

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
METHODS IN MATHEMATICS**

**B391/02**

Paper 1  
(Higher Tier)

Candidates answer on the Question Paper

**OCR Supplied Materials:**

None

**Other Materials Required:**

- Geometrical instruments
- Tracing paper (optional)

**SPECIMEN**

**Duration:** 1 hour 15 minutes



<b>Candidate Forename</b>		<b>Candidate Surname</b>	
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<b>Centre Number</b>						<b>Candidate Number</b>			
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that 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.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

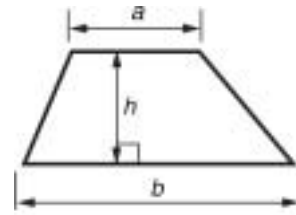
**INFORMATION FOR CANDIDATES**

- 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**.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (\*).
- This document consists of **16** pages. Any blank pages are indicated.

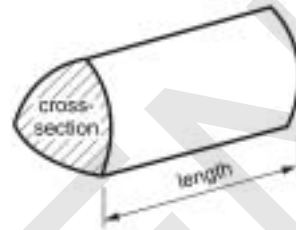
**WARNING**  
You are **NOT** permitted to use a calculator for this paper.

## Formulae Sheet: Higher Tier

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



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

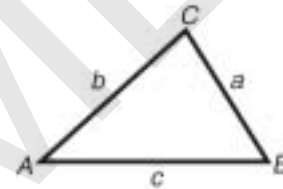


In any triangle  $ABC$

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

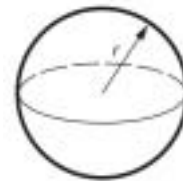
$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$

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



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

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



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

$$\text{Curved surface area of cone} = \pi r l$$



**The Quadratic Equation**

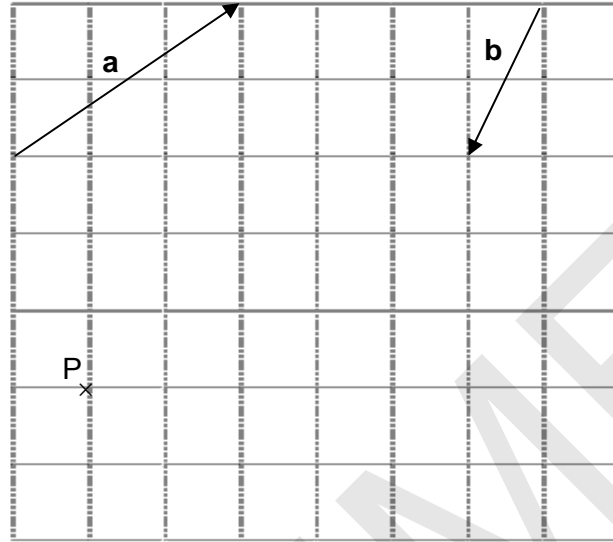
The solutions of  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , are given by

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

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1 The diagram shows two vectors, **a** and **b**.

The vector **a** =  $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$ .



(a) Write **b** as a column vector.

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

(b) Using the given vectors, describe a translation that moves P to another point on the same horizontal line.

(b) \_\_\_\_\_ [2]

- 2 A rugby club has 80 members.  
In a rugby team, some of the players are 'forwards'; the rest are 'backs'.  
32 of the members have played as forwards this season.  
43 of the members have played as backs this season.  
14 of the members have not played this season.

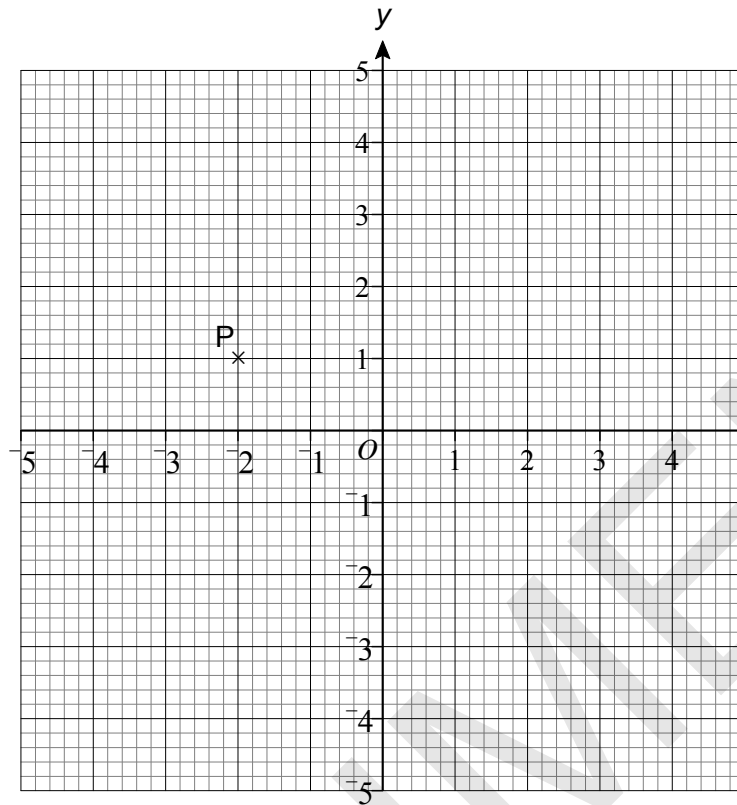
How many members have played as both forwards and backs this season?  
You must support your answer with evidence.

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[4]

3 This is a one-centimetre grid with the point P (-2, 1) marked on it.



(a) Draw a straight line with a gradient of 2 through the point P. [1]

(b) Write down the equation of the line in part (a).

(b) \_\_\_\_\_ [2]

(c) Write down the equation of a line parallel to the line in part (a).

(c) \_\_\_\_\_ [1]

- 4 Roshan, Simon and Tina are trying to estimate the probability that a student in their school is left-handed.  
To do this, they select a number of students at random.  
Their results are shown in this table.

	Roshan	Simon	Tina
Number of people selected	270	90	20
Number who are left-handed	30	15	8

The school has 1350 students.

Use these results to help you calculate the most reliable estimate for the number of left-handed students in the school.

\_\_\_\_\_ [4]

- (b) Assume Roshan's results are representative of the whole population of the United Kingdom.

Find the probability that two randomly chosen people from the United Kingdom are both left-handed.

(b) \_\_\_\_\_ [2]

5 Expressed as a product of its prime factors,  $540 = 2 \times 2 \times 3 \times 3 \times 3 \times 5$ .

(a) Express 252 as a product of its prime factors.

(a) \_\_\_\_\_ [2]

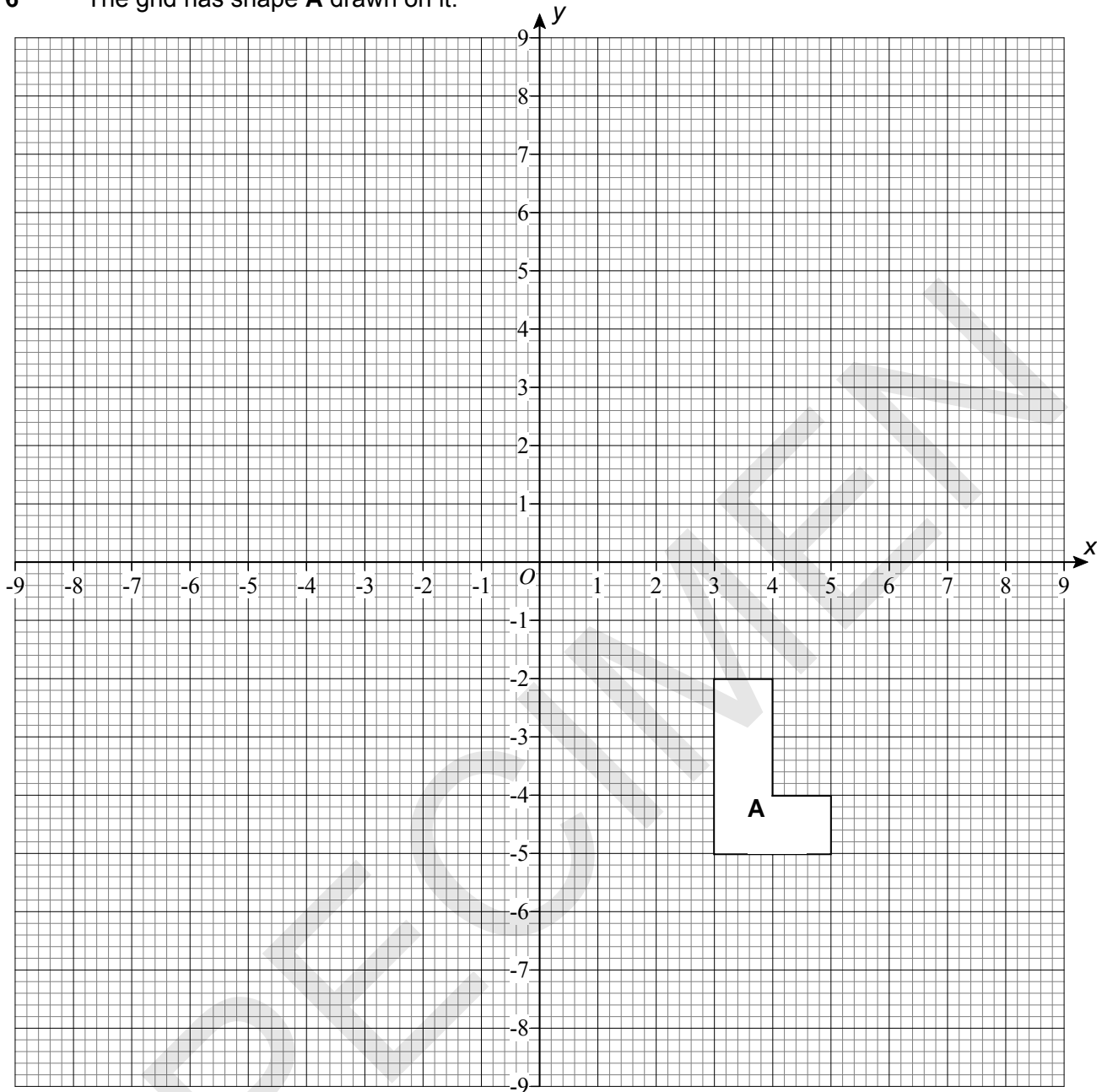
(b) Find the lowest common multiple (LCM) of 540 and 252.

(b) \_\_\_\_\_ [2]

(c) Find the smallest integer  $k$  such that  $540k$  is a square number.

(c) \_\_\_\_\_ [2]

6 The grid has shape **A** drawn on it.



- (a) Rotate shape **A**  $90^\circ$  anticlockwise about the point  $(1, -1)$ .  
Label your image **B**.

[2]

- (b) Translate shape **B** by  $\begin{bmatrix} -7 \\ 3 \end{bmatrix}$ .  
Label your image **C**.

[2]

- (c) What **single** transformation will map shape **C** onto shape **A**?

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[3]



- 7 Set  $A = \{n: \text{twice } n \text{ has to be greater than } -4 \text{ but less than or equal to } 6\}$  and  
Set  $B = \{\text{positive integers}\}$ .

(a) Write the condition for  $n$  in set  $A$  as an inequality.

(a) \_\_\_\_\_ [2]

(b) Write down the elements of  $A \cap B$ .

(b) \_\_\_\_\_ [2]

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- 8\* The largest angle in a triangle is 3 times the size of the smallest angle. The third angle is  $37^\circ$  less than the largest angle.  
The smallest angle is  $x$ .

Find, in degrees, the angles of the triangle.

\_\_\_\_\_  $^\circ$  [4]

- 9 To take part in an expedition, Sayeed has to pass a medical test and then pass a fitness test. If he fails the medical he is not allowed to take the fitness test.

The probability that he passes the medical test is 0.9.

The probability that he passes the fitness test is 0.7.

These events are independent.

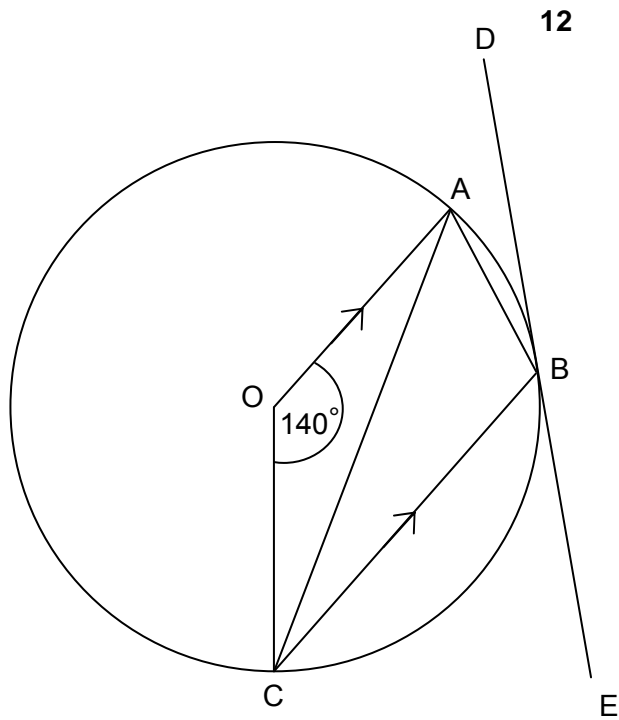
Is Sayeed's chance of taking part in the expedition better than evens?

You must support your answer with evidence.

[5]

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10



Not to scale

DE is the tangent at B to the circle, centre O. OA is parallel to CB.  
 Angle AOC =  $140^\circ$

Find these angles.

(a) ACB

(a) \_\_\_\_\_ $^\circ$  [2]

(b) ABC

(b) \_\_\_\_\_ $^\circ$  [2]

(c) ABD

(c) \_\_\_\_\_ $^\circ$  [1]

11 (a) Simplify.

(i)  $\frac{z^6 \times z^4}{z^{-3}}$

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

(ii)  $6(3x + 4z) - 5(2x - 6z)$

(ii) \_\_\_\_\_ [3]

(b) Expand and simplify.

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

(b) \_\_\_\_\_ [3]

(c) Solve.

(i)  $22 - 8x = 4$

(c)(i) \_\_\_\_\_ [2]

(ii)  $-3(x - 4) + 7x = 2(4x + 1)$

(c)(ii) \_\_\_\_\_ [3]

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OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
General Certificate of Secondary Education  
**METHODS IN MATHEMATICS**

**B391/02**

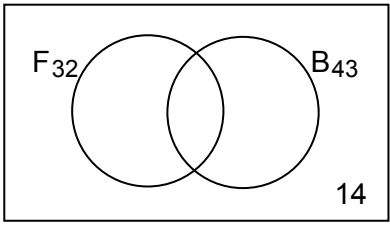
Paper 1 (Higher)

**Specimen Mark Scheme**

The maximum mark for this paper is **60**.

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This document consists of **4** printed pages.

1	(a)	$\begin{bmatrix} -1 \\ -2 \end{bmatrix}$	1	
	(b)	$a + b$	2	Accept any multiple of this Allow 1 mark for answer that has positive coeffs of both <b>a</b> and <b>b</b> or negative coeffs of both <b>a</b> and <b>b</b> . Allow 1 mark for ft from 'their' <b>(a)</b>
2		 <p style="text-align: right;">E<sub>80</sub></p> <p style="text-align: center;">F<sub>32</sub>      B<sub>43</sub></p> <p style="text-align: right;">14</p> <p>9</p>	2	Labels and numbers indicated appropriately <b>B1</b> for basic shape
			2	<b>M1</b> for $32 + 43 - (80 - 14)$ soi by 9 in correct place in diagram
3	(a)	Correct line drawn	1	
	(b)	$y = 2x + 5$	2	1 for $y = 2x$ 1 for +5
	(c)	$y = 2x + c$ , where $c \neq$ their 5	1	Allow ft from <i>their</i> line
4	(a)	Identify Roshan's data as most reliable  150	1	May be identified by being used
			3	Allow 3 marks for 225 from Simon or 540 from Tina. Allow <b>M1</b> for use of 'their' correct fraction and <b>M1</b> for multiplying 'their' fraction by 1350.
	(b)	$\frac{1}{81}$	2	<b>M1</b> for $\frac{1}{9} \times \frac{1}{9}$ oe
5	(a)	$2 \times 2 \times 3 \times 3 \times 7$	2	<b>M1</b> for one pair of factors seen.
	(b)	3780	2	<b>M1</b> for $540 \times 7$ or $252 \times 15$ oe
	(c)	15	2	<b>B1</b> for $15 \times$ square number evaluated
6	(a)	Shape drawn correctly, with vertices at (2, 1), (5, 1), (5, 3), (4, 3), (4, 2), (2, 2)	2	1 mark for rotation in wrong direction, or for at least 2 corners correct
	(b)	Shape drawn correctly	2ft	Allow follow through from their L shape for 2. 1 mark if at least 2 corners correct.

	(c)	rotation 90° anticlockwise oe about (-4, -3)	M1 A1 A1	
7	(a)	$-4 < 2n \leq 6$ $-2 < n \leq 3$	2	1 for one error in $-4$ , $2n$ or $6$ . For 1 mark do not worry about signs.
	(b)	1 2 3	2	1 mark for one of these and no others, or all three and one or two extras
8*		Complete and fully correct working to arrive at the angles 31°, 56° and 93° presented in a clear, logical and well expressed form. Good answers will most likely come from algebra, based on $x + 3x + 3x - 37^\circ = 180^\circ$ , or equivalent, though any other correct method, including Trial and Improvement, can score full marks.  A correct algebraic equation, or other appropriate method, together with an attempt at a reasoned explanation, attempted but incomplete or with minor errors in working.  No relevant comment or calculation shown.	3-4  1-2  0	For lower mark - Complete and correct working that provides a solution with one slip in working at any stage (allow follow through) or complete and fully correct working lacking clarity of explanation.  For lower mark - An algebraic equation, not solved, with no explanation or other appropriate method attempted eg trial and improvement with at least two trials with no explanation.
9	(a)	If done by tree diagram: 0.9 and 0.1 positioned correctly 0.7 and 0.3 positioned correctly 0.63 better that evens ft	1 1 2 1	If not done by tree diagram, award B1 for identifying and using 0.9 and B1 for identifying and using 0.7  M1 for $0.9 \times 0.7$
10	(a)	20°	2	B1 for angle ACO or CAO = 20 seen
	(b)	110°	2	B1 for reflex angle AOC = 220 seen
	(c)	20° or their (a)	1ft	
11	(a)	(i) $z^{13}$	1	
		(ii) $18x + 24z - 10x + 30z$ seen $8x + 54z$ www	2 1	M1 for $18x + 24z$ or $-10x - 30z$ cao
	(b)	$6x^2 + 4x - 3x - 2$ $6x^2 + x - 2$	2 1	Allow 1 for three correct terms cao

	<p><b>(c)</b></p> <p><b>(i)</b> Attempt to isolate <math>x</math>  <math>\frac{9}{4}</math> oe www</p> <p><b>(ii)</b> <math>-3x + 12 + 7x = 8x + 2</math>          Attempt to isolate <math>x</math>  <math>x = 2.5</math> oe</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>eg <math>22 - 4 = 8x</math></p> <p>cao</p> <p>eg <math>-4x = -10</math></p> <p>cao</p>

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**Assessment Objectives****GCSE Methods in Mathematics****B391/02 (Higher)**

Qn	AO1	AO2	AO3
1	1	2	
2			4
3	4		
4		6	
5	2	4	
6	3	4	
7	4		
8*			4
9			5
10	5		
11	12		
12			
<b>TOTAL</b>	<b>31</b>	<b>16</b>	<b>13</b>