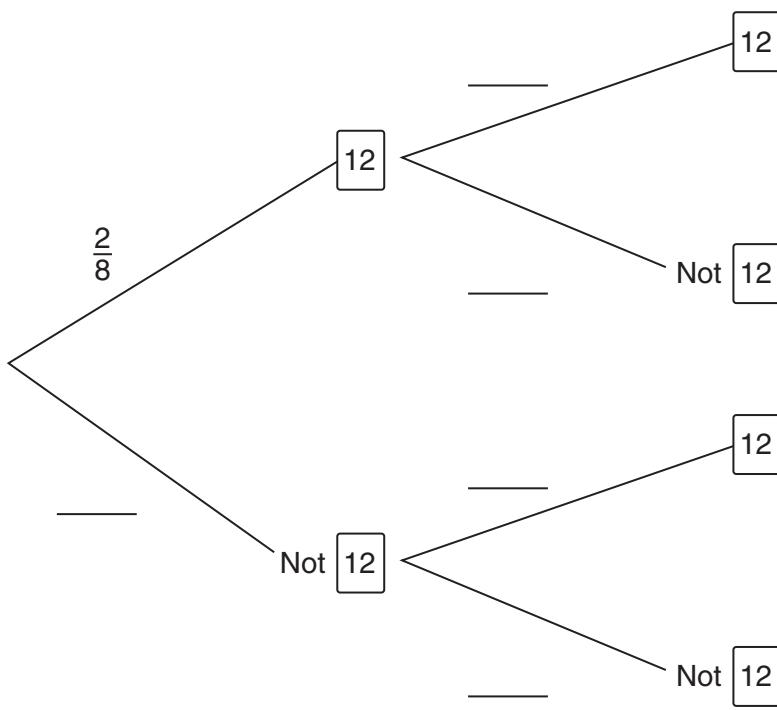
Write down the value of  $x$ .

(a) \_\_\_\_\_ [1]

(b) Ashraf replaces the card.

He then chooses **two** cards, one after the other, without replacement.

(i) Complete the probability tree diagram for the two cards.

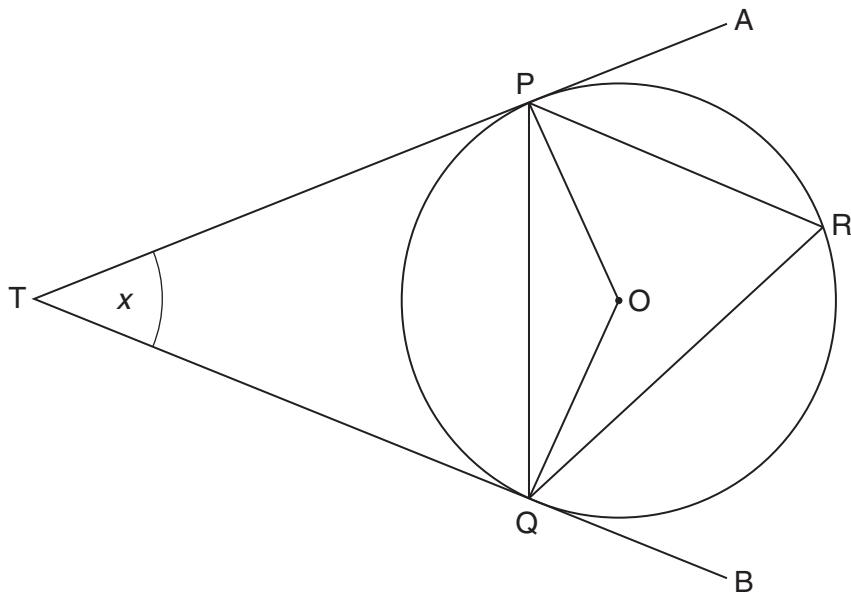


[2]

(ii) Find the probability that exactly one of Ashraf's two chosen cards is numbered 12.

(b)(ii) \_\_\_\_\_ [3]

13 P, Q and R are points on the circle, centre O.  
 TA and TB are tangents to the circle at P and Q.  
 Angle PTQ =  $x$ .



(a) Show that angle TPQ =  $90^\circ - \frac{1}{2}x$ .  
 Give a reason for each step in the working.

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[2]

(b) Hence prove the alternate segment theorem by showing that angle PRQ = angle TPQ.  
 Give reasons for each of your statements.

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[4]

**END OF QUESTION PAPER**

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