1	iA	$BC^2 = 348^2 + 302^2 - 2 \times 348 \times 302 \times \cos 72°$ BC = 383.86… 1033.86…[m] or ft 650 + their BC	M2 A1 1	M1 for recognisable attempt at Cosine Rule to 3 sf or more accept to 3 sf or more	4
	iB	$\dfrac{\sin B}{302} = \dfrac{\sin 72}{\text{their } BC}$ B = 48.4.. 355 − their B o.e. answer in range 306 to307	M1 A1 M1 A1	Cosine Rule acceptable or Sine Rule to find C or 247 + their C	4
	ii	Arc length PQ = $\dfrac{224}{360} \times 2\pi \times 120$ o.e. or 469.1... to 3 sf or more QP = 222.5…to 3 sf or more answer in range 690 to 692 [m]	M2 B1 A1	M1 for $\dfrac{136}{360} \times 2\pi \times 120$	4

| 2 | 7/9 or 140/180 o.e. | 2 | B1 for 180° = π rad o.e. or 0.78 or other approximations | 2 |

| 3 | (i) 5 | 2 | M1 for 6 = 1.2r | |
| | (ii) 5.646... to 2 sf or more | 3 | M2 for 2 x 5x sin 0.6
or $\sqrt{(5^2 + 5^2 – 2.5.5. \cos 1.2)}$
or 5 sin 1.2/sin 0.971
M1 for these methods with 1 error | 5 |

| 4 | (i) 2.4, $2\dfrac{2}{5}$, $\dfrac{12}{5}$ | B3 | M1 for 30 = ½ × 25 × q o.e.
M1 for q = (2 x 30) / 5^2 | 5 |
| | (ii) 22 | P2 | M1 for (arc =)5 x their 2.4 | |

Question			Answer	Marks	Guidance	
5	**(i**	(*A*)	$AC^2 = 12.8^2 + 7.5^2$ oe	**M1**	allow correct application of cosine rule or from finding relevant angle and using trig	
			$AC = 14.83543056..$	**A1**	rot to 3 or more sf , or 15	**B2** for 14.8 or better unsupported
			$\tan C = {}^{12.8}/_{7.5}$ or $C = 90 - \tan^{-1}({}^{7.5}/_{12.8})$ oe	**M1**	or $\sin C = {}^{12.8}/_{their14.8}$ or $\cos C = {}^{7.5}/_{their14.8}$	or $\dfrac{\sin C}{12.8} = \dfrac{\sin 90}{their14.8}$ or $\cos C = \dfrac{their14.8^2 + 7.5^2 - 12.8^2}{2 \times 7.5 \times their14.8}$
			59.6 to 59.64	**A1**		
			$\dfrac{AD}{\sin(155 - their59.6)} = \dfrac{their14.8}{\sin 35}$ oe	**M1**		
			25.69 to 25.8	**A1**	allow **B2** for $25.69 \le AD < 25.8$ unsupported…..but **B0** for 25.8 unsupported	**M0A0** for ${}^{14.8}/_{\cos 55} = 25.803...$
				[6]		

	Question		Answer	Marks	Guidance	
5	**(i**	(*B*)	area of *ABC* = 48 soi	**B1**	may be implied by correct final answer in range or by sight of ½ × 12.8 × 7.5 oe	condone 48.0…
			½×their 14.8…×their 25.7…×sin(their 59.6 – 10	**M1**	may be implied by 144.8 to 146	
			192.8 to 194[m²]	**A1**		**B3** for correct answer in range if unsupported
				[3]		
	(ii		angle *HMG* = $\dfrac{\pi - 1.1}{2}$ or *MHG* = 0.55 (31.5126°)	**B1**	or angle *EMF* or angle *MEF*	allow 1.02 to 1.021 *or* 58.487° to 58.5°
			HM = 1.7176 to 1.7225	**B1**		may be implied by final answer
			½ × 1.1 × *their HM*² or $\dfrac{\theta}{360} \times \pi \times their HM^2$	**M1**	1.63(0661924…) $\theta =$ 63(.025357…)	check arithmetic if necessary their *HM* ≠ 0.9 or 1.8
			area of triangle *EMF* = 0.652 to 0.662	**B1**	or *MGH*	may be implied by final answer or in double this (1.304 to 1.324)
			2.95 to 2.952 [m²] cao	**A1**		full marks may be awarded for final answer in correct range ie allow recovery of accuracy
				[5]		

6	i (A)	$5.2^2 + 6.3^2 - 2 \times 5.2 \times 6.3 \times \cos$ "57" ST = 5.6 or 5.57 cao	M2 A1	M1 for recognisable attempt at cos rule. or greater accuracy	3	
	i (B)	sin T/5.2 = sin(their 57)/their ST T=51 to 52 or S = 71 to 72 bearing 285 + their T or 408 − their S	M1 A1 B1	Or sin S/6.3 = … or cosine rule If outside 0 to 360, must be adjusted	3	
	ii	5.2θ, $24 \times 26/60$ θ = 1.98 to 2.02 θ = their 2 × 180/π or 114.6°... Bearing = 293 to 294 cao	B1B1 B1 M1 A1	Lost for all working in degrees Implied by 57.3	5	11

7	i	Correct attempt at cos rule correct full method for C C = 141.1… bearing = [0]38.8 cao	M1 M1 A1 A1	any vertex, any letter or B4	4
	ii	½ × 118 × 82 × sin their C or supp. 3030 to 3050 [m^2]	M1 A1	or correct use of angle A or angle B	2
	iiiA	sin (θ/2) = (½ × 189)/130 1.6276 → 1.63	M1 A1	or cosθ = (130^2+130^2- 189^2)/(2x130x130) In all methods, the more accurate number to be seen.	2
	iiiB	$0.5 \times 130^2 \times$ sin 1.63 $0.5 \times 130^2 \times$ 1.63 their sector − their triangle AOB 5315 to 5340	M1 M1 M1 A1	condone their θ (8435) condone their θ in radians (13770) dep on sector > triangle	4