

JULY/AUGUST MOCK

121/1 – MATHEMATICS Paper 1 (Alt. A)

MARKING SCHEME

CONFIDENTIAL

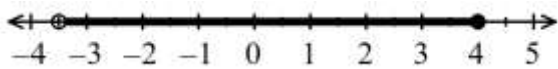
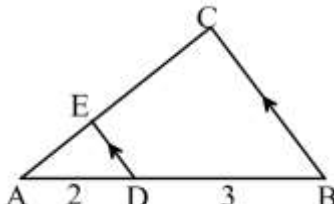
Examiner's Name
School.....
Date of Marking

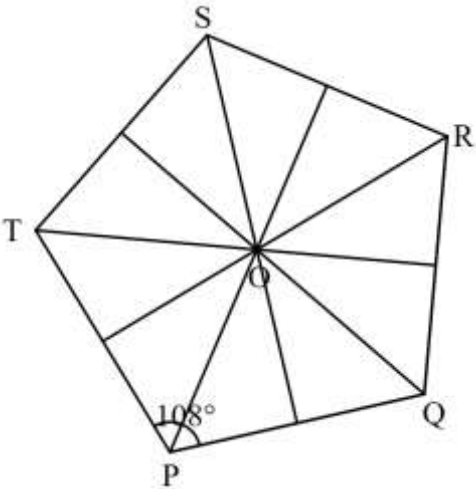
Marking Guidelines

- Examiners are advised to follow the marking scheme strictly.
- All marks to be awarded as indicated against each step.
- Examiners are advised to follow through the candidate's work whenever a legitimate alternative method is used and award full marks accordingly.
- Cross – check final answers against method marks.
- For unclear or ambiguous solution, consult with the **team leader**.

SECTION I (50 marks)

NO.	WORKINGS	MARKS	COMMENTS
1	$\frac{3}{4}x - 15 = \frac{5}{8}x$ $\Rightarrow \frac{1}{8}x = 15$ $\therefore x = 15 \times 8 = 120 \text{ litres}$	M1 M1 A1	✓ Equation formed ✓ Simplification CAO
	TOTAL MARKS	3	
2	$S.P = \frac{120}{100}x = 1.2x$ $\Rightarrow \frac{125}{100} \times 1.2x = 24000$ $1.5x = 24000$ $x = \text{Ksh. } 16000$	M1 M1 A1	✓ Eqn. leading to x ✓ Simplified eqn. CAO
	TOTAL MARKS	3	
3	Total scores of 5 students $= 68 \times 5 = 340$ Let the 6 th score = x $\Rightarrow \frac{x + 340}{6} = 70$ $x + 340 = 420$ $x = 80\%$	M1 M1 A1	 CAO
	TOTAL MARKS	3	
4	$\text{LCM} = 2^3 \times 3 \times 7 = 168 \text{ min.}$ Time = 17hrs + 5hrs 24min $= 22\text{hrs } 24\text{min} = 1344 \text{ min}$ $\Rightarrow \frac{1344}{168}$ $= 8 \text{ times}$	B1 M1 A1	
	TOTAL MARKS	3	
5	$\tan 35^\circ = \frac{h}{x + 30} \text{ and } \tan 50^\circ = \frac{h}{x}$ $\Rightarrow x \tan 35^\circ + 30 \tan 35^\circ = x \tan 50^\circ$ $x \tan 50^\circ - x \tan 35^\circ = 30 \tan 35^\circ$ $x = \frac{30 \tan 35^\circ}{\tan 50^\circ - \tan 35^\circ} = 42.74m$ $\therefore h = 42.74 \times \tan 50^\circ$ $= 50.94m \approx 50.9m$	M1 A1 M1 A1	
	TOTAL MARKS	4	

NO.	WORKINGS	MARKS	COMMENTS
6	$3x - 4y = 12 \Rightarrow y = \frac{3}{4}x - 3$ $\therefore m_2 = -\frac{4}{3}$ $\Rightarrow \frac{y+2}{x-4} = -\frac{4}{3}$ $y = -\frac{4}{3}x + \frac{10}{3}$	B1 M1 A1	✓ Grad of $\perp$ ✓ Simplification $y = -1\frac{1}{3}x + 3\frac{1}{3}$
	TOTAL MARKS	3	
7	$A + B = 10, \frac{1}{A} + \frac{1}{B} = \frac{5}{12}$ $\frac{1}{A} + \frac{1}{10-A} = \frac{5}{12} \Rightarrow 5A^2 - 50A + 120 = 0$ $\Rightarrow (A-4)(A-6) = 0$ $A = 4 \text{ or } 6$ $\therefore \begin{cases} \text{when } A = 4, B = 6 \text{ and} \\ \text{when } A = 6, B = 4 \end{cases}$	M1 M1 A1	✓ Eqn. formed ✓ Complete fact. CAO
	TOTAL MARKS	3	
8	$x - 5 < 3x + 2$ $-5 - 2 < 3x - x$ $-7 < 2x$ $-3.5 < x$ $\therefore -3.5 < x < 4$ $3x + 2 \leq 2(x + 3)$ $3x + 2 \leq 2x + 6$ $3x - 2x \leq 6 - 2$ $x \leq 4$ 	M1 A1 B1	✓ Inequalities split and simplified ✓ Combined inequality ✓ Number line
	TOTAL MARKS	3	
9	$A.S.F = \left(\frac{5}{2}\right)^2 = \frac{25}{4}$ $\text{Area of } ABC = \frac{25}{4} \times 20 = 125 \text{ cm}^2$ $\text{Area of } EDBC = 125 - 20 = 105 \text{ cm}^2$	B1 M1 A1	
	TOTAL MARKS	3	
10	$\text{Area of } \triangle ACD = \frac{1}{2} \times 10^2 \times \sin 120^\circ = 43.30 \text{ cm}^2$ $\text{Area of } \triangle AXD = \frac{30}{360} \times 3.142 \times 10^2 = 26.18 \text{ cm}^2$ $\text{Shaded region} = 43.30 - 26.18 = 17.12 \text{ cm}^2$	M1 M1 A1	
	TOTAL MARKS	3	

NO.	WORKINGS	MARKS	COMMENTS
11	$3 \times 8^{y+1} + 2^{3y-1} = 98$ $3 \times 2^{3y} \times 2^3 + 2^{3y} \times \frac{1}{2} = 98$ $24 = (2^{3y}) + \frac{1}{2}(2^{3y}) = 98$ $24 \frac{1}{2}(2^{3y}) = 98$ $2^{3y} = 4$ $2^{3y} = 2^2$ $3y = 2$ $y = \frac{2}{3}$	M1 M1 A1	✓ Law of indices applied
	TOTAL MARKS	3	
12		B1 B1 B1	✓ 108° at P or at R ✓ Complete pentagon ✓ All 5 lines of symmetry
	TOTAL MARKS	3	
13	<i>Son = x, Father = 7x</i> $\frac{7x+8}{x+8} = \frac{3}{1}$ $7x+8 = 3x+24$ $4x = 16 \therefore x = 4$ <i>Son = 4 yrs, Father = 28 yrs</i>	M1 A1 B1	✓ Equation formed ✓ CAO ✓ Both ages
	TOTAL MARKS	3	

NO.	WORKINGS	MARKS	COMMENTS
14	$A^{-1} = -\frac{1}{3} \begin{pmatrix} -5 & -4 \\ -2 & -1 \end{pmatrix} = \begin{pmatrix} \frac{5}{3} & \frac{4}{3} \\ \frac{2}{3} & \frac{1}{3} \end{pmatrix}$ $B^2 = \begin{pmatrix} 2 & 3 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} 2 & 3 \\ 1 & -1 \end{pmatrix} = \begin{pmatrix} 4+3 & 6-3 \\ 2-1 & 3+1 \end{pmatrix} = \begin{pmatrix} 7 & 3 \\ 1 & 4 \end{pmatrix}$ $(B^2)^{-1} = \begin{pmatrix} \frac{4}{25} & -\frac{3}{25} \\ -\frac{1}{25} & \frac{7}{25} \end{pmatrix}$ $C = (B^2)^{-1} (A^{-1}) = \begin{pmatrix} \frac{4}{25} & -\frac{3}{25} \\ -\frac{1}{25} & \frac{7}{25} \end{pmatrix} \begin{pmatrix} \frac{5}{3} & \frac{4}{3} \\ \frac{2}{3} & \frac{1}{3} \end{pmatrix}$ $C = \begin{pmatrix} \frac{20}{75} - \frac{6}{75} & \frac{16}{75} - \frac{3}{75} \\ -\frac{5}{75} + \frac{14}{75} & -\frac{4}{75} + \frac{7}{75} \end{pmatrix} = \begin{pmatrix} \frac{14}{75} & \frac{13}{75} \\ \frac{3}{25} & \frac{1}{25} \end{pmatrix}$	M1 M1 M1 A1	
	TOTAL MARKS	4	
15	$x = 2.5, y = -1.5$	B1 B1 B1	✓ Line $3x - 5y = 15$ ✓ Line $y = 6 - 3x$ ✓ Both values of x and y
	TOTAL MARKS	3	
16	$30 + 30 + 75(n - 2) = 360$ $75(n - 2) = 300$ $n - 2 = 4$ $n = 6$ sides $x = 6 - 2 = 4$ triangles $300 + 105(n - 2) = 180(n - 2)$ $300 + 105n - 210 = 180n - 360$ $75n = 450$ $n = 6$ sides $x = 6 - 2 = 4$ triangles	M1 A1 B1	✓ Equation formed ✓ CAO ✓ No. of triangles
	TOTAL MARKS	3	

SECTION II (50 marks)				
17	(a)			
	(i)	$\mathbf{OB} = \begin{pmatrix} -6 \\ -6 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$	M1	Finding OB
		$\therefore A(2, 4) \text{ and } B(-4, -2)$		
		$M\left(\frac{2 + -4}{2}, \frac{4 + -2}{2}\right)$	M1	Mid-point
		$M(-1, 1)$	A1	Point M
	(ii)	$\mathbf{MR} = \begin{pmatrix} 5 \\ 3 \end{pmatrix} - \begin{pmatrix} -1 \\ 1 \end{pmatrix} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$		
		$ \mathbf{MR} = \sqrt{6^2 + 2^2}$	M1	
		$= \sqrt{40} \approx 6.32$	A1	
	(b) (i)	$\begin{pmatrix} -1 \\ -5 \end{pmatrix} + \begin{pmatrix} -1 \\ 1 \end{pmatrix} = \begin{pmatrix} -2 \\ -4 \end{pmatrix}$	M1	
		$\therefore P(-2, -4)$	A1	
	(ii)	$\mathbf{PR} = \begin{pmatrix} 5 \\ 3 \end{pmatrix} - \begin{pmatrix} -2 \\ -4 \end{pmatrix} = \begin{pmatrix} 7 \\ 7 \end{pmatrix}$	B1	
		$\mathbf{AB} = -\frac{6}{7}\mathbf{PR}$	B1	
		Thus AB is parallel to PR	B1	
TOTAL MARKS			10	

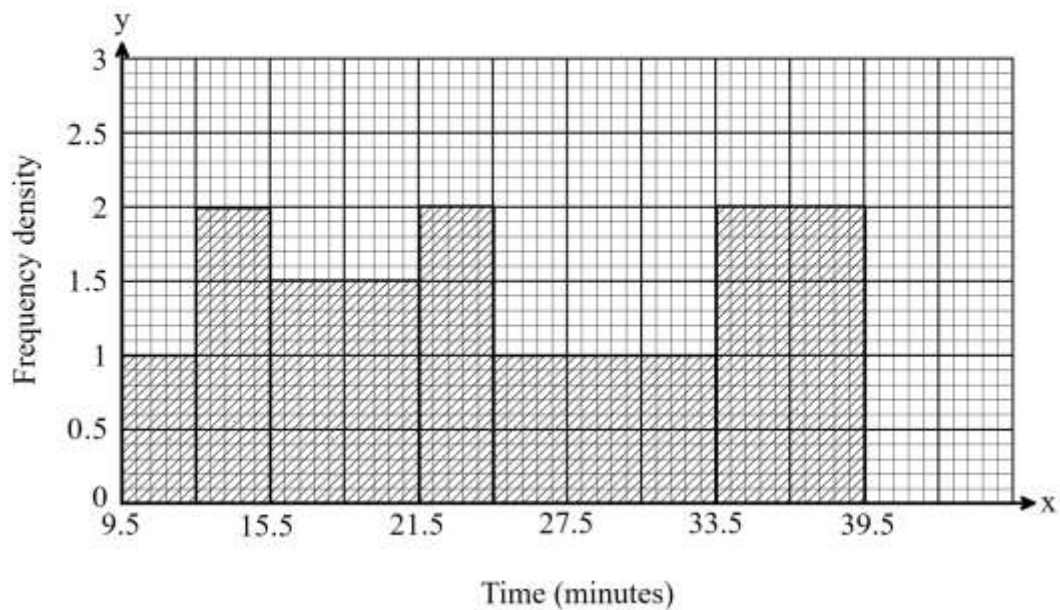
18

(a)	Time in minutes	10–12	13–15	16–21	22–24	25–33	34–39
	Tally	III	HHH I	HHH III	HHH I	HHH III	HHH HHH II
	No. of students	3	6	9	6	9	12

B1 Tally

B1 freq.

(b)



B1 – f.d

B2 –bars

(c) (i)

$$\frac{\text{Total Area}}{2} = \frac{45}{2} = 22.5$$

$$22.5 - 18 = 4.5$$

$$2 \times w = 4.5$$

$$w = 2.25$$

$$\text{Median} = 21.5 + 2.25 = 23.75$$

M1

M1

A1

(ii)

$$6 + 9 + 6$$

$$= 21 \text{ students}$$

M1

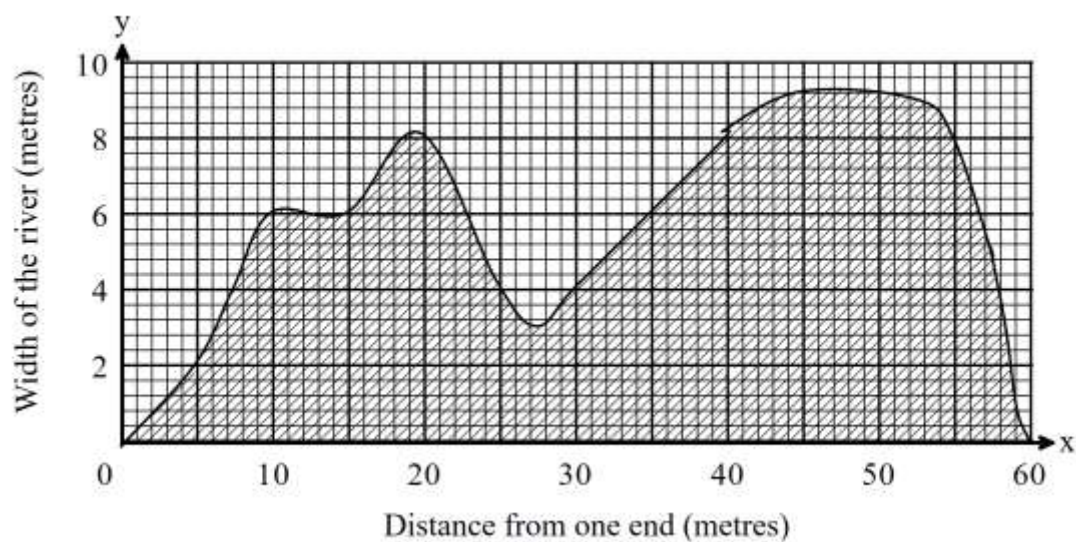
A1

TOTAL MARKS

10

19	(a) $\frac{180}{x} - \frac{180}{x+18} = \frac{1}{2}$ $\Rightarrow x^2 + 18x - 6480 = 0$ $(x - 72)(x + 90) = 0$ $x = 72$ or -90 (ignored) $\therefore x = 72$ km/hr (b) (i) Distance after 20 min = $\frac{20}{60} \times 72 = 24$ km Time = $\frac{156}{72 + 32} = 1\frac{1}{2}$ hours Meeting time = 7.20 a.m. + $1\frac{1}{2}$ hours = 8.50 a.m. (ii) Time taken by bus to B from 7.20 a.m. = $\frac{156}{72} = 2$ hours 10 min Distance covered by the tractors in 2 h 10 min = $2\frac{1}{6} \times 32$ = $69\frac{1}{3}$ km Distance from A = $180 - 69\frac{1}{3}$ = $110\frac{2}{3}$ km	M1 M1 M1 A1 B1 M1 A1 M1 M1 A1	
	TOTAL MARKS	10	

20



(a)

Distance	0	5	10	15	20	25	30	35	40	45	50	55	60
Width from river	0	2	6	6	8	4	4	6	8	9.2	9.2	8	0

B2 All correct

(Award B1 if 8 – 11 values are correct)

(b) (i)

$$\begin{aligned}
 \text{Area} &= \frac{1}{2} \times 10 \left[(0+0) + 2(6+8+4+8+9.2) \right] \\
 &= 352 \text{ m}^2 \\
 &= \frac{352}{10000} \\
 &= 0.0352 \text{ ha}
 \end{aligned}$$

M1

A1

M1

A1

(ii)

$$\begin{aligned}
 \text{Area} &= 10(2+6+4+6+9.2+8) \\
 &= 352 \text{ m}^2 \\
 &= \frac{352}{10000} \\
 &= 0.0352 \text{ ha}
 \end{aligned}$$

M1

A1

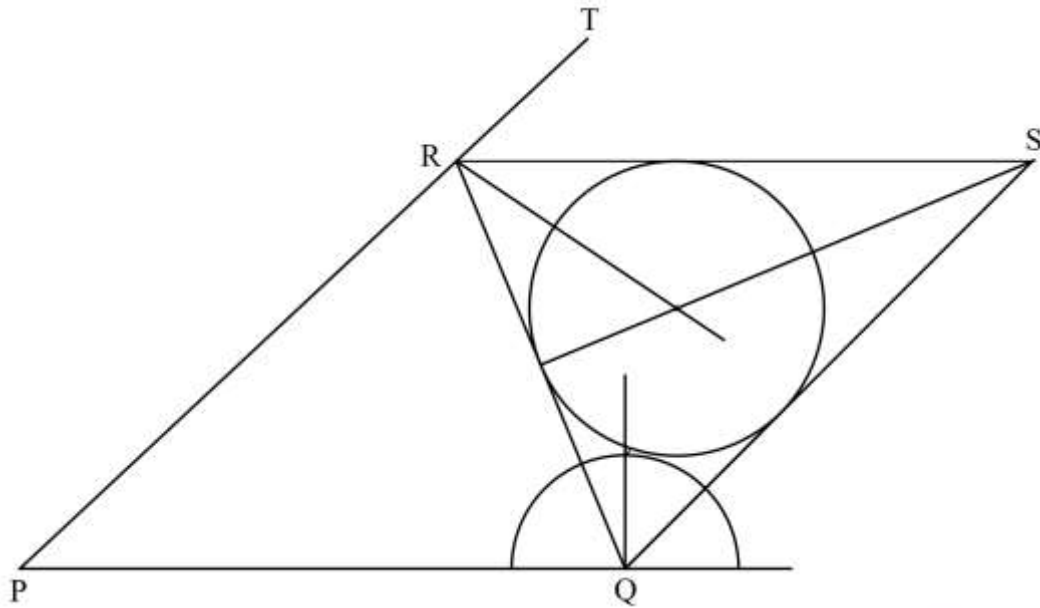
M1

A1

TOTAL MARKS**10**

21

(a)

(a) (i) 67.5° at Q

Triangle PQR

(ii) Parallel line RS constructed

Bisector of RQ or angle transfer to locate S

Quadrilateral PQSR completed

(b) Inscribed circle

Radius $r = 1.8 \text{ cm} \pm 0.1 \text{ cm}$ (c) Area of $\Delta = \frac{1}{2} \times 5.5 \times 6.7 = 18.425 \text{ cm}^2$ Area of circle $= 3.142 \times 1.8^2 = 10.180 \text{ cm}^2$ Required area $= 18.425 - 10.180 = 8.245 \text{ cm}^2$

B1

B1

B1

B1

B1

B1

B1

M1

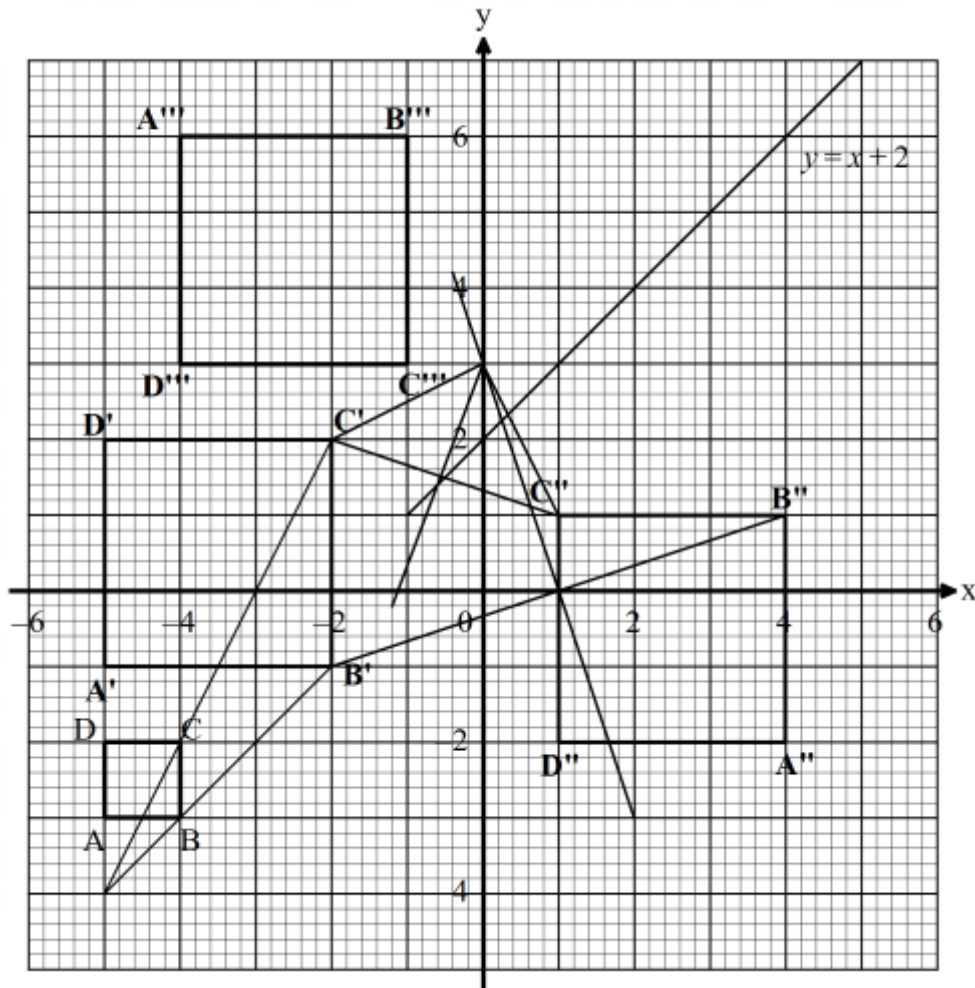
M1

A1

TOTAL MARKS**10**

22	(a) $256 = x^2 h$ $h = \frac{256}{x^2}$ (b) $A = x^2 + 4hx$ $A = x^2 + 4x \left(\frac{256}{x^2} \right)$ $A = x^2 + \frac{1024}{x}$ (c) (i) $\frac{dA}{dx} = 2x - \frac{1024}{x^2} = 0$ $\therefore 2x = \frac{1024}{x^2}$ $\Rightarrow x^3 = 512$ $x = \sqrt[3]{512}$ $x = 8 \text{ cm}$ $h = \frac{256}{8^2}$ $h = 4 \text{ cm}$ (ii) $A = 8^2 + \frac{1024}{8}$ $A = 192 \text{ cm}^2$	B1 M1 M1 A1 M1 M1 A1 B1 M1 A1	
	TOTAL MARKS	10	

23



(a) Location of the centre of rotation by construction

+90° turn about (0,3)

B1

B2

(b) Using the centre of enlargement

Square ABCD correctly drawn and labelled

B1

B2

(c) (i) Line $y = x + 2$ drawn

B1

(ii) Square $A'''B'''C'''D'''$

B1

(d) (i) Direct congruency

B1

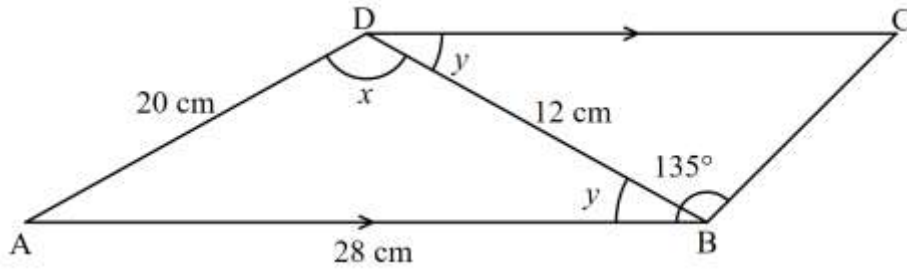
(ii) Opposite congruency

B1

TOTAL MARKS

10

24



(a) (i)

$$28^2 = 20^2 + 12^2 - (2 \times 20 \times 12 \times \cos x)$$

$$\cos x = -\frac{240}{480} = -0.5$$

$$x = \cos^{-1} -0.5$$

$$x = 120^\circ$$

(ii)

$$A = \frac{1}{2} \times 20 \times 12 \times \sin 120^\circ \quad \left| \quad A = \sqrt{30 \times 2 \times 10 \times 18} \right.$$

$$A = 60\sqrt{3} \text{ cm}^2$$

$$A = 60\sqrt{3} \text{ cm}^2$$

(b) (i)

$$\frac{1}{2} \times 28 \times BC \times \sin 135^\circ = 60\sqrt{3}$$

$$BC = 10.50 \text{ cm}$$

(ii)

$$\frac{20}{\sin y} = \frac{28}{\sin 120^\circ}$$

$$\sin y = \frac{20 \times \sin 120^\circ}{28}$$

$$y = 38.21^\circ$$

$$\frac{DC}{\sin 96.79^\circ} = \frac{10.50}{\sin 38.21^\circ}$$

$$= 16.86 \text{ cm}$$

M1

M1

A1

CAO

M1

A1

M1

A1

M1

M1

A1

TOTAL MARKS

10