

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	
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

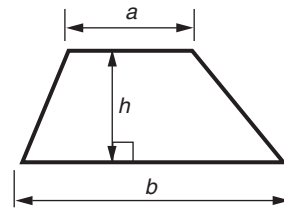
- The number of marks is given in brackets [] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are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



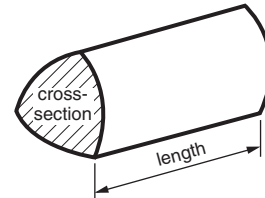
This paper has been pre modified for carrier language

Formulae Sheet: Higher Tier

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



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

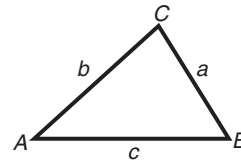


In any triangle ABC

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

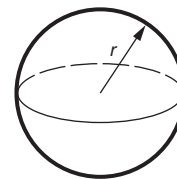
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



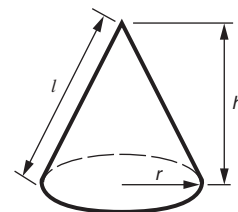
Volume of sphere $= \frac{4}{3} \pi r^3$

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

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

PLEASE DO NOT WRITE ON THIS PAGE

3

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

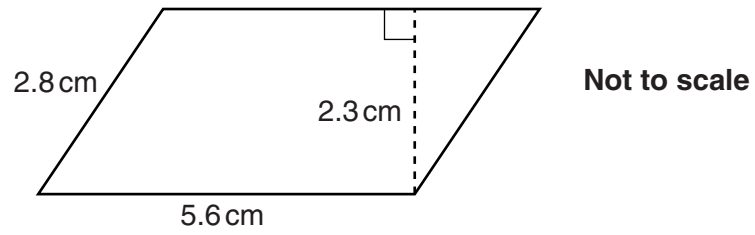
(b)(i) _____ [2]

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

(ii) _____ [2]

4

- 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]

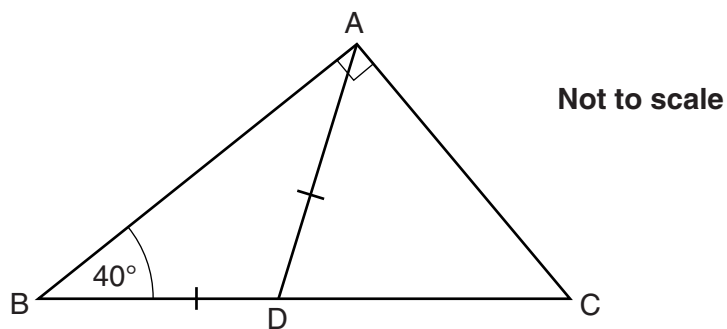
- (b) Hence solve.

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

(b) _____ [2]

5

- 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]

6

5 (a) $16 = 2^n$

Find n .

(a) $n =$ _____ [1]

(b) Simplify these.

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

(b)(i) _____ [1]

(ii) x^0

(ii) _____ [1]

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

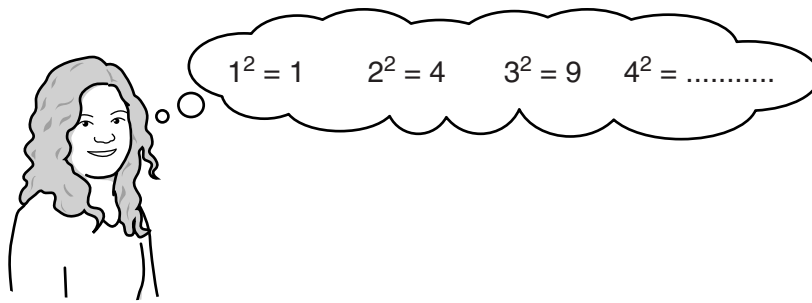
(iii) _____ [1]

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

(iv) _____ [2]

7

- 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]

8

- 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
----------	------------	-------------	-------------

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.

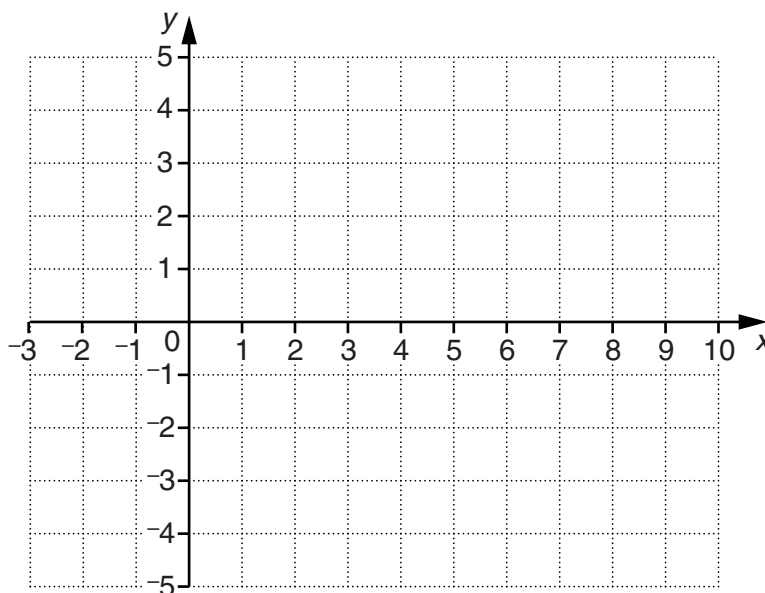
The transformation could be _____ [1]

- (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.

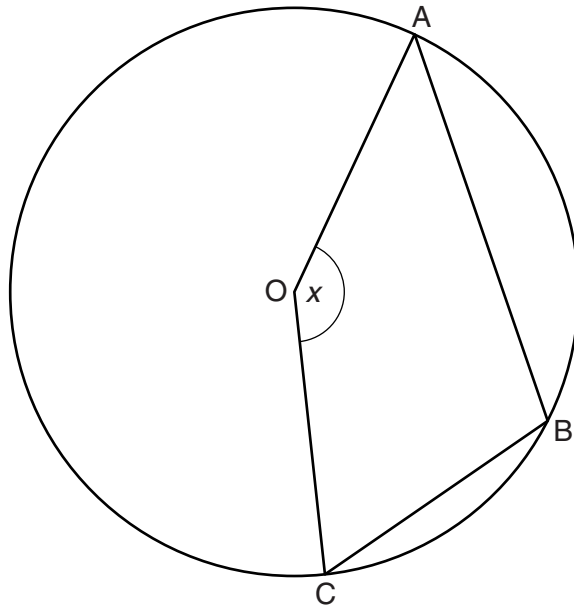
Equation	Straight line? Yes or No	Gradient
$y = 3x + 2$		
$y = 2x^2 + 3$		
$y = \frac{3}{x} + 2$		
$y = 5 - 3x$		
$y = x(x - 3)$		
$y = \frac{x}{2} - 5$		

[5]

11

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

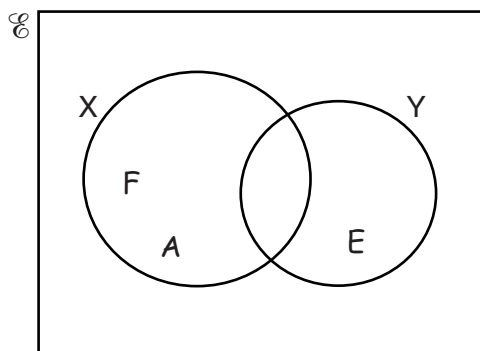
Not to scale



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.

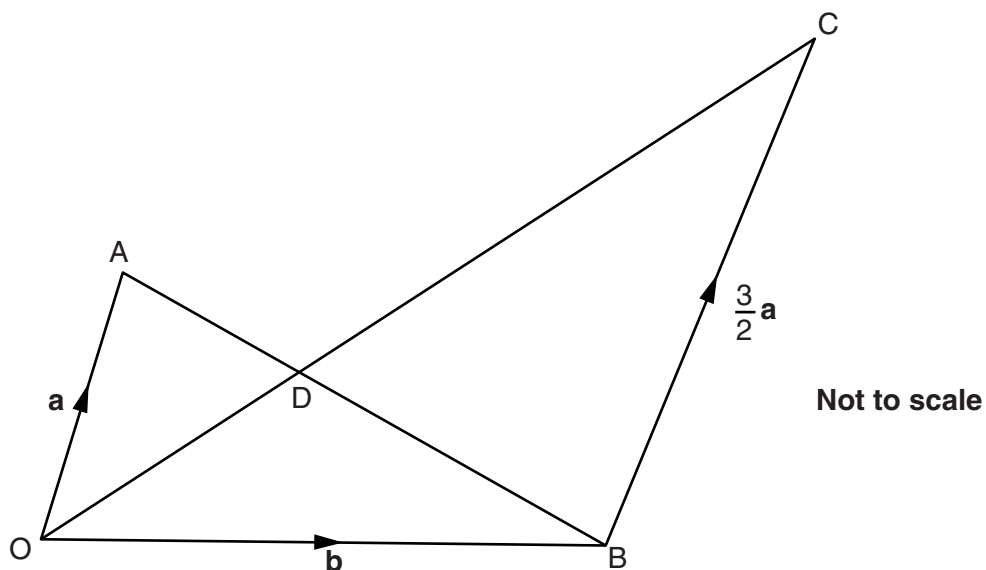
_____ **[3]**

TURN OVER FOR QUESTION 13

14

- 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

15
BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.