

OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GCSE

**B391/02**

**METHODS IN MATHEMATICS**

**Methods in Mathematics 1 (Higher Tier)**

**MONDAY 17 JUNE 2013: Morning**

**DURATION: 1 hour 15 minutes  
plus your additional time allowance**

**MODIFIED ENLARGED**

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**Candidates answer on the Question Paper.**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

**Geometrical instruments  
Tracing paper (optional)**

<p><b>WARNING</b> <b>No calculator can be used for this paper</b></p>
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**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

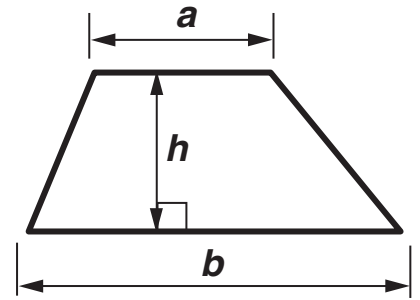
- Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer ALL the questions.
- Read each question carefully. Make sure you know what you have to do before 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).

## **INFORMATION FOR CANDIDATES**

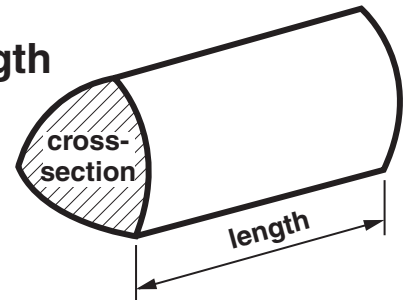
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 60.
- The Quality of Written Communication is assessed in questions marked with an asterisk (\*).
- Any blank pages are indicated.

# FORMULAE SHEET: HIGHER TIER

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



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

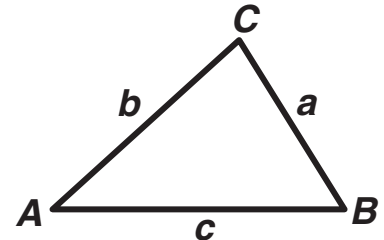


In any triangle  $ABC$

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

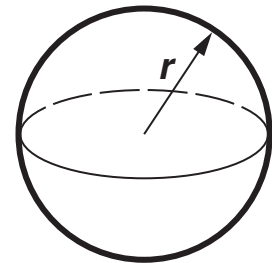
Cosine rule  $a^2 = b^2 + c^2 - 2bc \cos A$

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



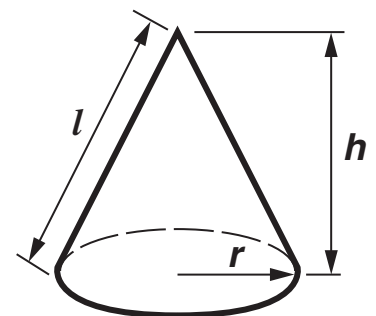
Volume of sphere =  $\frac{4}{3} \pi r^3$

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



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

Curved surface area of cone =  $\pi r l$

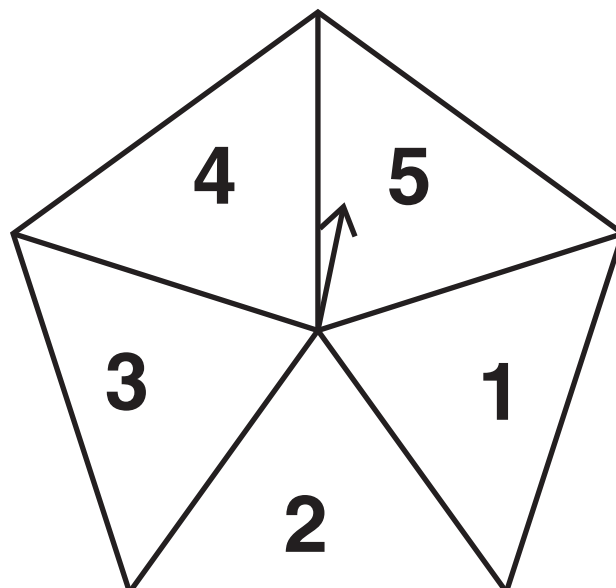
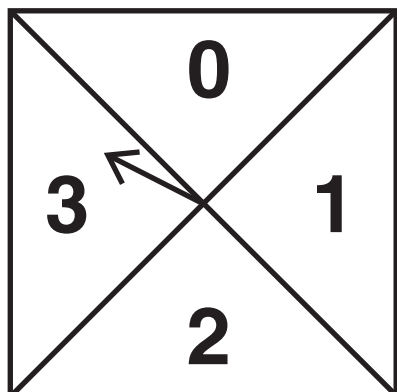


The Quadratic Equation

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

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

- 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 following 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,**

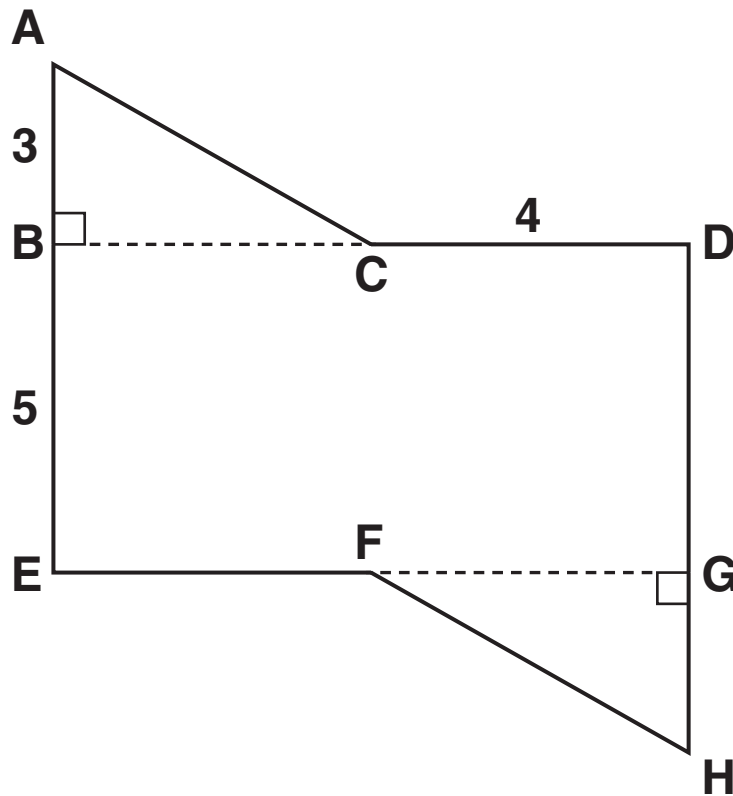
**(b)(i) \_\_\_\_\_ [1]**

**(ii) an odd number.**

**(ii) \_\_\_\_\_ [1]**

2 In the shape shown below

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



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<sup>2</sup> [2]**

**(ii) the complete shape.**

**(ii) \_\_\_\_\_ cm<sup>2</sup> [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.**

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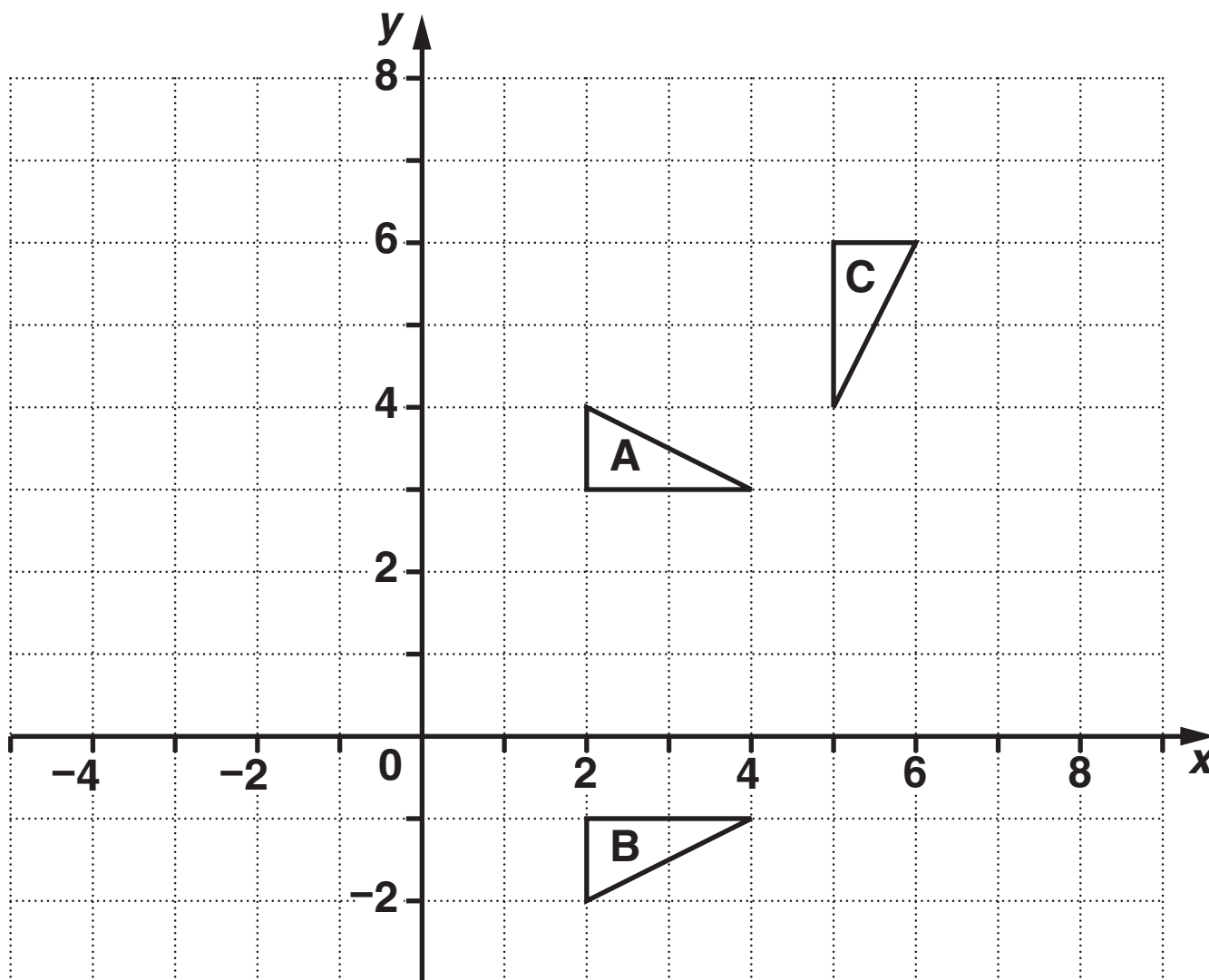
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**[5]**

**Question 6 starts on page 12.**

- 6 The following diagram shows shapes A, B and C on a grid.



(a) Describe FULLY the single transformation that maps

(i) triangle A onto triangle B,

\_\_\_\_\_ [2]

(ii) triangle A onto triangle C.

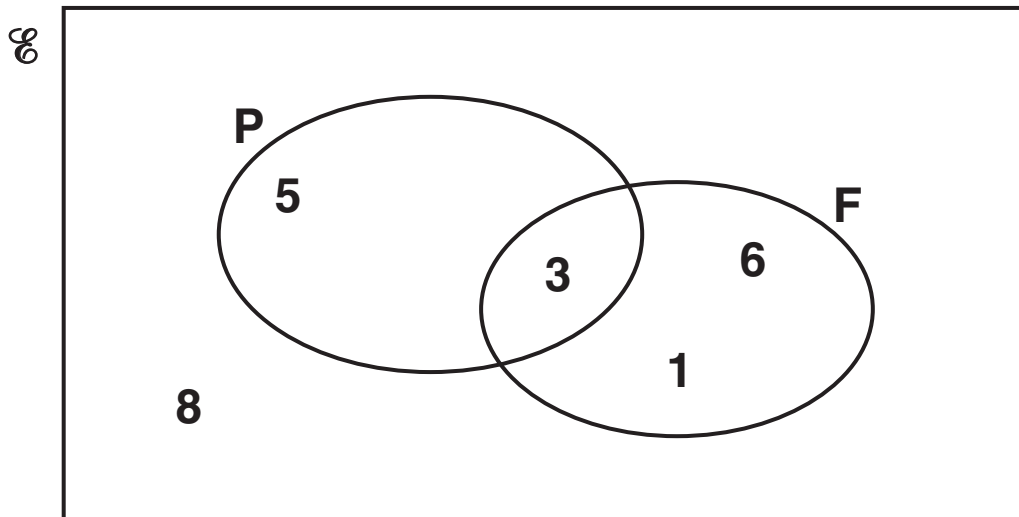
\_\_\_\_\_ [3]

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



[3]

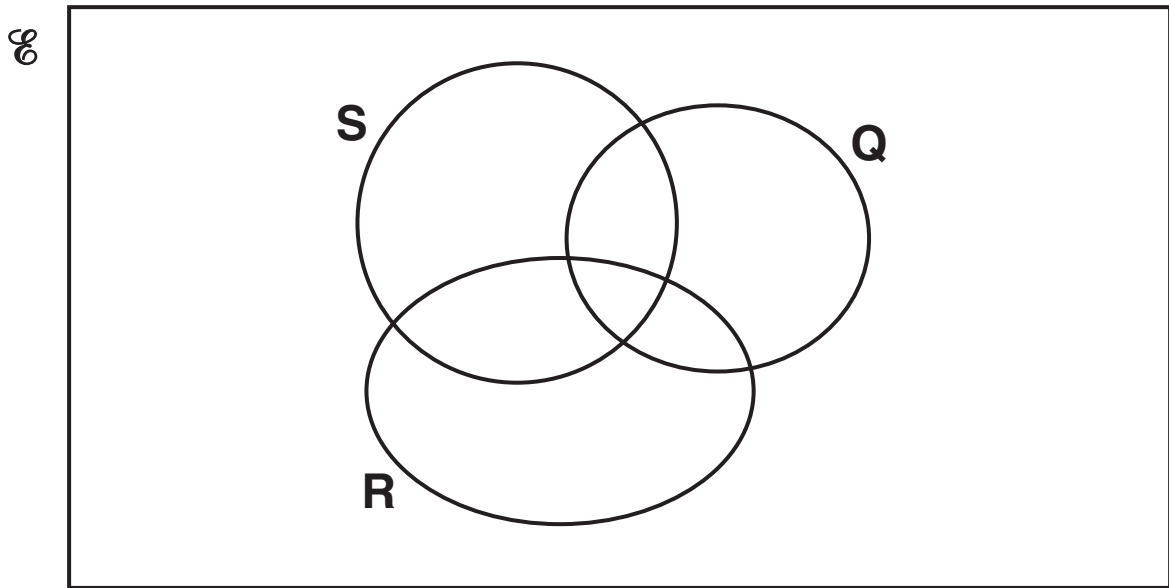
- (ii) List the members of  $P \cap F$ .

(a)(ii) \_\_\_\_\_ [1]

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

(iii) \_\_\_\_\_ [1]

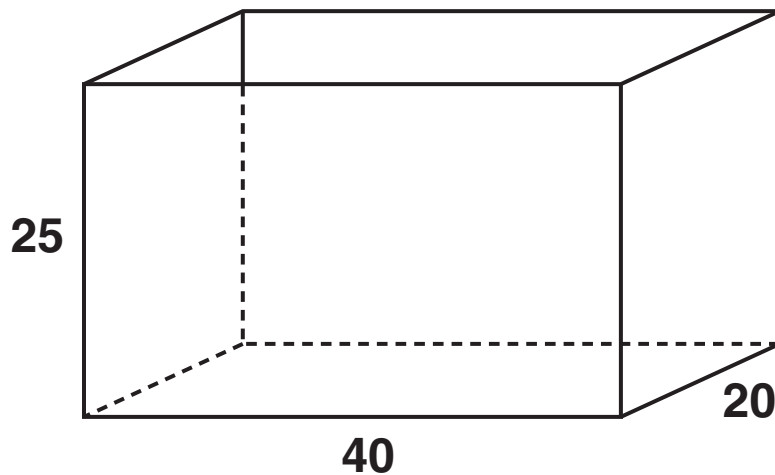
(b) The following Venn diagram shows sets Q, R and S.



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]

- 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 =  $1000\text{ cm}^3$ .

Find the depth of water in the tank.



**Question 9 starts on page 18.**

**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]**

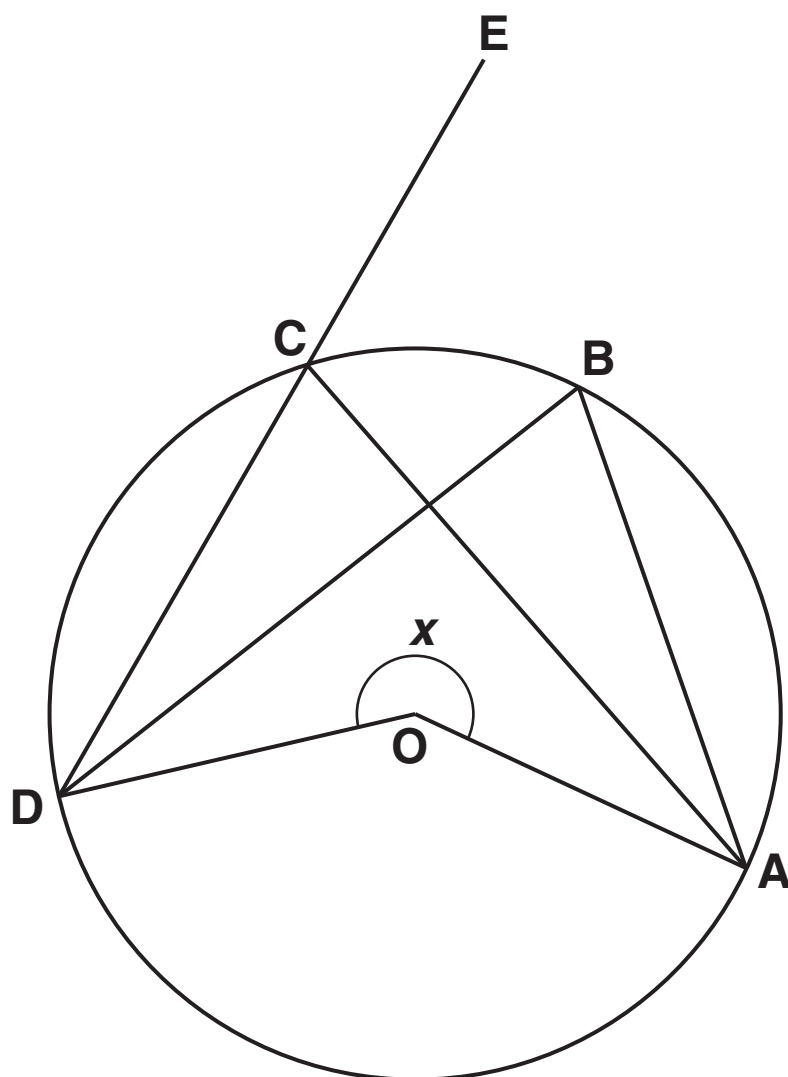
**(c) the highest common factor (HCF) of  $a$ ,  $b$  and  $c$ ,**

**(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, as shown on the following diagram.



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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