

Centre No.						Paper Reference					Surname	Initial(s)		
Candidate No.						7	3	6	1	/	0	2	Signature	

Paper Reference(s)

7361/02

London Examinations GCE

Mathematics Syllabus B

Ordinary Level

Paper 2

Tuesday 15 January 2008 – Morning

Time: 2 hours 30 minutes

Examiner's use only

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Team Leader's use only

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Materials required for examination

Nil

Items included with question papers

Nil

Candidates are expected to have an electronic calculator when answering this paper.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature. Check that you have the correct question paper.

You must write your answer for each question in the space following the question.

If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).

Full marks may be obtained for answers to ALL questions.

There are 11 questions in this question paper. The total mark for this paper is 100.

There are 24 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Write your answers neatly and legibly.

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1. $f : x \mapsto x^2 - 2,$
 $g : x \mapsto x - 4.$

(a) Express the function fg in the form $fg : x \mapsto \dots\dots\dots$, simplifying your answer. (2)

(b) Solve $fg(x) = f(x).$ (2)

(Total 4 marks)

Q1

2. (a) Show that $(x - 1)$ is a factor of $x^3 - 2x^2 - 11x + 12.$ (2)

(b) Hence, or otherwise, factorise completely $x^3 - 2x^2 - 11x + 12.$ (3)

(Total 5 marks)

Q2



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3. (a) Calculate the inverse of the matrix $\begin{pmatrix} 5 & -1 \\ 4 & 2 \end{pmatrix}$. **(2)**

(b) By using your answer to part (a), or otherwise, find the value of x and the value of y that satisfy

$$\begin{pmatrix} 5 & -1 \\ 4 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}.$$

(4)

[The inverse of matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \frac{1}{ad-bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$]

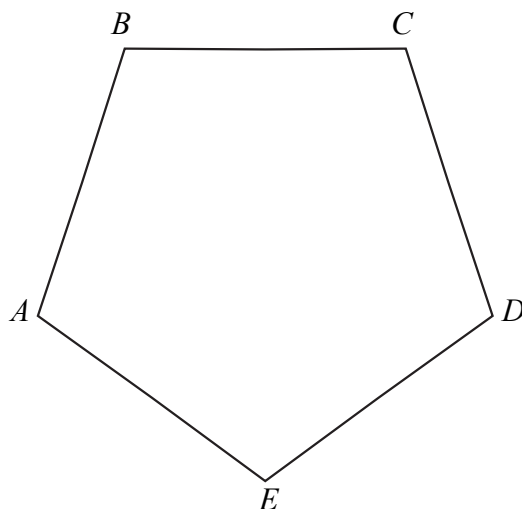
(Total 6 marks)

Q3



4.

Figure 1



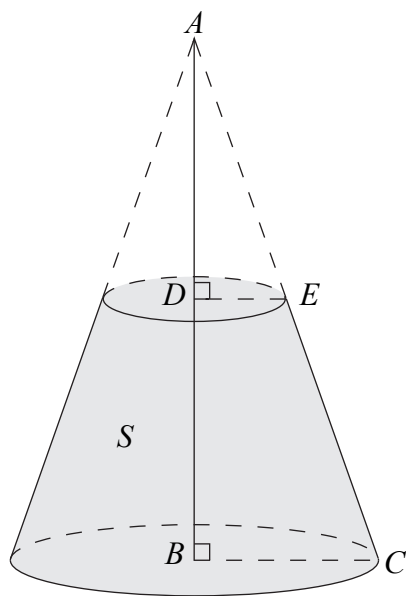
In Figure 1, $ABCDE$ is a regular pentagon.

- (a) Calculate the size, in degrees, of an interior angle of $ABCDE$. (1)
- (b) Calculate the size, in degrees, of $\angle ABE$. (2)
- (c) Show that $\angle AEB = \angle CED = \angle BEC$, stating your reasons. (3)

$$\left[\text{Sum of interior angles of polygon} = (2n - 4) \text{ right angles} \right]$$

5.

Figure 2



A solid S of height 3 cm is shown shaded in Figure 2. It is formed by removing a right circular cone of base radius 2 cm from a right circular cone of base radius 5 cm. The point D is the centre of the top surface of S and the point B is the centre of the base of S , so that $DE = 2$ cm, $BC = 5$ cm and $DB = 3$ cm.

(a) By considering $\triangle ADE$ and $\triangle ABC$, calculate the length, in cm, of

(i) AD ,

(ii) AB .

(4)

(b) Calculate the volume, in cm^3 to 3 significant figures, of the solid S .

(3)

$$\left[\text{Volume of a right circular cone} = \frac{1}{3}\pi r^2 h \right]$$

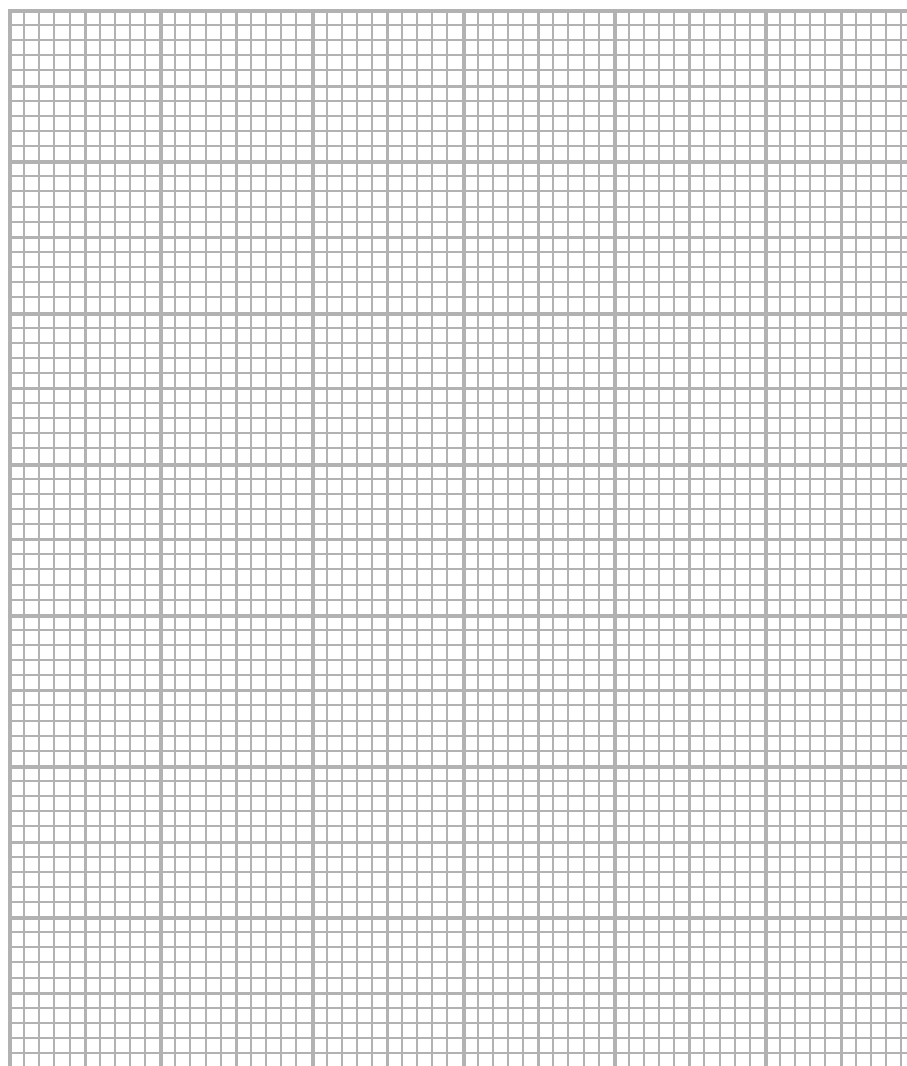


6. The table gives information about the ages of the population of a country.

Age (a years)	Number (millions)
$0 \leq a < 10$	9
$10 \leq a < 20$	8
$20 \leq a < 35$	10
$35 \leq a < 50$	19
$50 \leq a < 55$	4
$55 \leq a < 65$	7
$65 \leq a < 80$	4
$80 \leq a < 100$	1

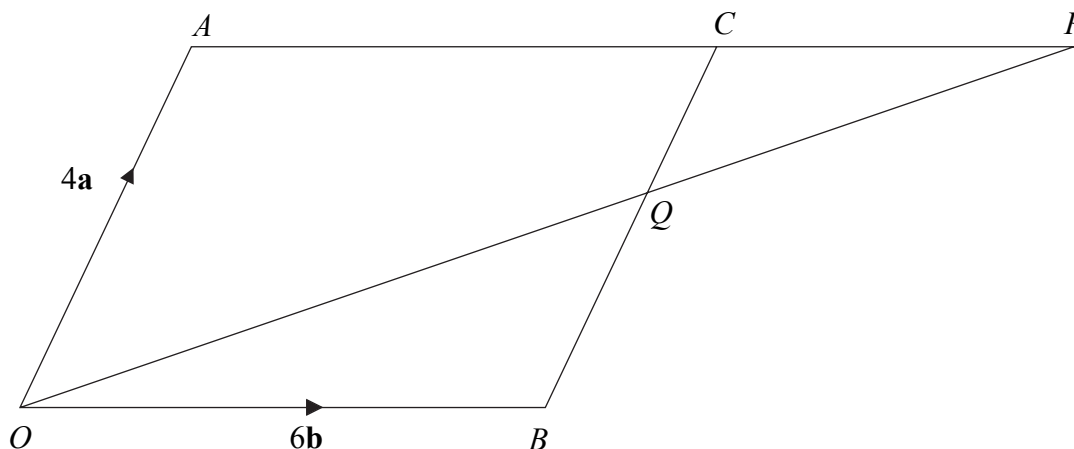
(a) On the graph paper below, using a scale of 1 cm to represent 10 years on the Age axis, draw a histogram to represent this information.

(4)



7.

Figure 3



In Figure 3, $OACB$ is a parallelogram with $\vec{OA} = 4\mathbf{a}$ and $\vec{OB} = 6\mathbf{b}$. The point Q lies on BC such that $BQ = 3QC$. The lines AC and OQ are extended and meet at the point P .

- (a) Write down \vec{QC} . (1)
- (b) Show, stating your reasons, that $\triangle CPQ$ is similar to $\triangle APO$. (2)
- (c) Find,
 - (i) \vec{CP} ,
 - (ii) \vec{AP} . (4)

The area of $\triangle CPQ$ is 4 cm^2 .

- (d) Calculate the area, in cm^2 , of $ACQO$. (3)



Question 7 continued

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Lined writing area for the answer to Question 7.

(Total 10 marks)

Q7

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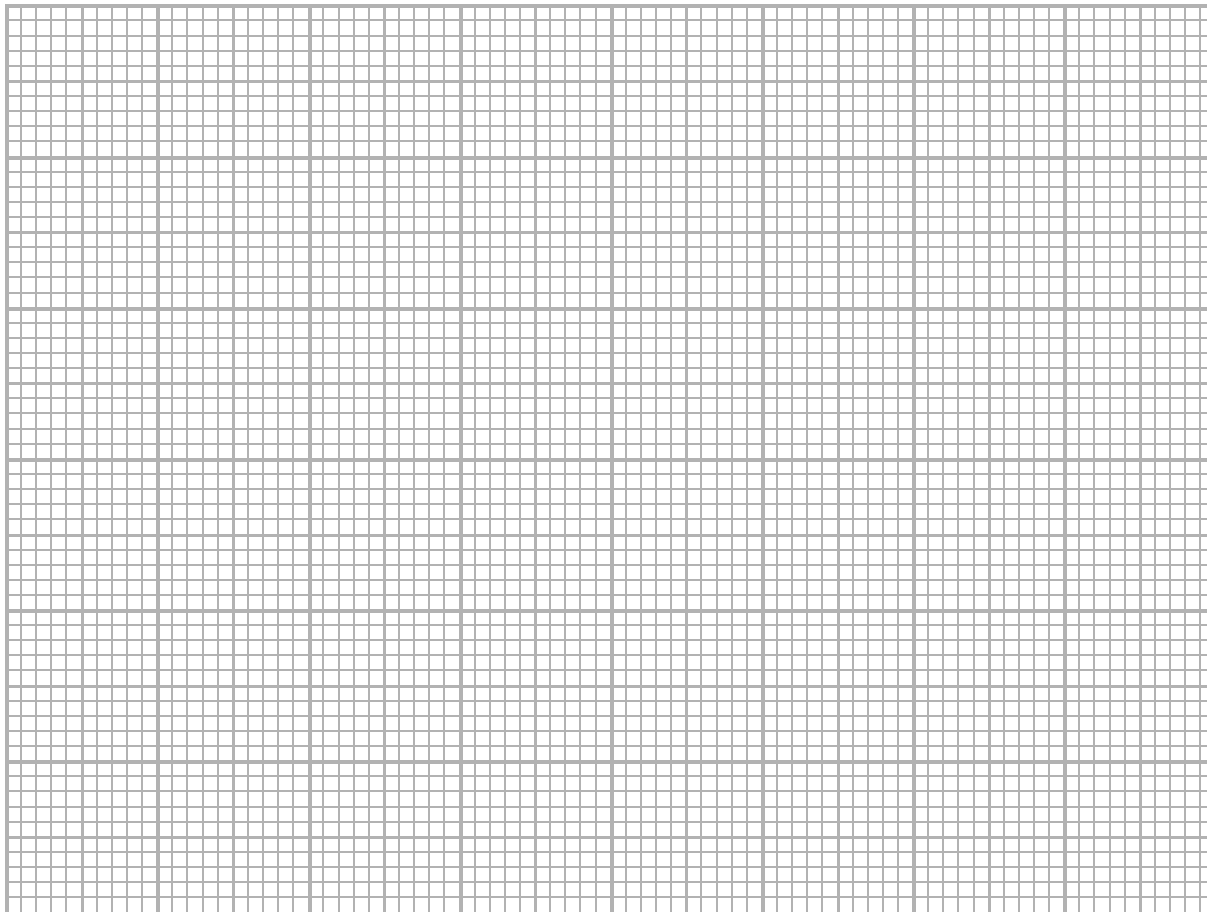


8. The coordinates of the vertices of $\triangle ABC$ are $A(1, 1)$, $B(2, 0)$ and $C(2, 2)$.

(a) On the graph paper below, using a scale of 2 cm to represent one unit on both axes and taking $0 \leq x \leq 7$ and $-2 \leq y \leq 3$, draw and label $\triangle ABC$.

(1)

The matrix $\mathbf{P} = \begin{pmatrix} 2 & 1 \\ 0 & 1 \end{pmatrix}$.



(b) Calculate the matrix product $\mathbf{P} \begin{pmatrix} 1 & 2 & 2 \\ 1 & 0 & 2 \end{pmatrix}$. (2)

$\triangle A'B'C'$ is the image of $\triangle ABC$ under the transformation represented by the matrix \mathbf{P} .

(c) Draw and label $\triangle A'B'C'$. (1)

The matrix $\mathbf{Q} = \begin{pmatrix} 0 & \frac{1}{2} \\ -\frac{1}{4} & \frac{1}{4} \end{pmatrix}$.

(d) Draw and label $\triangle A''B''C''$ which is the image of $\triangle A'B'C'$ under the transformation represented by the matrix \mathbf{Q} . (3)

$\triangle ABC$ can be mapped into $\triangle A''B''C''$ by a rotation followed by an enlargement.

(e) Describe fully the rotation and the enlargement. (4)

Q8

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(Total 11 marks)



9.

Figure 4

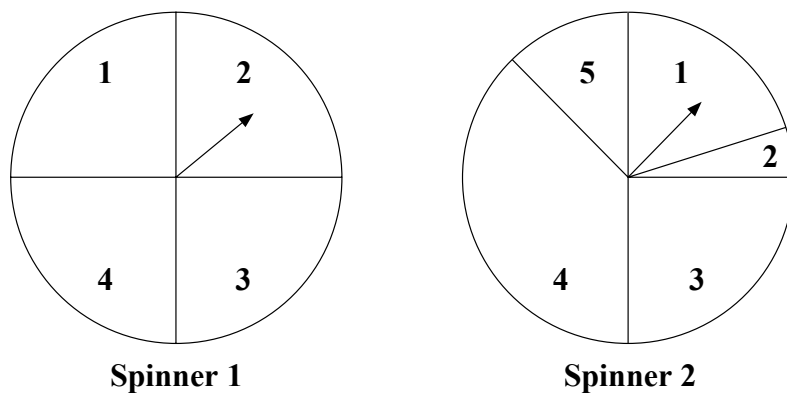


Figure 4 shows two circular spinners. Spinner 1 has four sectors numbered 1, 2, 3 and 4. Spinner 2 has five sectors numbered 1, 2, 3, 4 and 5. A trial consists of spinning each spinner once and adding together the numbers in the sectors in which the pointers stop. This is called the score. So in Figure 4 the score is $2 + 1 = 3$.

(a) Complete the table to show all possible scores.

		Spinner 2				
		Score	1	2	3	4
Spinner 1	1	2			5	
	2			5		7
	3	4	5			
	4			7		9

(2)

For Spinner 2, the probability that the pointer stops in the sectors numbered 1, 2, 3, 4 and 5 is shown in the following table.

Sector	1	2	3	4	5
Probability	$3x$	x	$4x$	$5x$	$2x$

(b) Calculate the value of x .

(2)



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For Spinner 1, the probability that the pointer stops in any one of the sectors numbered 1, 2, 3 and 4 is $\frac{1}{4}$. Spinner 1 and spinner 2 are each spun once.

(c) Calculate the probability of obtaining

- (i) a score of 1,
- (ii) a score of 3,
- (iii) a score of 6.

(7)

Area for writing answers, consisting of horizontal lines.

Q9

(Total 11 marks)

15

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10.

Figure 5

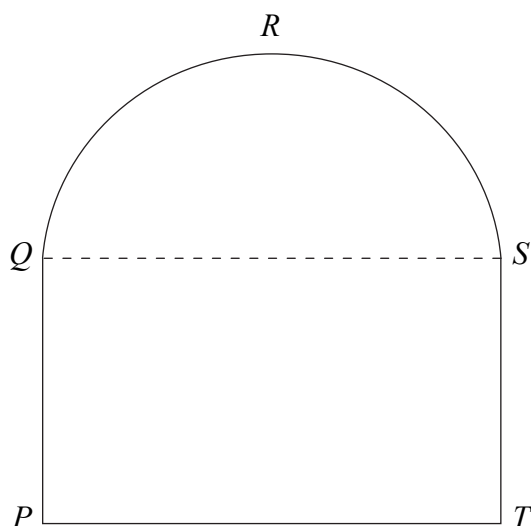


Figure 5 shows a semicircle, QRS , of radius r , and a rectangle $PQST$. The perimeter of $PQRSTP$ is 25 cm.

(a) Taking π as $\frac{22}{7}$ show that,

(i) the length of PQ is $\frac{1}{2}\left(25 - \frac{36r}{7}\right)$ cm, (2)

(ii) the area, A cm², of $PQRSTP$, is given by

$$A = 25r\left(1 - \frac{r}{7}\right).$$
(2)



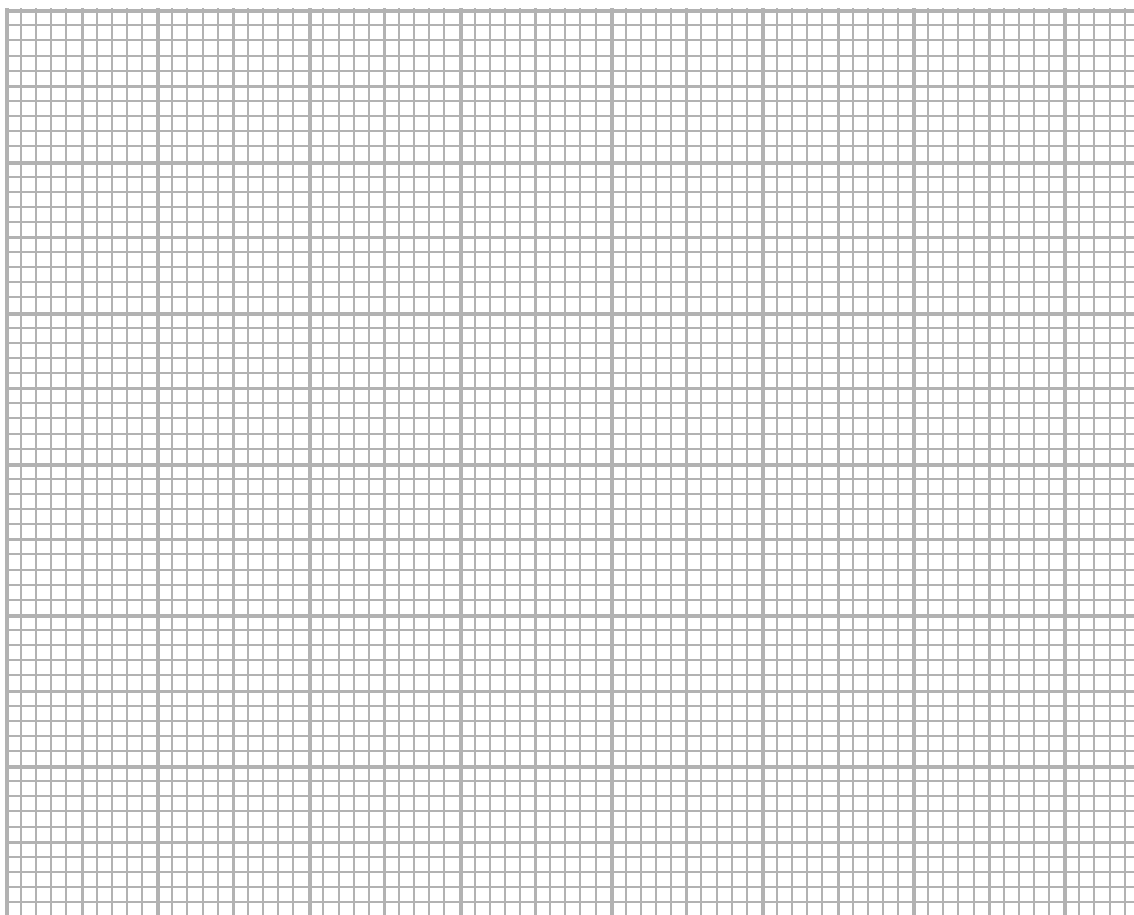
(b) For $A = 25r\left(1 - \frac{r}{7}\right)$, complete the table, giving your values of A to one decimal place, where appropriate.

r	0	1	1.5	2	3	3.5	4	4.8
$25r$	0			50	75			120
$1 - \frac{r}{7}$	1			.714	.571			.314
A	0			35.7	42.9			37.7

(3)

(c) On the graph paper below, use a scale of 2 cm to represent 1 unit on the r axis and 1 cm to represent 5 units on the A axis. Take $0 \leq r \leq 5$ and $0 \leq A \leq 50$. Plot all the points from your completed table and join them to form a smooth curve.

(3)



11.

Figure 6

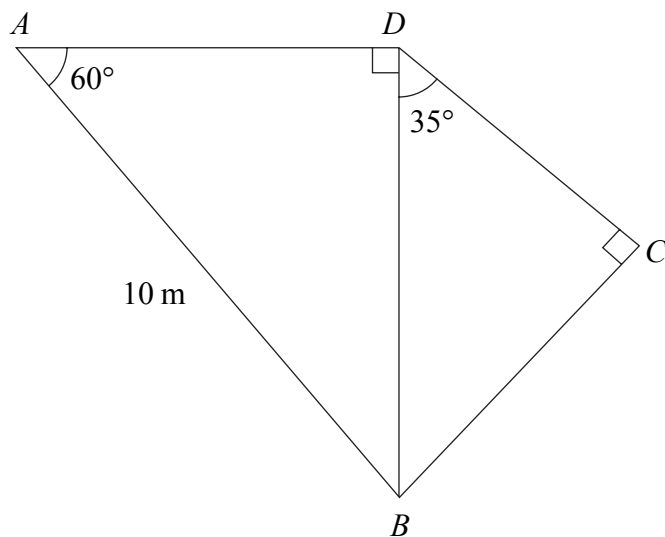


Figure 6 shows a quadrilateral $ABCD$ in a horizontal plane in which $AB = 10$ m, $\angle ADB = \angle BCD = 90^\circ$, $\angle BAD = 60^\circ$ and $\angle BDC = 35^\circ$.

Calculate, in m to 3 significant figures, the length of

- (a) BD , (2)
- (b) CD , (2)
- (c) BC . (2)



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N 2 6 5 8 2 A 0 2 3 2 4

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