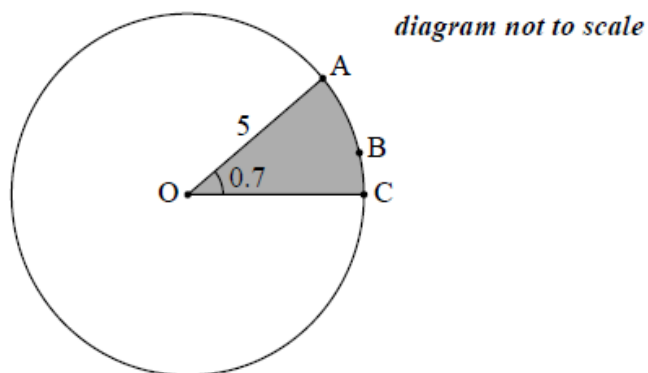


Homework: Trig exam problems

**1a.** The following diagram shows a circle with centre  $O$  and radius  $5$  cm.



The points  $A$ ,  $B$  and  $C$  lie on the circumference of the circle, and  $\angle AOC = 0.7$  radians.

Find the length of the arc  $ABC$ .

[2 marks]

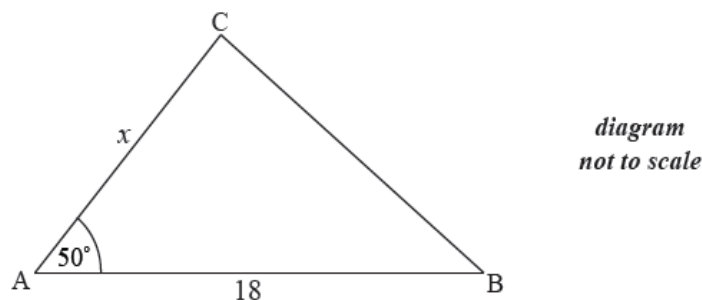
**1b.** Find the perimeter of the shaded sector.

[2 marks]

**1c.** Find the area of the shaded sector.

[2 marks]

**2a.** The following diagram shows a triangle  $ABC$ .



The area of triangle  $ABC$  is  $80 \text{ cm}^2$ ,  $AB = 18 \text{ cm}$ ,  $AC = x \text{ cm}$  and  $\angle BAC = 50^\circ$ .

Find  $x$ .

[3 marks]

**2b.** Find  $BC$ .

[3 marks]

**3a.** In triangle  $ABC$ ,  $AB = 6 \text{ cm}$  and  $AC = 8 \text{ cm}$ . The area of the triangle is  $16 \text{ cm}^2$ .

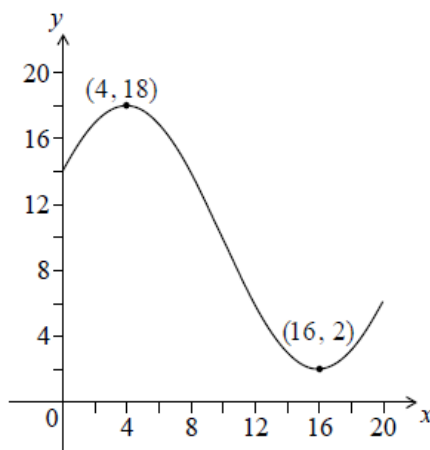
Find the two possible values for  $\hat{A}$ .

[4 marks]

**3b.** Given that  $\hat{A}$  is obtuse, find  $BC$ .

[3 marks]

**4a.** Let  $f(x) = p \cos(q(x + r)) + 10$ , for  $0 \leq x \leq 20$ . The following diagram shows the graph of  $f$ .



The graph has a maximum at  $(4, 18)$  and a minimum at  $(16, 2)$ .

Write down the value of  $r$ .

[2 marks]

**4b.** Find  $p$ .

[2 marks]

**4c.** Find  $q$ .

[2 marks]

**4d.** Solve  $f(x) = 7$ .

[2 marks]

**5a.** Let  $f(x) = \sin\left(x + \frac{\pi}{4}\right) + k$ . The graph of  $f$  passes through the point  $\left(\frac{\pi}{4}, 6\right)$ .

Find the value of  $k$ .

[3 marks]

**5b.** Find the minimum value of  $f(x)$ .

[2 marks]

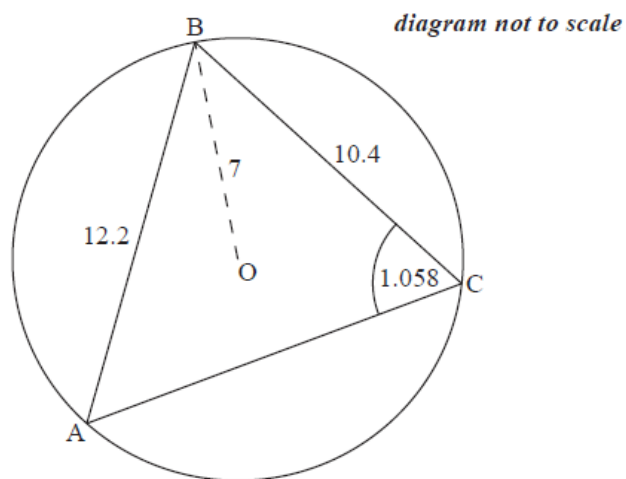
**5c.** Let  $g(x) = \sin x$ . The graph of  $g$  is translated to the graph of  $f$  by the vector  $\begin{pmatrix} p \\ q \end{pmatrix}$ .

Write down the value of  $p$  and of  $q$ .

[2 marks]

**6a.** [3 marks]

Consider a circle with centre  $O$  and radius  $7$  cm. Triangle  $ABC$  is drawn such that its vertices are on the circumference of the circle.



$AB = 12.2$  cm,  $BC = 10.4$  cm and  $\hat{ACB} = 1.058$  radians.

Find  $\hat{BAC}$ .

**6b.** [5 marks]

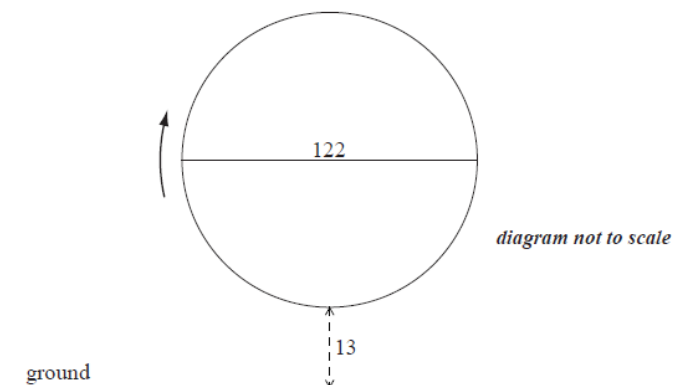
Find  $AC$ .

**6c.** [6 marks]

Hence or otherwise, find the length of arc  $ABC$ .

7a. [2 marks]

A Ferris wheel with diameter **122** metres rotates clockwise at a constant speed. The wheel completes **2.4** rotations every hour. The bottom of the wheel is **13** metres above the ground.



A seat starts at the bottom of the wheel.

Find the maximum height above the ground of the seat.

7b. [2 marks]

After  $t$  minutes, the height  $h$  metres above the ground of the seat is given by

$$h = 74 + a \cos bt.$$

(i) Show that the period of  $h$  is **25** minutes.

(ii) Write down the **exact** value of  $b$ .

7c. [3 marks]

Find the value of  $a$ .

7d. [4 marks]

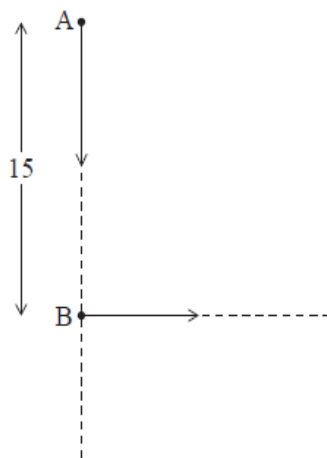
Sketch the graph of  $h$ , for  $0 \leq t \leq 50$ .

7e. [5 marks]

In one rotation of the wheel, find the probability that a randomly selected seat is at least **105** metres above the ground.

**8a.** [5 marks]

The following diagram shows two ships A and B. At noon, ship A was 15 km due north of ship B. Ship A was moving south at  $15 \text{ km h}^{-1}$  and ship B was moving east at  $11 \text{ km h}^{-1}$ .



Find the distance between the ships

(i) at 13:00;

(ii) at 14:00.

**8b.** [6 marks]

Let  $s(t)$  be the distance between the ships  $t$  hours after noon, for  $0 \leq t \leq 4$ .

Show that  $s(t) = \sqrt{346t^2 - 450t + 225}$ .

**8c.** [3 marks]

Sketch the graph of  $s(t)$ .

**8d.** [3 marks]

Due to poor weather, the captain of ship A can only see another ship if they are less than 8 km apart.

Explain why the captain cannot see ship B between noon and 16:00.