

Trig in triangles 09.02 [101 marks]

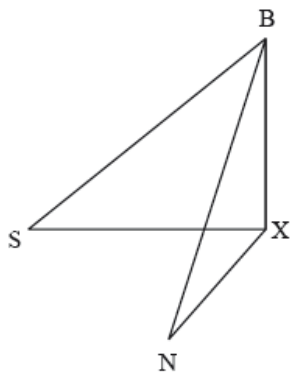
1. Barry is at the top of a cliff, standing 80 m above sea level, and observes [6 marks] two yachts in the sea.

"Seaview" (S) is at an angle of depression of 25° .

"Nauti Buoy" (N) is at an angle of depression of 35° .

The following three dimensional diagram shows Barry and the two yachts at S and N .

X lies at the foot of the cliff and angle $SXN = 70^\circ$.



Find, to 3 significant figures, the distance between the two yachts.

A large rectangular box containing 15 horizontal dotted lines, intended for writing or drawing.

The lengths of two of the sides in a triangle are 4 cm and 5 cm. Let θ be the angle between the two given sides. The triangle has an area of $\frac{5\sqrt{15}}{2}$ cm².

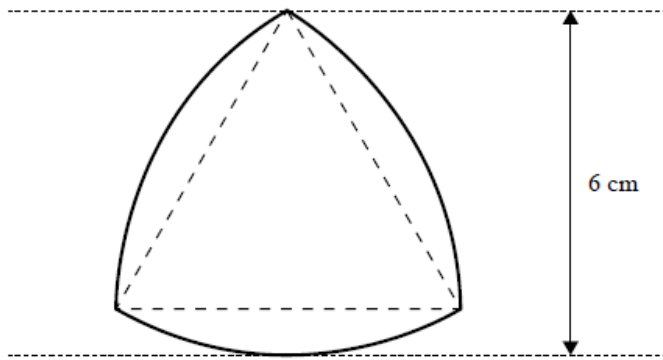
2a. Show that $\sin \theta = \frac{\sqrt{15}}{4}$.

[1 mark]

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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.

diagram not to scale



For this shape, calculate

6a. the perimeter.

[2 marks]

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6b. the area.

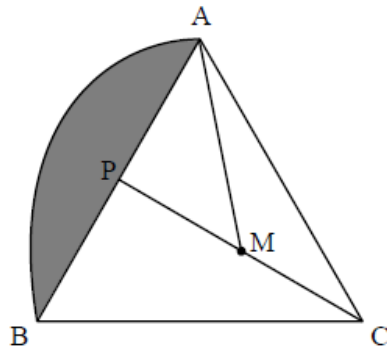
[5 marks]

A large rectangular box containing 15 horizontal dotted lines for writing.

8c. By sketching the graph of p as a function of q , determine the range of values of p for which there are possible values of q . [4 marks]

A large rectangular box with a solid black border, containing six horizontal dotted lines for graphing. The lines are evenly spaced and extend across most of the width of the box.

Consider the following diagram.



The sides of the equilateral triangle ABC have lengths 1 m. The midpoint of $[AB]$ is denoted by P . The circular arc AB has centre, M , the midpoint of $[CP]$.

10a. Find AM .

[3 marks]

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10b. Find \hat{AMP} in radians.

[2 marks]

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10c. Find the area of the shaded region.

[3 marks]

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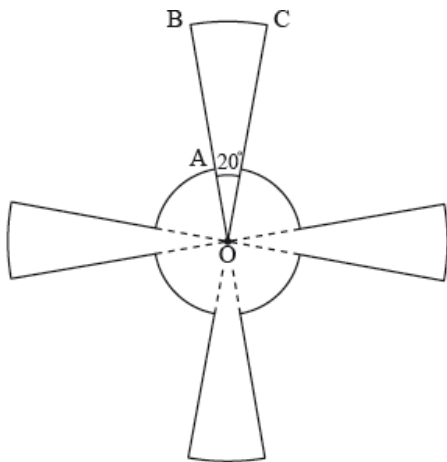
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11. This diagram shows a metallic pendant made out of four equal sectors of [4 marks]
a larger circle of radius $OB = 9$ cm and four equal sectors of a smaller
circle of radius $OA = 3$ cm.
The angle $BOC = 20^\circ$.



Find the area of the pendant.

A large rectangular box containing 15 horizontal dotted lines, intended for writing or drawing.

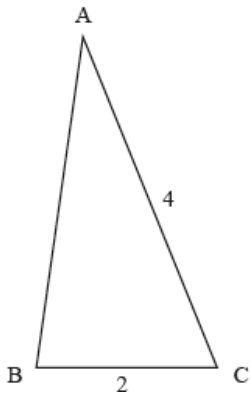
12a. Find the set of values of k that satisfy the inequality $k^2 - k - 12 < 0$. [2 marks]

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12b. The triangle ABC is shown in the following diagram. Given that $\cos B < \frac{1}{4}$, find the range of possible values for AB. [4 marks]



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In a triangle ABC, $AB = 4\text{cm}$, $BC = 3\text{cm}$ and $\hat{BAC} = \frac{\pi}{9}$.

13a. Use the cosine rule to find the two possible values for AC.

[5 marks]

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13b. Find the difference between the areas of the two possible triangles ABC.[3 marks]

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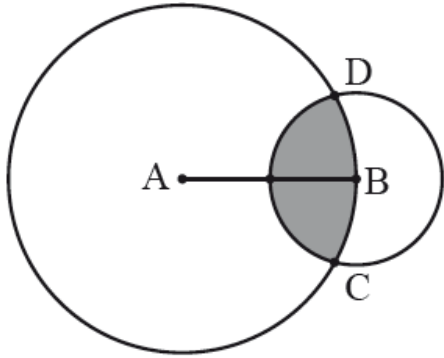
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The diagram shows two circles with centres at the points A and B and radii $2r$ and r , respectively. The point B lies on the circle with centre A. The circles intersect at the points C and D.



Let α be the measure of the angle CAD and θ be the measure of the angle CBD in radians.

14a. Find an expression for the shaded area in terms of α , θ and r . *[3 marks]*

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14b. Show that $\alpha = 4 \arcsin \frac{1}{4}$. *[2 marks]*

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14c. Hence find the value of r given that the shaded area is equal to 4. *[3 marks]*

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