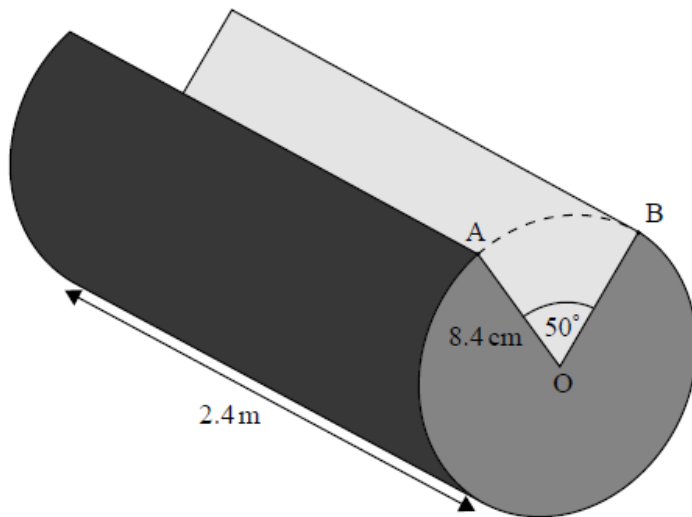


Mock exam review - geometry and trigonometry *[48 marks]*

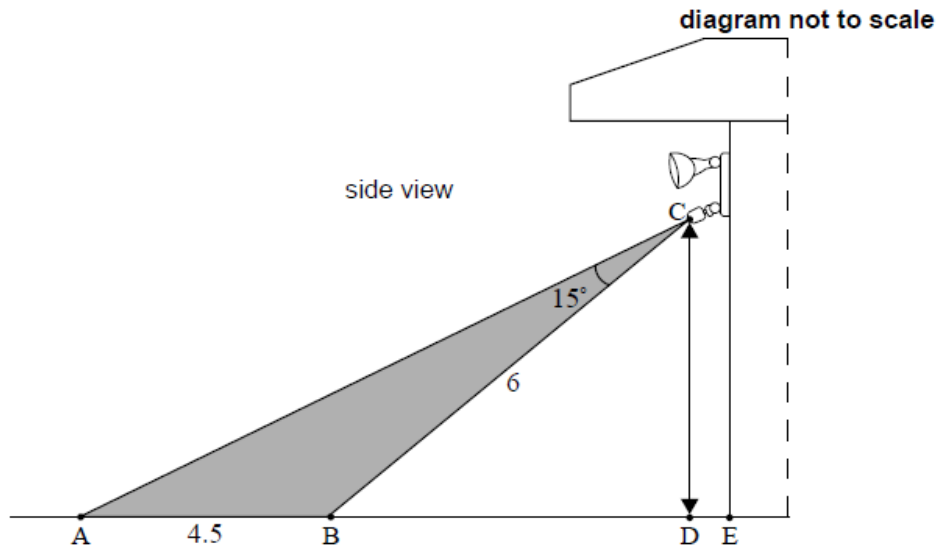
1. Helen is building a cabin using cylindrical logs of length 2.4 m and radius *[4 marks]* 8.4 cm. A wedge is cut from one log and the cross-section of this log is illustrated in the following diagram.

diagram not to scale



Find the volume of this log.

Ollie has installed security lights on the side of his house that are activated by a sensor. The sensor is located at point C directly above point D. The area covered by the sensor is shown by the shaded region enclosed by triangle ABC. The distance from A to B is 4.5 m and the distance from B to C is 6 m. Angle $\hat{A}CB$ is 15° .



2a. Find $\hat{C}AB$.

[3 marks]

2b. Point B on the ground is 5 m from point E at the entrance to Ollie's house. He is 1.8 m tall and is standing at point D, below the sensor. He walks towards point B.

[5 marks]

Find the distance Ollie is **from the entrance to his house** when he first activates the sensor.

A farmer owns a triangular field ABC. The length of side $[AB]$ is 85 m and side $[AC]$ is 110 m. The angle between these two sides is 55° .

3a. Find the area of the field.

[3 marks]

3b. The farmer would like to divide the field into two equal parts by constructing a straight fence from A to a point D on $[BC]$.

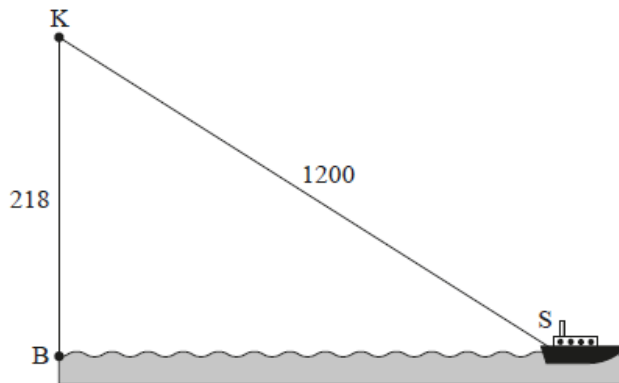
[6 marks]

Find BD. Fully justify any assumptions you make.

Kacheena stands at point K , the top of a 218 m vertical cliff. The base of the cliff is located at point B . A ship is located at point S , 1200 m from Kacheena.

This information is shown in the following diagram.

diagram not to scale



4a. Find the angle of elevation from the ship to Kacheena. [2 marks]

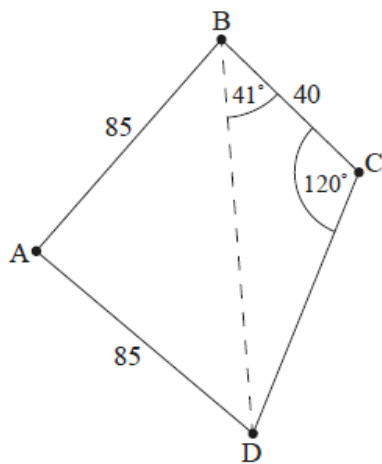
4b. Find the horizontal distance from the base of the cliff to the ship. [2 marks]

4c. Write down your answer to part (b) in the form $a \times 10^k$ where $1 \leq a < 10$ and $k \in \mathbb{Z}$. [2 marks]

The following diagram shows a park bounded by a fence in the shape of a quadrilateral $ABCD$. A straight path crosses through the park from B to D .

$AB = 85$ m, $AD = 85$ m, $BC = 40$ m, $\widehat{CBD} = 41^\circ$, $\widehat{BCD} = 120^\circ$

diagram not to scale



5a. Write down the value of angle BDC . [1 mark]

5b. Hence use triangle BDC to find the length of path BD . [3 marks]

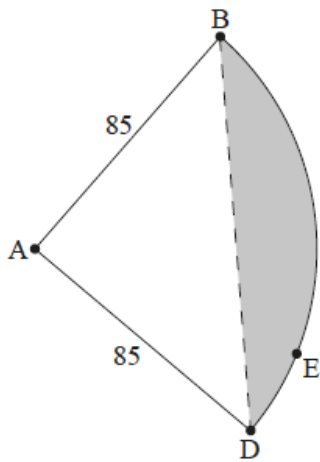
5c. Calculate the size of angle \widehat{BAD} , correct to five significant figures. [3 marks]

The size of angle \widehat{BAD} rounds to 77° , correct to the nearest degree. Use $\widehat{BAD} = 77^\circ$ for the rest of this question.

5d. Find the area bounded by the path BD , and fences AB and AD . [3 marks]

A landscaping firm proposes a new design for the park. Fences BC and CD are to be replaced by a fence in the shape of a circular arc BED with center A . This is illustrated in the following diagram.

diagram not to scale



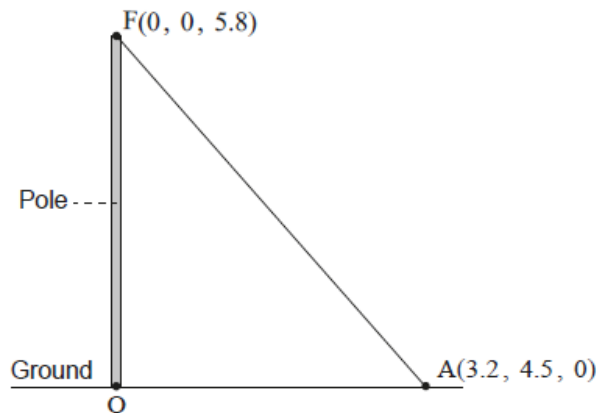
5e. Write down the distance from A to E . [1 mark]

5f. Find the perimeter of the proposed park, $ABED$. [3 marks]

5g. Find the area of the shaded region in the proposed park. [3 marks]

A vertical pole stands on horizontal ground. The bottom of the pole is taken as the origin, O , of a coordinate system in which the top, F , of the pole has coordinates $(0, 0, 5.8)$. All units are in metres.

diagram not to scale



The pole is held in place by ropes attached at F .

One of the ropes is attached to the ground at a point A with coordinates $(3.2, 4.5, 0)$. The rope forms a straight line from A to F .

6a. Find the length of the rope connecting A to F . [2 marks]

6b. Find \hat{FAO} , the angle the rope makes with the ground. [2 marks]