Mark scheme

Sine rule, cosine rule and area of a triangle

Mathematics 0580 · Questions from Paper 2 and Paper 4

Total marks

64

MARKS FOR EACH QUESTION

1	2	3	4	5	6	7	8	9	10	Total
2	2	3	4	4	5	6	10	12	16	**64**

Question 1 **[2]**

1	5.36 or 5.360 to 5.361	**2**	**M1** for $\frac{1}{2}\times 5.6\times 4.9\times \sin 23$ oe

Question 2 **[2]**

2	40.7 or 40.73 to 40.74	**2**	**M1** for $\frac{1}{2}\times 92.5\times 71\sin x = 2143$ oe

Question 3 **[3]**

3	29.7 or 29.66[...]	**3**	**M2** for [$\sin y =$] $\frac{8.3\sin 105}{16.2}$ or **M1** for $\frac{16.2}{\sin 105} = \frac{8.3}{\sin y}$ oe

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Question 4 **[4]**

4	12.7 or 12.68 to 12.69	**4**	**M3** for $\frac{7\sin 115}{\sin(180-115-35)}$ or **B2** for 8.03… seen OR **B1** for [angle C =] 30 **M2** for $\frac{7\sin 115}{\sin(their\ \text{angle}\ C)}$ or **M1** for $\frac{\sin 115}{BC}=\frac{\sin(their\ \text{angle}\ C)}{7}$ oe

Question 5 **[4]**

5	236[.0…]	**4**	**M2** for $\frac{27.3\times \sin 125}{62.4}$ or **M1** for $\frac{27.3}{\sin UWV}=\frac{62.4}{\sin 125}$ **M1** for $180+(125-90)+their\ 21$ oe or $180+(90-their\ 34)$ oe If 0 scored **SC1** for the correct bearing marked at W

Question 6 **[5]**

6	076 or 076.4 to 076.5	**5**	**B3** for [angle ABC =] 144 or 144.4 to 144.5 OR **M2** for [sin ABC =] $\frac{17.6\sin 25}{12.8}$ oe or **M1** for $\frac{17.6}{\sin B}=\frac{12.8}{\sin 25}$ oe **M1** for $180-their\ 35.5$ AND **M1** for $their\ \text{angle}\ ABC-(180-112)$ oe

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Question 7 **[6]**

7	9.37 or 9.370 to 9.371	**6**	**M2** for $\sin[P] = \dfrac{38.5}{0.5\times 9\times 10}$ or **M1** for $0.5 \times 10 \times 9 \times \sin = 38.5$ **M3** for $\sqrt{(9^2 + 10^2 - 2\times 9\times 10 \times \cos(\textit{their } P))}$ or **M2** for $9^2 + 10^2 - 2\times 9\times 10 \times \cos(\textit{their } P)$ or **M1** for a correct implicit expression e.g. $\cos(\textit{their } P) = \dfrac{9^2 + 10^2 - RQ^2}{2\times 9\times 10}$ Note: 87.8, 87.81[…] or 87.7[55…] score 4 marks or M is foot of perpendicular from R to PQ **M2** for perp.ht $= 38.5 \div \frac{1}{2} \times 10$ or 7.7 or **M1** for $\frac{1}{2} \times 10 \times [\ldots] = 38.5$ **M1** for $PM = \sqrt{(9^2 - 7.7^2)}$[= 4.659… or 4.66] **M1** for $QM = 10 - \textit{their}$ 4.659…[= 5.34…] **M1** for $QR = \sqrt{((\textit{their } QM)^2 + 7.7^2)}$

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Question 8 **[10]**

8(a)	392 or 392.4 to 392.5	**3**	**M2** for $\sqrt{300^2+112^2-2\times300\times112\times\cos140}$ OR **M1** for $300^2+112^2-2\times300\times112\times\cos140$ **A1** for 154 022[…]
8(b)	10.6 or 10.7 or 10.55 to 10.69	**3**	**M2** for $\frac{112\sin140}{their\ \textbf{(a)}}$ oe or $\cos[DBC]=\frac{300^2+(their\ \textbf{(a)})^2-112^2}{2\times300\times their\ \textbf{(a)}}$ or **M1** for $\frac{112}{\sin DBC}=\frac{their\ \textbf{(a)}}{\sin140}$ oe or $112^2=300^2+(their\ \textbf{(a)})^2-2\times300\times their\ \textbf{(a)}\times\cos DBC$ oe
8(c)	279 or 278.9…	**4**	**M3** for $(35\,900-\frac{1}{2}\times112\times300\times\sin140)\div\left(\frac{1}{2}\times180\right)$ oe OR **M1** for $\frac{1}{2}\times112\times300\times\sin140$ oe **M1** for recognition that the shortest distance from D is perpendicular to AB

Question 9 **[12]**

9	**(a)** $(\cos Q=)\frac{4^2+4.5^2-7^2}{2\times4\times4.5}$ o.e. 110.74….	M2 E2	**M1** for $7^2=4^2+4.5^2-2\times4\times4.5\times\cos(Q)$ If **E0** then **A1** for – 0.354(1….)
	(b) $(RS=)\frac{7\sin40}{\sin85}$ 4.516 …	M2 E1	**M1** for $\frac{RS}{\sin40}=\frac{7}{\sin85}$ o.e. Can be implied by second M
	(c) Angle R = 55° 0.5 × 7 × 4.52 × sin(their 55) o.e. 0.5 × 4 × 4.5 × sin110.7 o.e. Triangle PRS + Triangle PQR 21.4 (21.36 – 21.42)	B1 M1 M1 M1 A1	(May be seen on diagram) (12.95 – 13.0) their 55 is (180 – 40 – 85) (8.418 – 8.42) (s = 7.75) Dependent on M1, M1 www 5

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Question 10 **[16]**

10(a)	$8^2 + 7^2 - 2 \times 7 \times 8 \times \cos 78$ oe	**M2**	**M1** for correct implicit version
	9.471.. to 9.472	**A2**	**A1** for 89.7…
10(b)	46.3 or 46.29 to 46.30…	**3**	**M2** for $[\sin OAC =]\frac{7\sin 78}{9.47}$ or **M1** for $\frac{\sin OAC}{7}=\frac{\sin 78}{9.47}$
10(c)	$29.5 - (7 + 8 + 9.47)$	**M1**	
	$\frac{360\times(29.5-(7+8+9.47))}{2\times\pi\times 7}$	**M3**	**M2** for $\frac{x}{360}\times 2\times\pi\times 7$ = *their* arc length oe or **M1** for $\frac{x}{360}\times 2\times\pi\times 7$ oe
	41.15 to 41.171..	**B1**	
10(d)	45[.0] or 44.98 to 45.01 nfww	**4**	**M3** for ½ × 8 × 7 × sin 78 oe + $\frac{41.2}{360}\times\pi\times 7^2$ oe OR **M1** for ½ × 8 × 7 × sin 78 oe or ½ × 8 × 9.47 × sin *their* **(b)** oe **M1** for $\frac{41.2}{360}\times\pi\times 7^2$ oe

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