

**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**

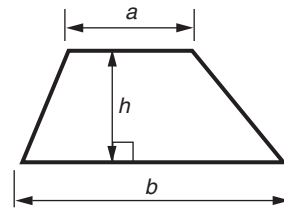
- The number of marks is given in brackets [ ] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (\*).
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are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



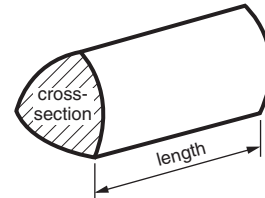
This paper has been pre modified for carrier language

## Formulae Sheet: Higher Tier

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



**Volume of prism** = (area of cross-section)  $\times$  length

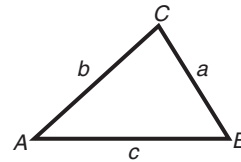


**In any triangle ABC**

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

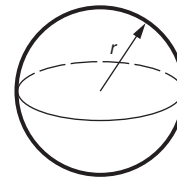
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



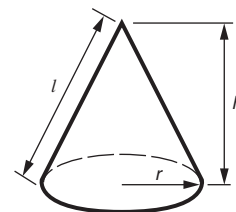
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**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.

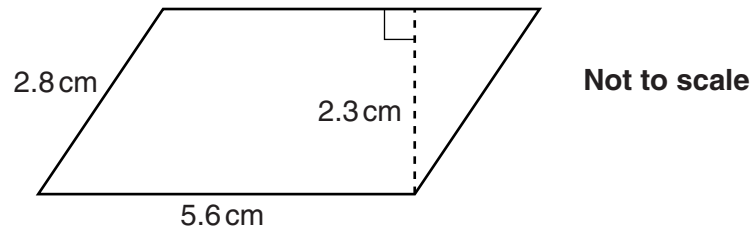
(i)  $\frac{1}{4} + \frac{5}{8}$

(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.

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

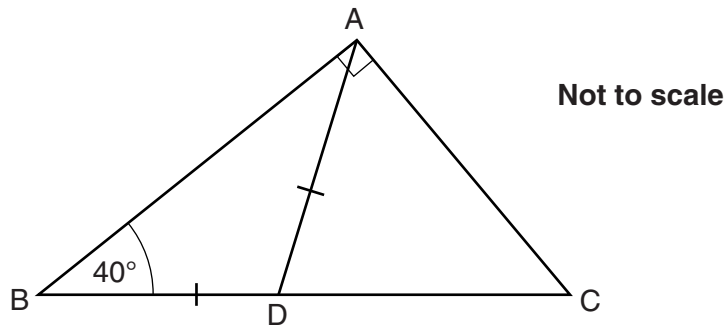
(a) \_\_\_\_\_ [3]

- (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.

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[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]

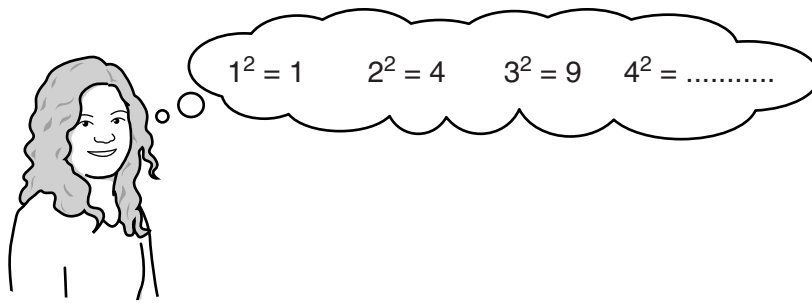
(b)(i) \_\_\_\_\_ [1]

(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.

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[3]

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

2      3      5      7      11

Explain why a prime number cannot be a square number.

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[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
<b>Number of throws</b>	200	20	100	500
<b>Number of sixes</b>	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
<b>Relative frequency of throwing a six</b>				

[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.

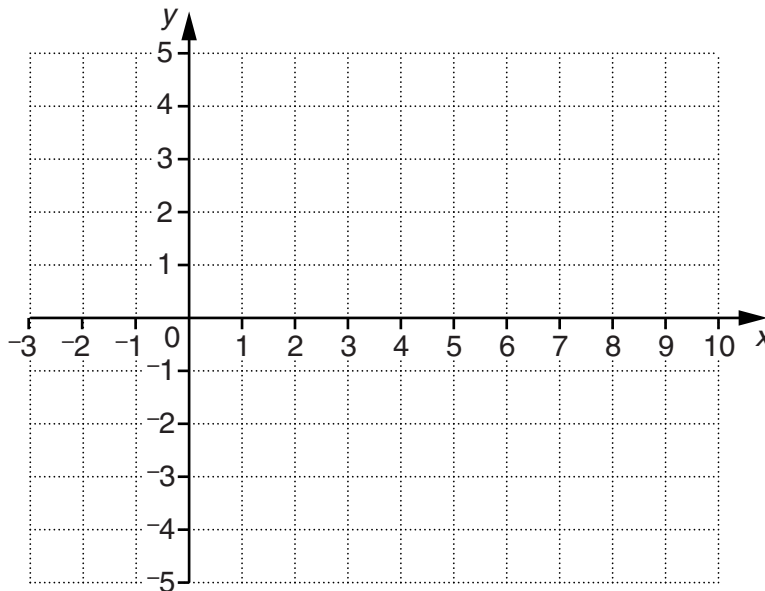
The transformation could be \_\_\_\_\_ [1]

- (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  $180^\circ$  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.

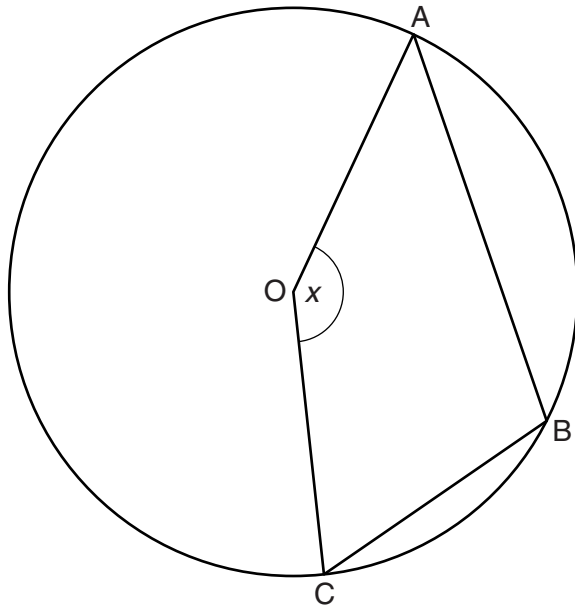
If the graph is a straight line, state the gradient of the line.

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 =  $x$ .

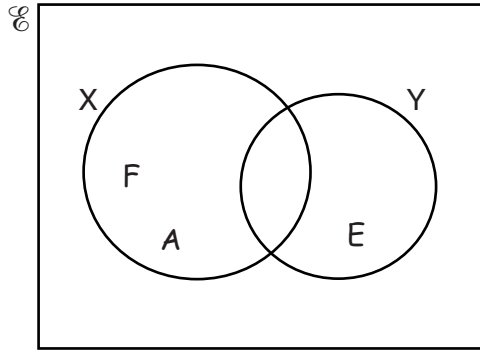
Not to scale



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.

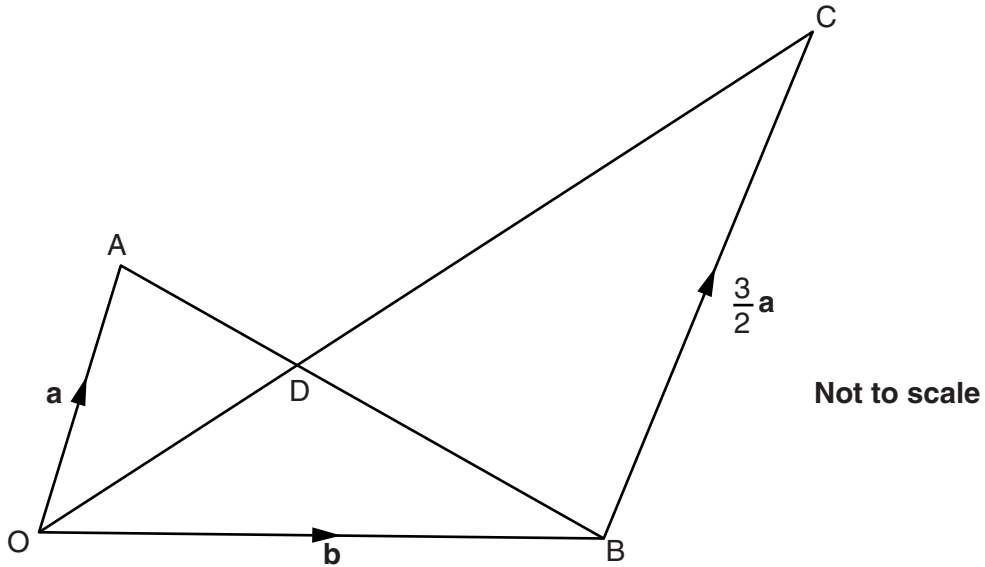
Calculate the probability that she takes two wristbands of different colours.

\_\_\_\_\_ [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.

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[3]

END OF QUESTION PAPER

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