

Thursday 17 January 2013 – 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

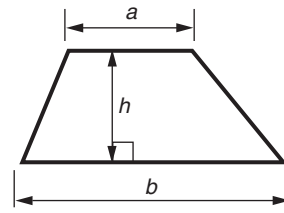
- The number of marks is given in brackets [] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are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



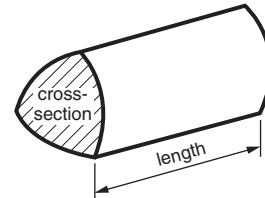
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Formulae Sheet: Higher Tier

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

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

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1 (a) Work out.

(i) $10 + ^{-}4 - ^{-}5$

(a)(i) _____ [1]

(ii) $\frac{5 \times ^{-}6}{^{-}3}$

(ii) _____ [2]

(b) Work these out.

Give each answer as a fraction in its lowest terms.

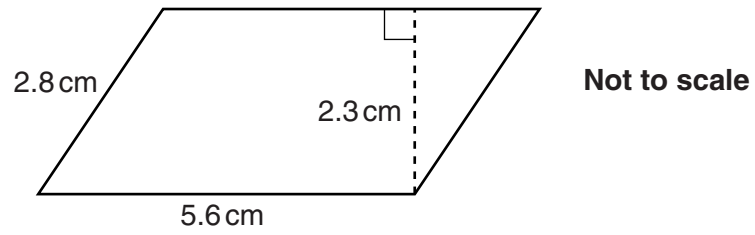
(i) $\frac{1}{4} + \frac{5}{8}$

(b)(i) _____ [2]

(ii) $\frac{3}{10} \times \frac{5}{9}$

(ii) _____ [2]

- 2 Calculate the area of this parallelogram.
Give your answer with the correct units.



_____ [4]

- 3 (a) Simplify.

$$5(x - 2) - 3(x - 1)$$

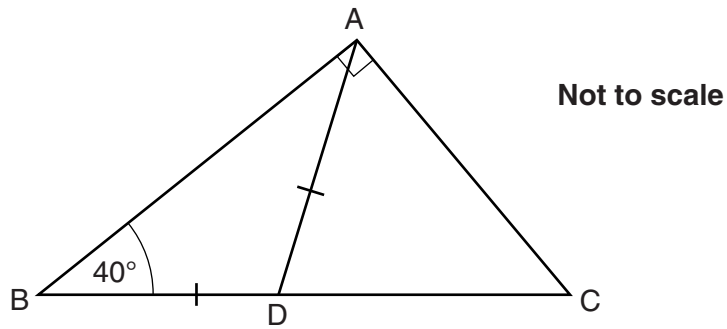
(a) _____ [3]

- (b) Hence solve.

$$5(x - 2) - 3(x - 1) = 4 - 3x$$

(b) _____ [2]

- 4 In the diagram, angle $BAC = 90^\circ$ and angle $ABC = 40^\circ$.
 BDC is a straight line and $AD = BD$.



(a) Find

(i) angle BAD ,

(a)(i) _____ $^\circ$ [1]

(ii) angle ADC .

(ii) _____ $^\circ$ [1]

(b) Using your answers to part (a), explain why triangle DAC is isosceles.
 Show all your working.

[2]

5 (a) $16 = 2^n$

Find n .

(b) Simplify these.

(i) $x^3 \times x^4$

(ii) x^0

(iii) $(x^2)^3$

(iv) $\sqrt{\frac{x^8}{x^2}}$

(a) $n =$ _____ [1]

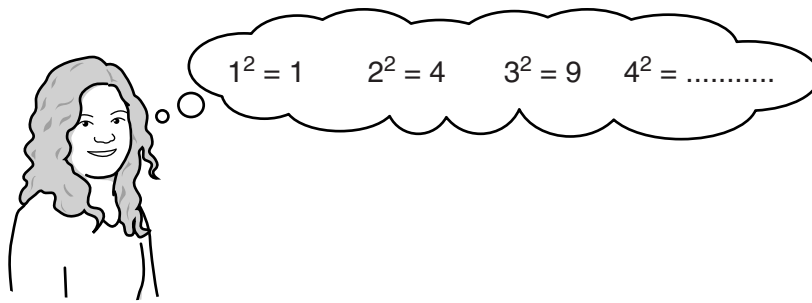
(b)(i) _____ [1]

(ii) _____ [1]

(iii) _____ [1]

(iv) _____ [2]

- 6 (a) Liz is thinking about the sequence of square numbers.



Liz thinks that 1 is the only square number that is also a cube number.

Is she correct?

Give reasons for your answer.

[3]

- (b) Here are the first five prime numbers.

2 3 5 7 11

Explain why a prime number cannot be a square number.

[1]

- 7 Ali, Ben, Cara and Danni each throw the same **biased** dice. They want to find the probability of throwing a six using this dice. They each throw the dice a different number of times.

These are their results.

	Ali	Ben	Cara	Danni
Number of throws	200	20	100	500
Number of sixes	44	5	15	100

- (a) Complete the table below to show the relative frequencies of their results. Write your answers as decimals.

	Ali	Ben	Cara	Danni
Relative frequency of throwing a six				

[2]

- (b) Whose result gives the best estimate of the probability of throwing a six with the biased dice? Give a reason for your answer.

_____ because _____ [1]

- (c) A **different** biased dice has a probability of 0.37 of getting a six. What is the probability of **not** getting a six when this dice is thrown?

(c) _____ [2]

- 8 (a) Here are four types of transformation.

Rotation	Reflection	Translation	Enlargement
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Below are some statements about transforming triangles.
 For the statements choose words from the list.
 There may be more than one transformation.
 Give all the possible transformations.

- (i) A transformation maps triangle A onto triangle B.
 Triangle A is similar to triangle B but not congruent.

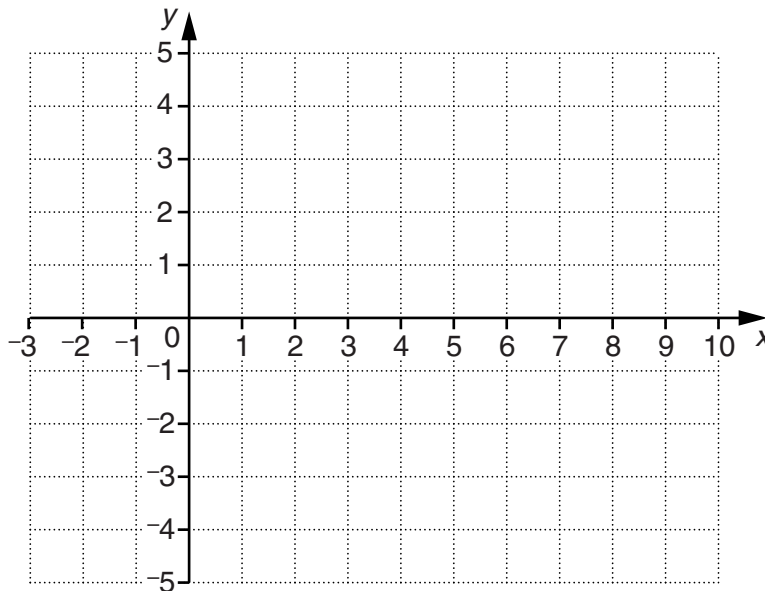
The transformation could be _____ [1]

- (ii) A transformation maps triangle C onto triangle D.
 Each side of triangle C is parallel to its corresponding side in triangle D.

The transformation could be _____ [2]

- (b) Describe fully the **single** transformation equivalent to a reflection in the x -axis followed by a rotation of 180° about the point $(4, 0)$.

You may use this grid to help you.



_____ [2]

9 Look at the six equations in the table.

For each equation, write Yes if the equation is a straight line or No if it is not.

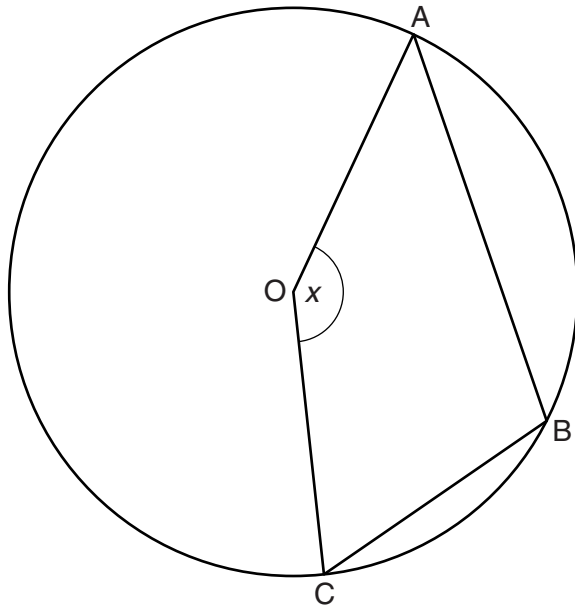
If the graph is a straight line, state the gradient of the line.

Equation	Straight line? Yes or No	Gradient
$y = 3x + 2$		
$y = 2x^2 + 3$		
$y = \frac{3}{x} + 2$		
$y = 5 - 3x$		
$y = x(x - 3)$		
$y = \frac{x}{2} - 5$		

[5]

- 10 A, B and C are points on the circle centre O.
Angle AOC = x .

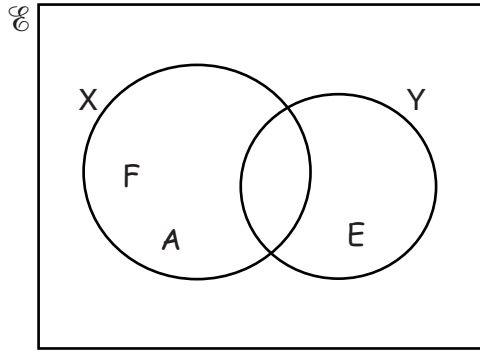
Not to scale



Find an expression, in terms of x , for angle ABC.

_____ [2]

11 (a)



$X = \{\text{letters in the word FACTOR}\}$

$Y = \{\text{letters in the word TRIPLE}\}$

(i) Complete the Venn Diagram for the sets X and Y. [2]

(ii) Write down the members of the set $X \cap Y$.

(a)(ii) _____ [1]

(b) The sets A, B and C are subsets of the universal set \mathcal{U} .

- B is a subset of A
- $B \cap C = \emptyset$
- $A \cap C \neq \emptyset$

Draw a Venn diagram to show the sets A, B, C and \mathcal{U} . [3]

13

- 12** A box contains only 7 yellow wristbands and 3 pink wristbands.
Lisa takes two wristbands at random from the box and puts one on each wrist.

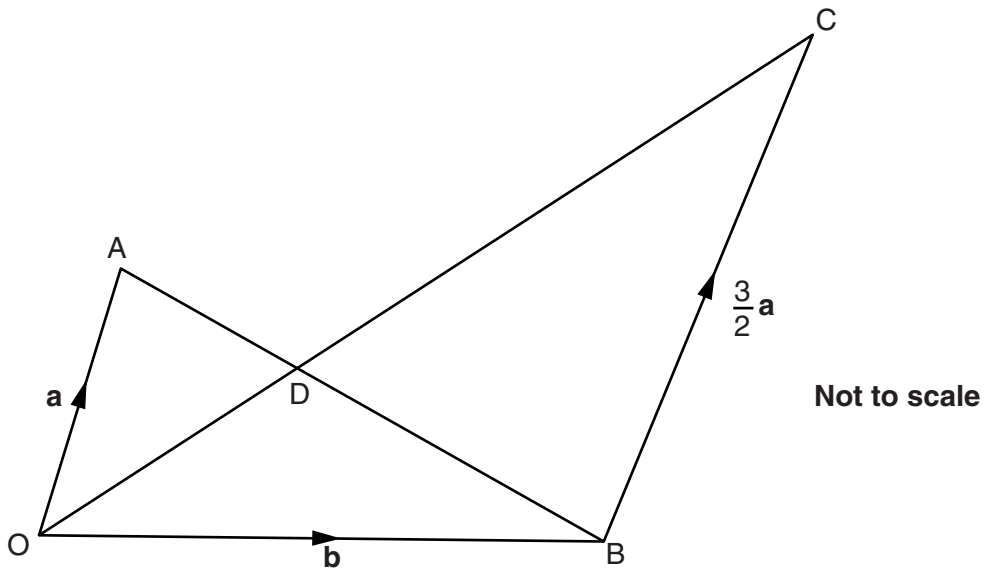
Calculate the probability that she takes two wristbands of different colours.

_____ [3]

TURN OVER FOR QUESTION 13

13 D is a point on AB such that $AD = \frac{2}{5} AB$.

$\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$ and $\vec{BC} = \frac{3}{2} \mathbf{a}$.



(a) Find \vec{OC} in terms of \mathbf{a} and \mathbf{b} .

(a) _____ [1]

(b)* By finding \vec{OD} in terms of \mathbf{a} and \mathbf{b} , prove that ODC is a straight line.

[3]

END OF QUESTION PAPER

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