

Monday 17 June 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

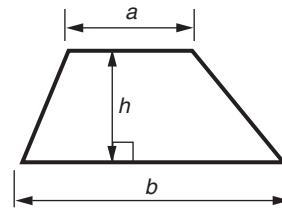
- The number of marks is given in brackets [] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **60**.
- This document consists of **16** pages. Any blank pages are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



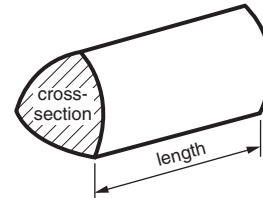
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Formulae Sheet: Higher Tier

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



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

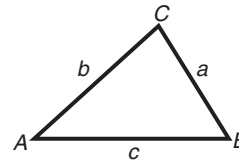


In any triangle ABC

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

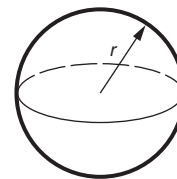
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



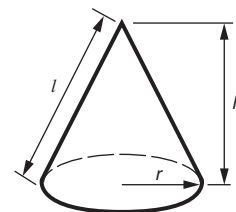
Volume of sphere $= \frac{4}{3} \pi r^3$

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

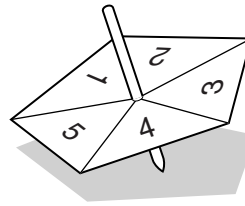
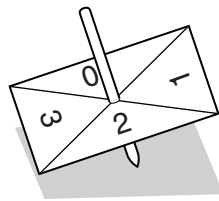
The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

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

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3

- 1 Kirsty has these two fair spinners.



She spins each spinner once.

Her score is the **product** of the numbers on the two spinners.

- (a) Complete the grid showing Kirsty's possible scores.

		2nd spinner				
		1	2	3	4	5
1st spinner	0	0			0	
	1			3		
	2				8	
	3					

[2]

- (b) Find the probability that Kirsty's score is

- (i) 6,

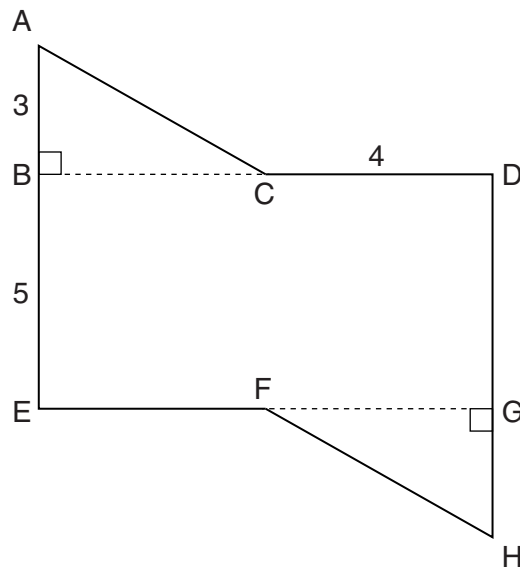
(b)(i) _____ [1]

- (ii) an odd number.

(ii) _____ [1]

2 In this shape

- $AB = GH = 3\text{ cm}$
- $BC = CD = EF = FG = 4\text{ cm}$
- $BE = DG = 5\text{ cm}$.



Not to scale

(a) What type of symmetry does this shape have?

(a) _____ [1]

(b) Find the area of

(i) the triangle ABC,

(b)(i) _____ cm^2 [2]

(ii) the complete shape.

(ii) _____ cm^2 [2]

5

- 3** Anne and Waqar have each written a number on a piece of paper.
Anne's number is three times Waqar's number.
The difference between the two numbers is 5.
The numbers are not whole numbers.

Find the two numbers.

Anne's number _____

Waqar's number _____ [3]

- 4 (a)** Solve.

(i) $12 - 2x = 3$

(a)(i) _____ [2]

(ii) $7x + 1 = 3x - 11$

(ii) _____ [2]

- (b)** Factorise completely.

$$6x^2 - 15xy$$

(b) _____ [2]

6

5* Jack drives 12 000 miles each year in his car.

His car travels 8 miles on one litre of petrol.

Petrol costs £1.40 per litre.

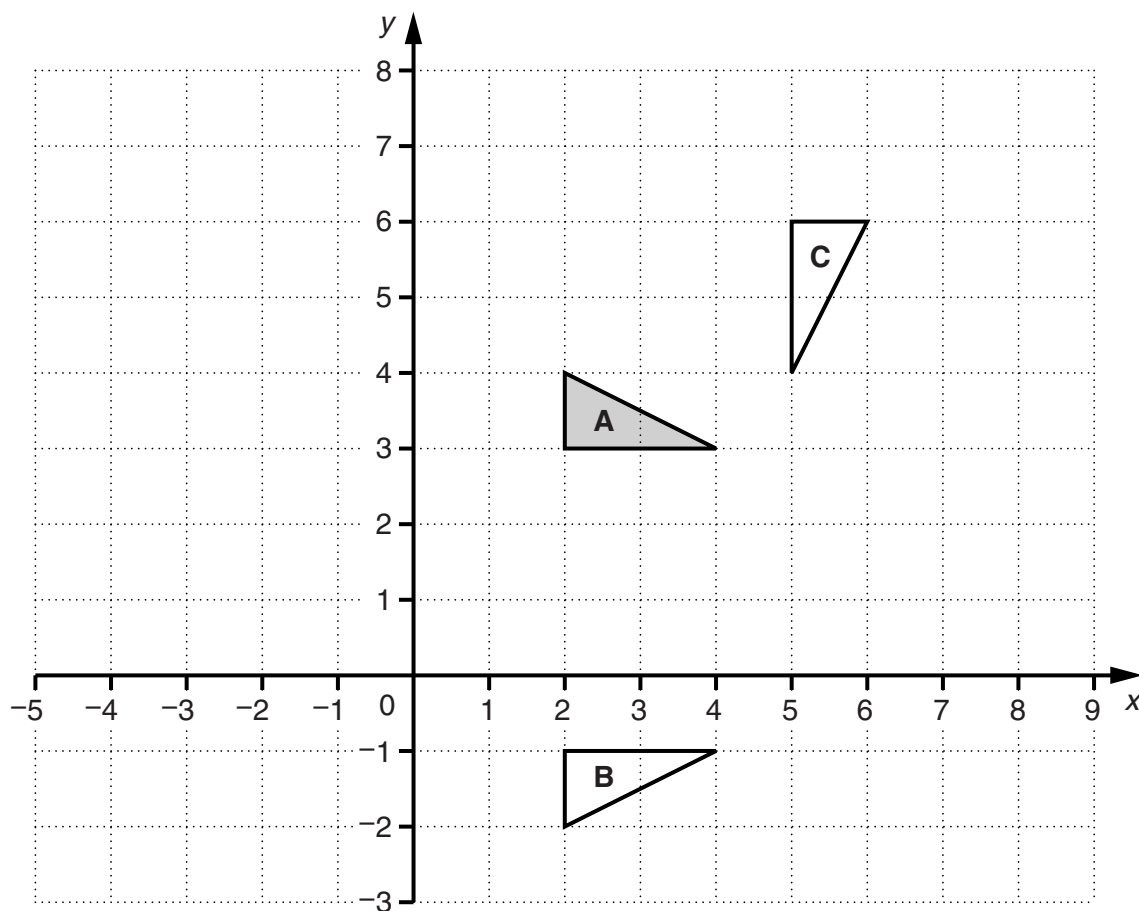
In addition to petrol he has these extra costs each year:

- road tax £130
- servicing and other maintenance £500
- insurance normal price £600.

One year the insurance company reduces the normal price by $\frac{1}{5}$.

Calculate Jack's total motoring costs for this year.

[5]



(a) Describe **fully** the single transformation that maps

(i) triangle **A** onto triangle **B**,

_____ [2]

(ii) triangle **A** onto triangle **C**.

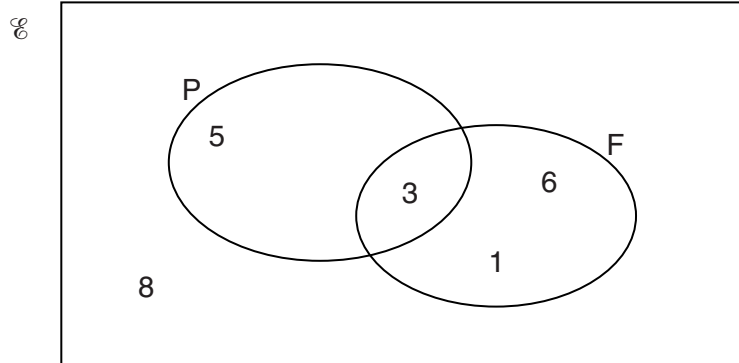
_____ [3]

(b) On the grid, translate triangle **A** using the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$.

[2]

- 7 (a) $\mathcal{E} = \{\text{integers from 1 to 12}\}$
 $P = \{\text{prime numbers}\}$
 $F = \{\text{factors of 12}\}$

- (i) Complete the Venn diagram to show all the members of the set $\mathcal{E}$.
 Some members have been done for you.



[3]

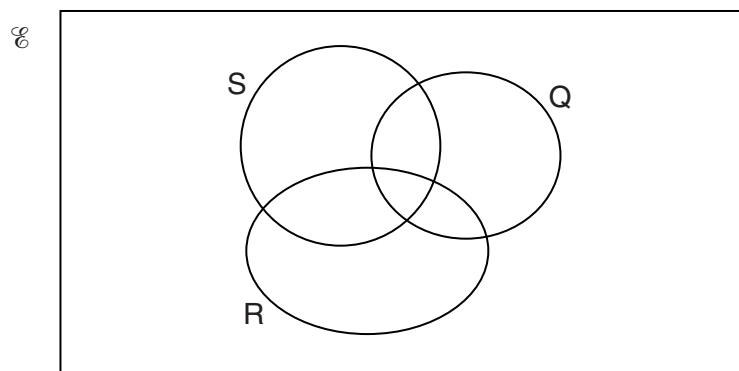
- (ii) List the members of $P \cap F$.

(a)(ii) _____ [1]

- (iii) List the members of $(P \cup F)'$.

(iii) _____ [1]

(b)

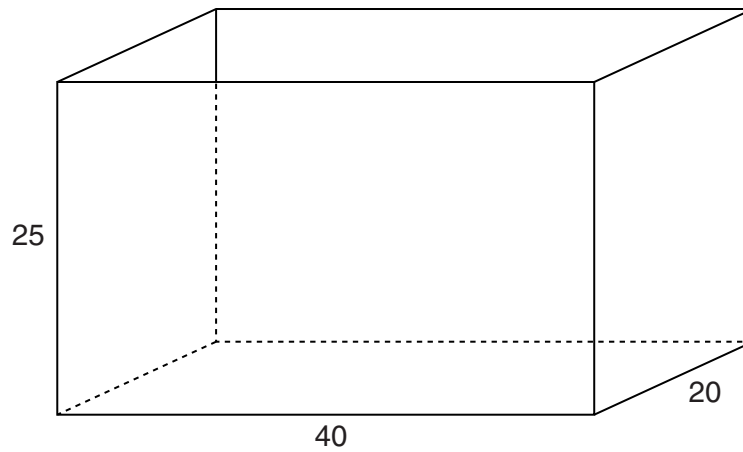


Insert the members a, b, c in the correct subsets in the Venn Diagram so that

- (i) a is a member of $S \cap Q \cap R$, [1]
 (ii) b is a member of $(S \cup Q)' \cap R$, [1]
 (iii) c is a member of $S \cap R \cap Q'$. [1]

9

- 8 The diagram shows an empty tank in the shape of a cuboid.



The dimensions of the tank are 20 cm by 40 cm by 25 cm.
12 litres of water are poured into the tank.
1 litre = 1000 cm³.

Find the depth of water in the tank.

_____ cm [3]

10

9 Written as the product of prime factors,

$$a = 2^2 \times 3^4,$$

$$b = 2^3 \times 3^5 \times 5,$$

$$c = 2^3 \times 3^2 \times 7.$$

Find, as the product of prime factors,

(a) $\sqrt{a}$,

(a) _____ [1]

(b) $\frac{b}{a}$,

(b) _____ [1]

(c) the highest common factor (HCF) of a , b and c ,

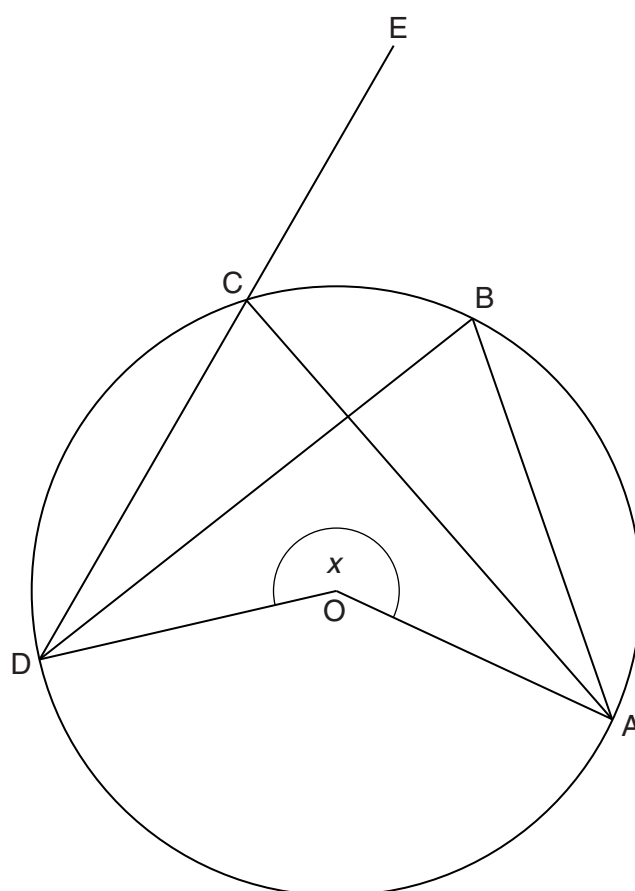
(c) _____ [1]

(d) the least common multiple (LCM) of a , b and c .

(d) _____ [2]

11

10 A, B, C and D are points on the circle, centre O.



Not to scale

DCE is a straight line.
Reflex angle AOD = x .

Find expressions in terms of x for

(a) angle ABD,

(a) _____ [2]

(b) angle ACE.

(b) _____ [2]

12

11 (a) Simplify.

(i) $3a^4b^2 \times 2a^2b^3$

(a)(i) _____ [2]

(ii) $(2x^2y^4)^3$

(ii) _____ [2]

(b) Simplify $9^{-\frac{3}{2}}$.

Write your answer as a fraction.

(b) _____ [3]

13

- 12** There are 7 red balls, 5 white balls and 6 blue balls in a bag.
Asif takes a ball from the bag, then Becky takes a ball and finally Carlos takes a ball.
They each take their ball at random and the balls are not replaced.

Asif took a red ball.

Find the probability that

- (a)** Becky took a white ball,

(a) _____ [1]

- (b)** Becky and Carlos both took a white ball.

(b) _____ [2]

END OF QUESTION PAPER

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