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Tuesday 17 June 2014 – 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



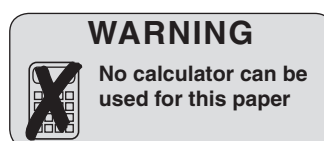
Candidate forename		Candidate surname	
Centre number		Candidate number	

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.

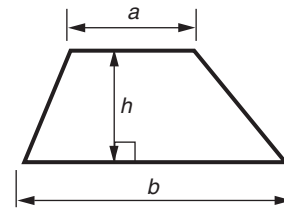
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- 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.

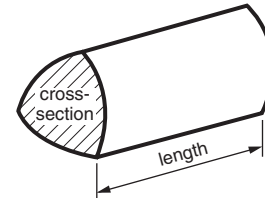


Formulae Sheet: Higher Tier

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



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

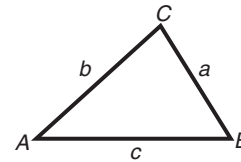


In any triangle ABC

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

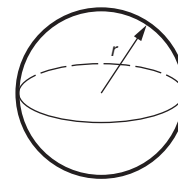
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



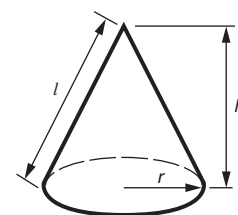
Volume of sphere $= \frac{4}{3} \pi r^3$

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

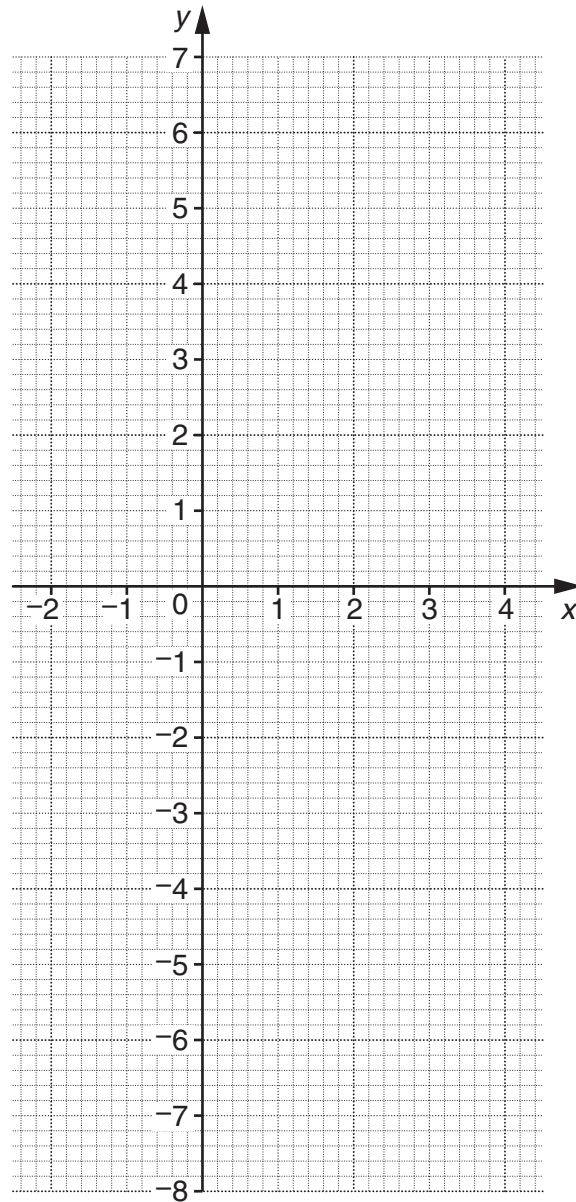
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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3

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]

4

2 Work out.

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

(a) _____ [1]

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

(b) _____ [1]

(c) $80\,000 \times 500$

(c) _____ [1]

(d) $54\,000\,000 \div 60\,000$

(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]

5

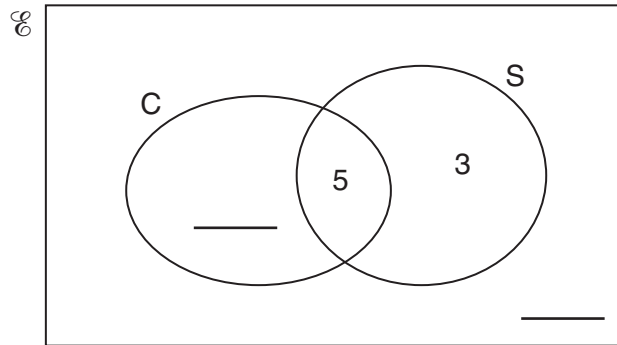
- 4 Mosna has 25 books in her electronic book reader.

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]

6

- 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?

_____ [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?

_____ [1]

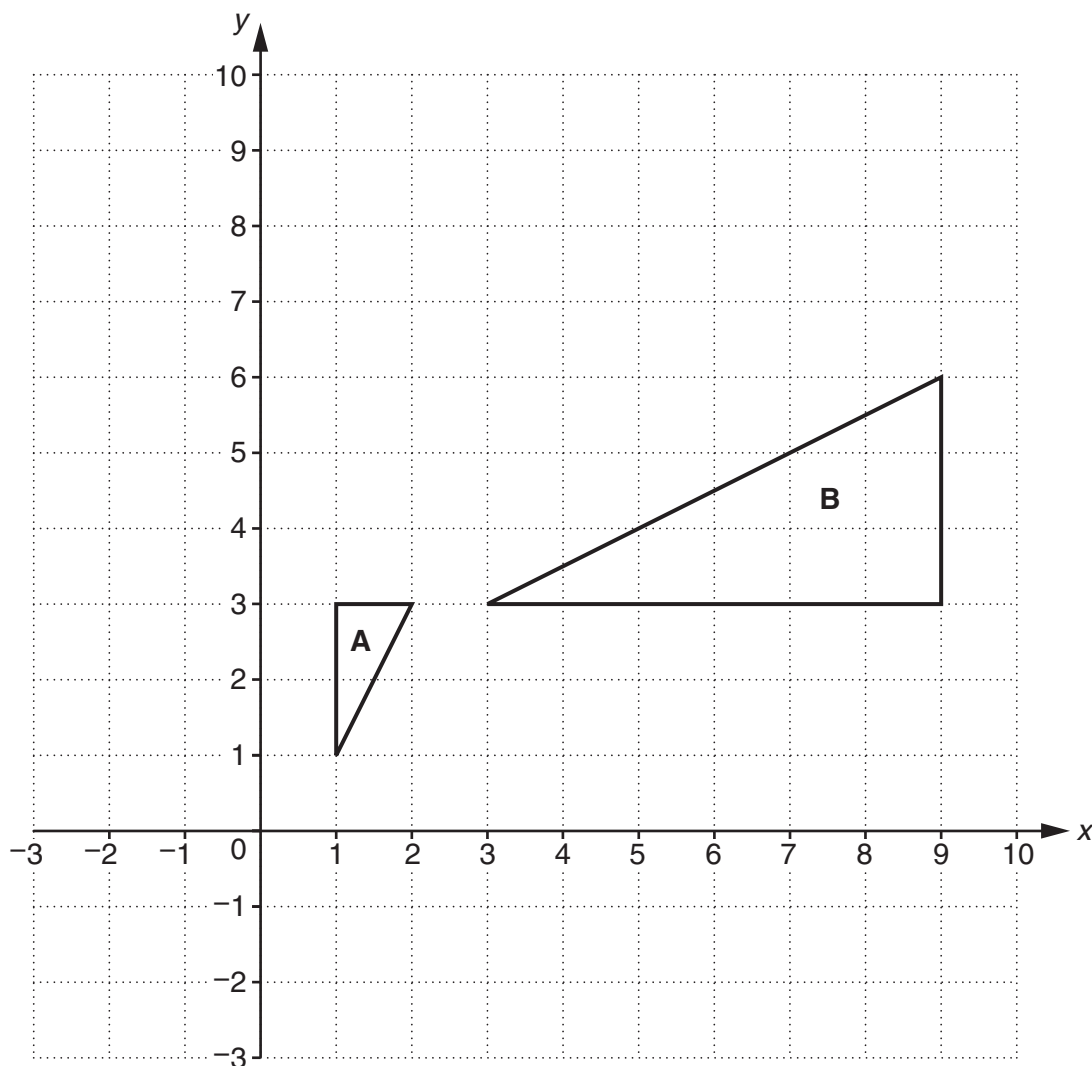
- (c) (i) Round 58 367 952 to the nearest thousand.

(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.

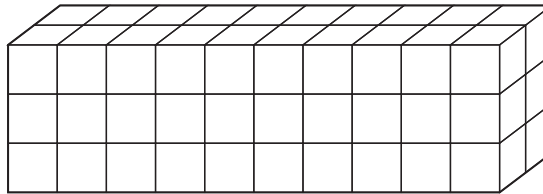
(ii) _____ [2]

- 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.

[illegible]

Dimensions of cuboid _____ cm by _____ cm by _____ cm

Minimum surface area = _____ cm² [6]

10

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]

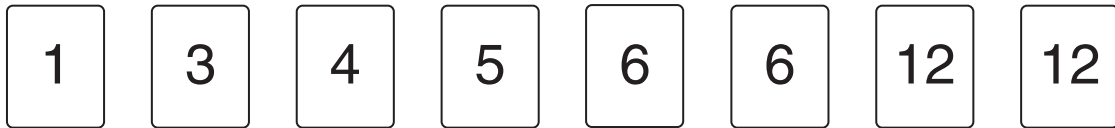
11 Rationalise the denominator to write $\frac{12}{\sqrt{3}}$ in the form $a\sqrt{3}$.

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 $\frac{5}{8}$.

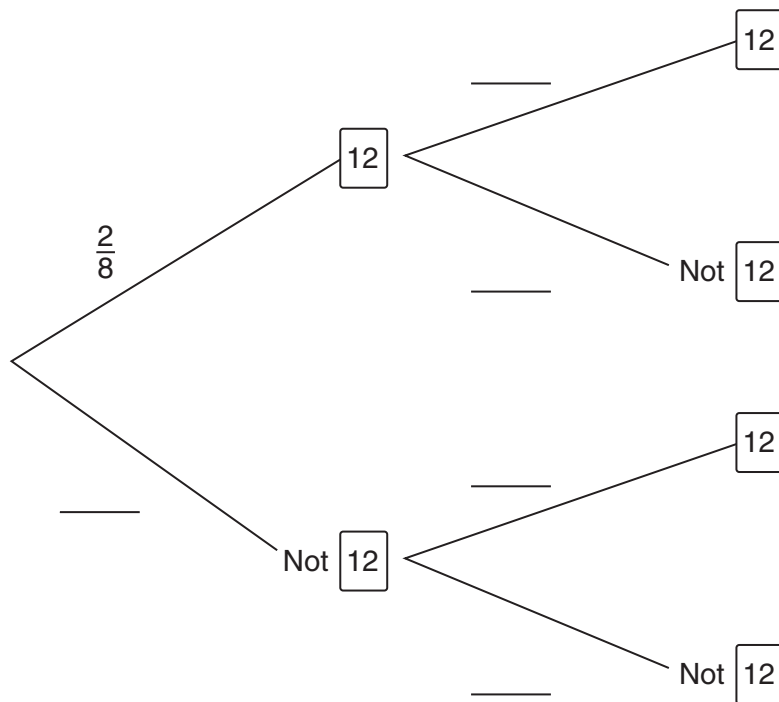
Write down the value of x .

(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.



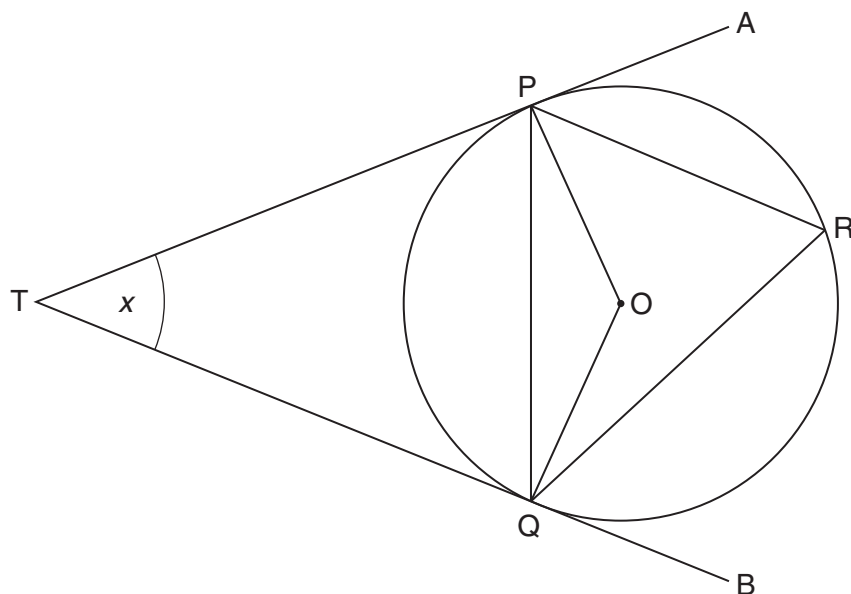
[2]

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

(b)(ii) _____ [3]

13

- 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.

[2]

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

[4]

END OF QUESTION PAPER

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