

trig revision 2 [20 marks]

1. [Maximum mark: 7]

19N.2.SL.TZ0.S_4

The following diagram shows a right-angled triangle, ABC , with $AC = 10$ cm, $AB = 6$ cm and $BC = 8$ cm.

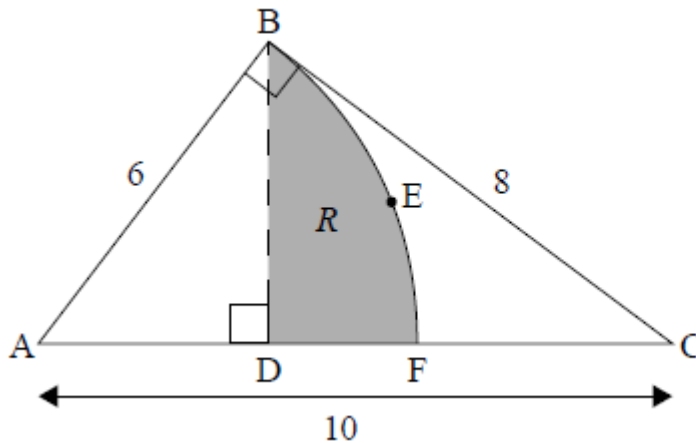
The points D and F lie on $[AC]$.

$[BD]$ is perpendicular to $[AC]$.

BEF is the arc of a circle, centred at A .

The region R is bounded by $[BD]$, $[DF]$ and arc BEF .

diagram not to scale



(a) Find \widehat{BAC} .

[2]

Markscheme

correct working (A1)

$$\text{eg } \sin \alpha = \frac{8}{10}, \cos \theta = \frac{6}{10}, \cos \widehat{BAC} = \frac{6^2 + 10^2 - 8^2}{2 \times 6 \times 10}$$

0.927295

$$\widehat{BAC} = 0.927 (= 53.1^\circ) \quad (\text{A1}) \text{ N2}$$

[2 marks]

(b) Find the area of R .

[5]

Markscheme

Note: There may be slight differences in the final answer, depending on the approach the candidate uses in part (b). Accept a final answer that is consistent with their working.

correct area of sector ABF (seen anywhere) **(A1)**

$$\text{eg } \frac{1}{2} \times 6^2 \times 0.927, \frac{53.1301^\circ}{360^\circ} \times \pi \times 6^2, 16.6913$$

correct expression (or value) for either $[AD]$ or $[BD]$ (seen anywhere)
(A1)

$$\text{eg } AD = 6 \cos(\widehat{BAC}) \quad (= 3.6)$$

$$BD = 6 \sin(53.1^\circ) \quad (= 4.8)$$

correct area of triangle ABD (seen anywhere) **(A1)**

$$\text{eg } \frac{1}{2} \times 6 \cos \widehat{BAD} \times 6 \sin \widehat{BAD}, 9 \sin(2\widehat{BAC}), 8.64$$

(exact)

appropriate approach (seen anywhere) **(M1)**

$$\text{eg } A_{\text{triangle ABD}} - A_{\text{sector}}, \text{ their sector} - \text{their triangle ABD}$$

8.05131

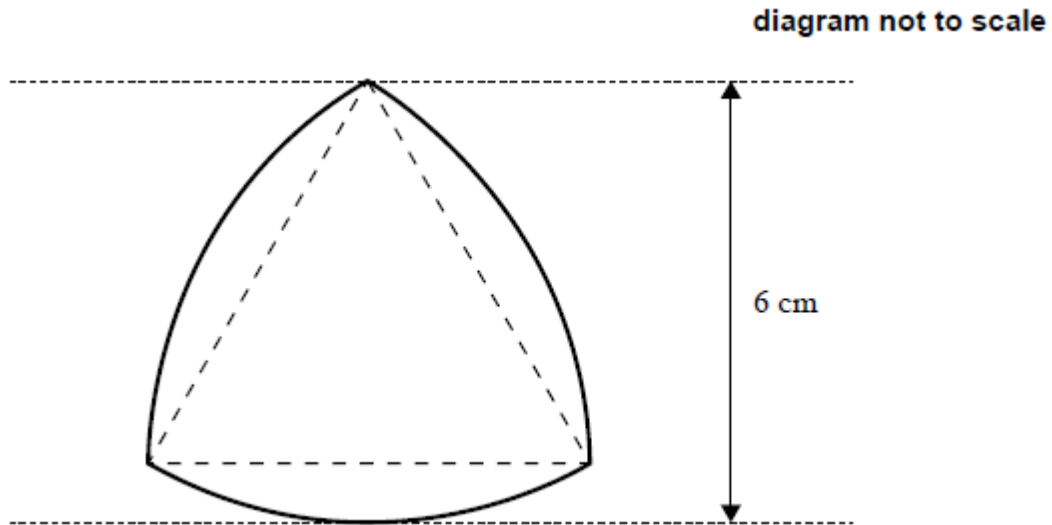
$$\text{area of shaded region} = 8.05 \text{ (cm}^2\text{)} \quad \mathbf{A1 N2}$$

[5 marks]

2. [Maximum mark: 7]

19N.2.AHL.TZ0.H_4

The following shape consists of three arcs of a circle, each with centre at the opposite vertex of an equilateral triangle as shown in the diagram.



For this shape, calculate

(a) the perimeter.

[2]

Markscheme

each arc has length $r\theta = 6 \times \frac{\pi}{3} = 2\pi$ ($= 6.283\dots$) (M1)

perimeter is therefore 6π ($= 18.8$) (cm) A1

[2 marks]

(b) the area.

[5]

Markscheme

area of sector, s , is $\frac{1}{2}r^2\theta = 18 \times \frac{\pi}{3} = 6\pi$ ($= 18.84\dots$) (A1)

area of triangle, t , is $\frac{1}{2} \times 6 \times 3\sqrt{3} = 9\sqrt{3}$ ($= 15.58\dots$) (M1)(A1)

Note: area of segment, k , is 3.261... implies area of triangle

finding $3s - 2t$ or $3k + t$ or similar

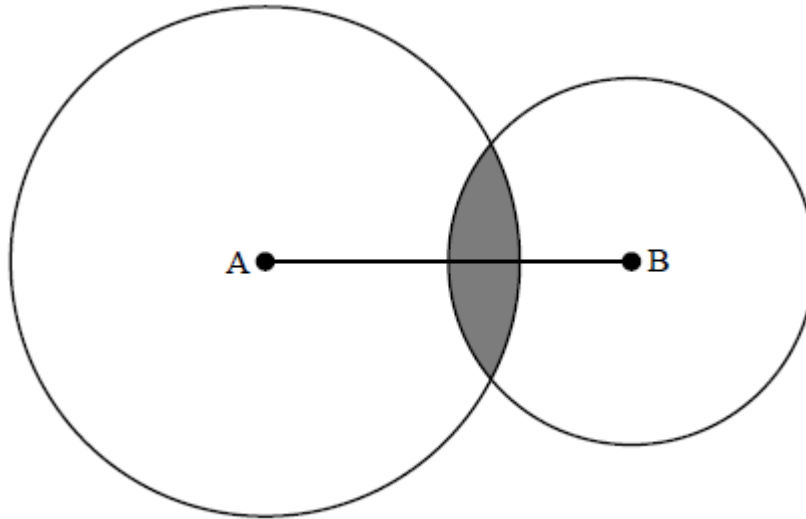
$$\text{area} = 3s - 2t = 18\pi - 18\sqrt{3} (= 25.4) \text{ (cm}^2\text{)} \quad (M1)A1$$

[5 marks]

3. [Maximum mark: 6]

18N.2.AHL.TZ0.H_7

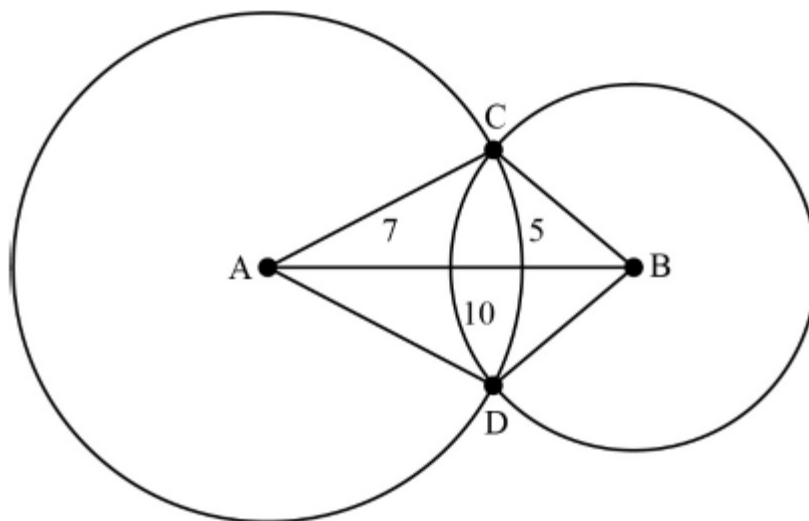
Boat A is situated 10km away from boat B, and each boat has a marine radio transmitter on board. The range of the transmitter on boat A is 7km, and the range of the transmitter on boat B is 5km. The region in which both transmitters can be detected is represented by the shaded region in the following diagram. Find the area of this region.



[6]

Markscheme

* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.



use of cosine rule (M1)

$$\hat{C}AB = \arccos\left(\frac{49+100-25}{2 \times 7 \times 10}\right) = 0.48276 \dots (= 27.660 \dots^\circ) \quad (A1)$$

$$\hat{C}BA = \arccos\left(\frac{25+100-49}{2 \times 5 \times 10}\right) = 0.70748 \dots (= 40.535 \dots^\circ) \quad (A1)$$

attempt to subtract triangle area from sector area (M1)

area

$$= \frac{1}{2} \times 49 \left(2\hat{C}AB - \sin 2\hat{C}AB\right) + \frac{1}{2} \times 25 \left(2\hat{C}BA - \sin 2\hat{C}BA\right)$$

$$= 3.5079 \dots + 5.3385 \dots \quad (A1)$$

Note: Award this *A1* for either of these two values.

$$= 8.85 \text{ (km}^2\text{)} \quad A1$$

Note: Accept all answers that round to 8.8 or 8.9.

[6 marks]