OCR
RECOGNISING ACHIEVEMENT

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Monday 17 June 2013 – Morning

GCSE METHODS IN MATHEMATICS

B391/02 Methods in Mathematics 1 (Higher Tier)

B31708061 3

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Geometrical instruments
- Tracing paper (optional)

Duration: 1 hour 15 minutes

B391 02

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.

WARNING

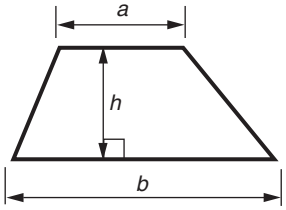
No calculator can be used for this paper

This paper has been pre modified for carrier language

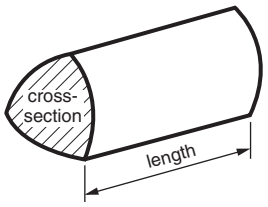
DC (LEG/CGW) 66637/3

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

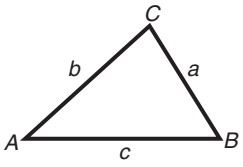


In any triangle *ABC*

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

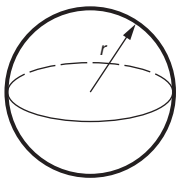
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



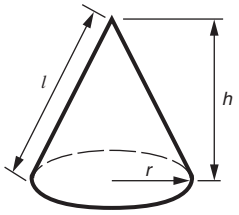
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$



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 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,

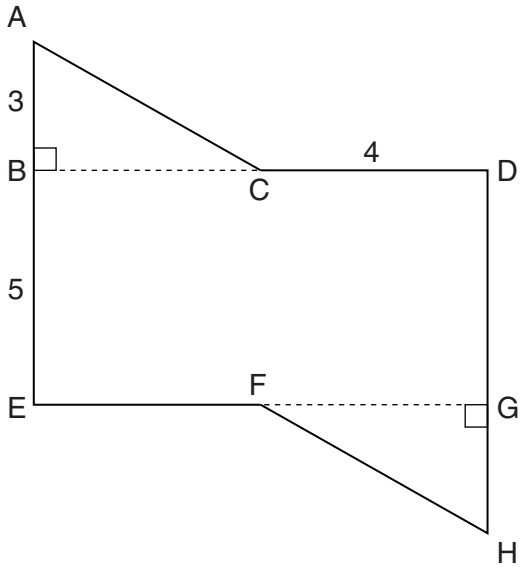
(b)(i) _____ **[1]**

(ii) an odd number.

(ii) _____ **[1]**

2 In this shape

- AB = GH = 3 cm
- BC = CD = EF = FG = 4 cm
- BE = DG = 5 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]**

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]**

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.

_____

_____

_____

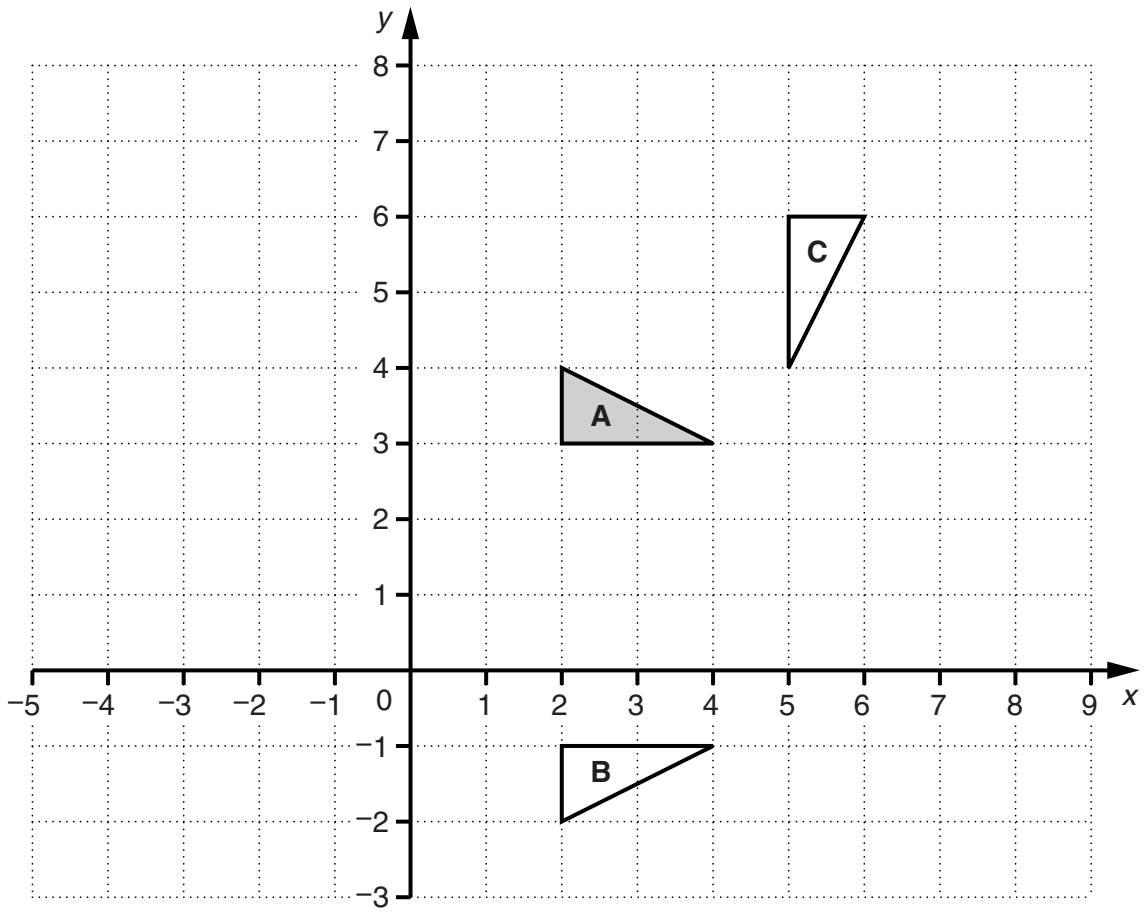
_____

_____

_____

_____ **[5]**

6



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

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

_____ **[2]**

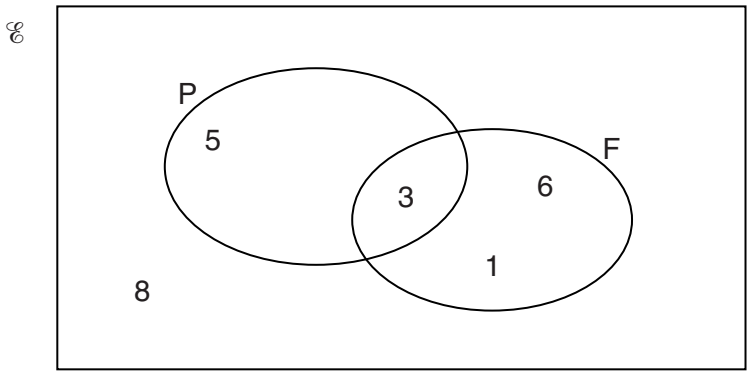
(ii) triangle **A** onto triangle **C**.

_____ **[3]**

(b) On the grid, translate triangle **A** using the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$. **[2]**

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

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



[3]

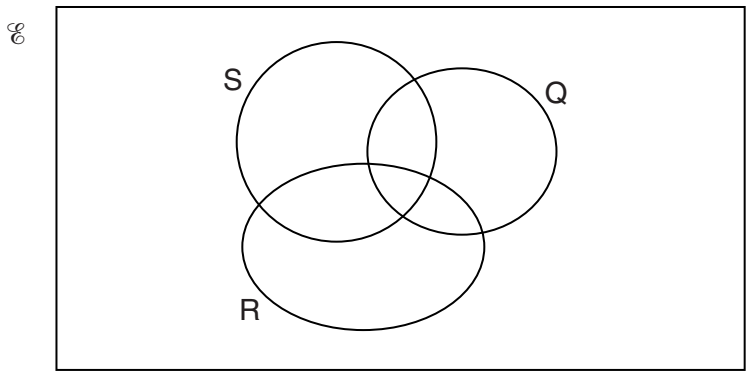
(ii) List the members of P ∩ F.

(a)(ii) _____ **[1]**

(iii) List the members of (P ∪ F)′.

(iii) _____ **[1]**

(b)



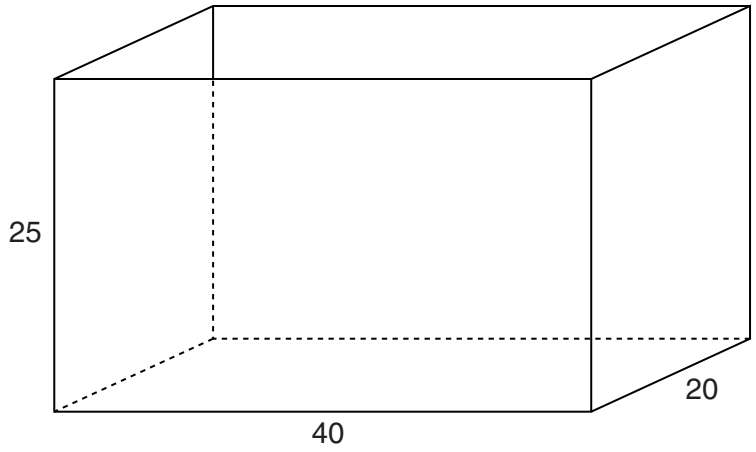
Insert the members a, b, c in the correct subsets in the Venn Diagram so that

(i) a is a member of S ∩ Q ∩ R, **[1]**

(ii) b is a member of (S ∪ Q)′ ∩ R, **[1]**

(iii) c is a member of S ∩ R ∩ Q′. **[1]**

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 cm^3.

Find the depth of water in the tank.

_____ cm **[3]**

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]**

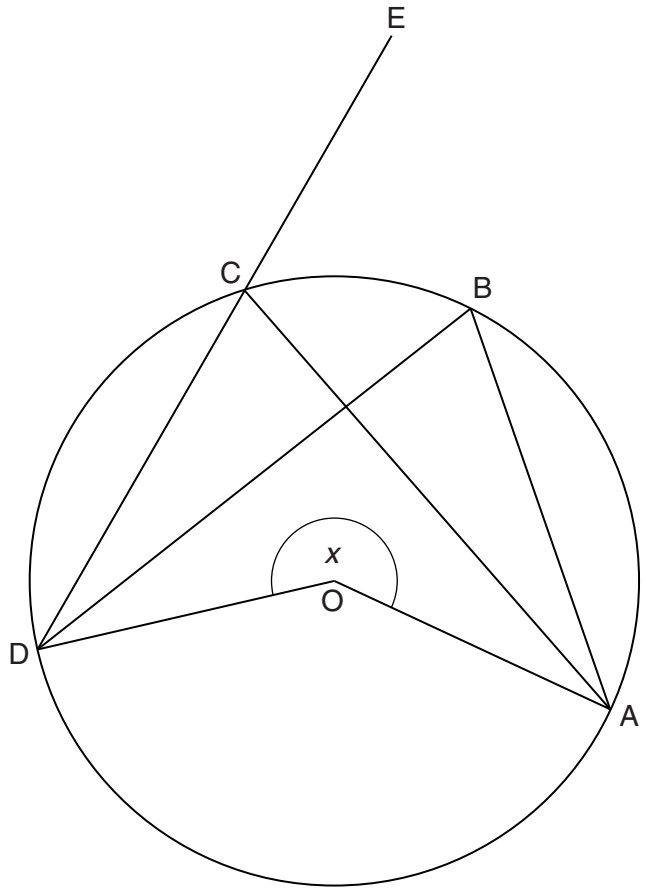
(c) the highest common factor (HCF) of a, b and c,

(c) _____ **[1]**

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

(d) _____ **[2]**

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]**

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]**

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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