

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

Answer **all** questions. Answers must be written within the answer boxes provided. Working may be continued below the lines if necessary.

The following diagram shows a circle with centre A and radius 6 cm.

A circle with center A . A shaded sector ABC is formed by radii AB and AC , with a central angle of 2 radians. The radius AB is labeled 6 . A point D is marked on the circumference of the circle.

(a) Find the area of the shaded sector. [2]

(b) Find the perimeter of the non-shaded sector ABDC. [4]

[illegible]

7. [Maximum mark: 6]

Given that $\sin x = \frac{1}{3}$, where $0 < x < \frac{\pi}{2}$, find the value of $\cos 4x$.

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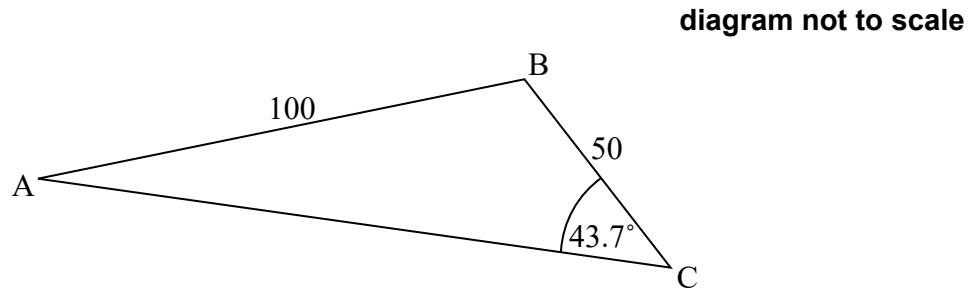
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5. [Maximum mark: 15]

A flat horizontal area, ABC , is such that $AB = 100$ m, $BC = 50$ m and angle $\hat{ACB} = 43.7^\circ$ as shown in the diagram.



- (a) Show that the size of angle \hat{BAC} is 20.2° , correct to 3 significant figures. [3]
- (b) Calculate the area of triangle ABC . [4]
- (c) Find the length of AC . [3]

A vertical pole, TB , is constructed at point B and has height 25 m.

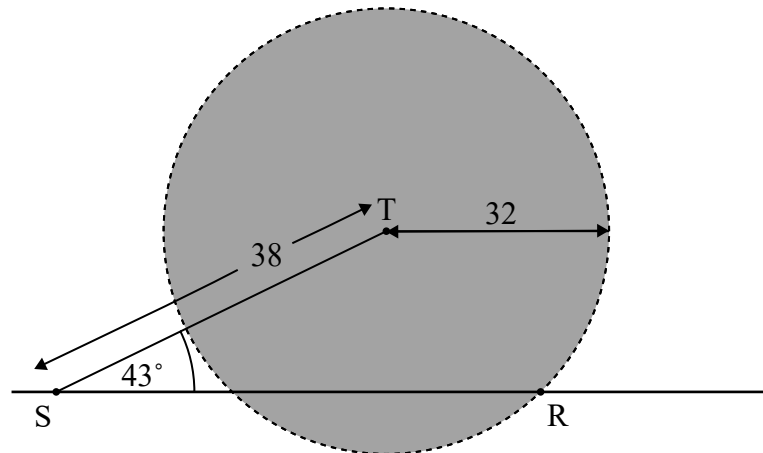
- (d) Calculate the angle of elevation of T from, M , the midpoint of the side AC . [5]

7. [Maximum mark: 6]

A communication tower, T, produces a signal that can reach cellular phones within a radius of 32 km. A straight road passes through the area covered by the tower's signal.

The following diagram shows a line representing the road and a circle representing the area covered by the tower's signal. Point R is on the circumference of the circle and points S and R are on the road. Point S is 38 km from the tower and $\hat{RST} = 43^\circ$.

diagram not to scale



- (a) Let $SR = x$. Use the cosine rule to show that $x^2 - (76 \cos 43^\circ)x + 420 = 0$. [2]
- (b) Hence or otherwise, find the total distance along the road where the signal from the tower can reach cellular phones. [4]

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