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Assignment - Trigonometry

Complete all questions in the space provided.

1. The diagram shows two concentric circles with centre O.

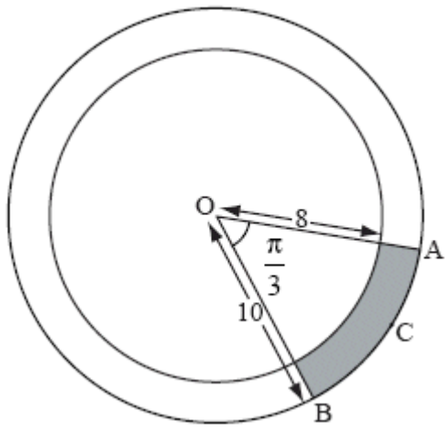


diagram not to scale

The radius of the smaller circle is 8 cm and the radius of the larger circle is 10 cm.
Points A, B and C are on the circumference of the larger circle such that $A\hat{O}B$ is $\frac{\pi}{3}$ radians.

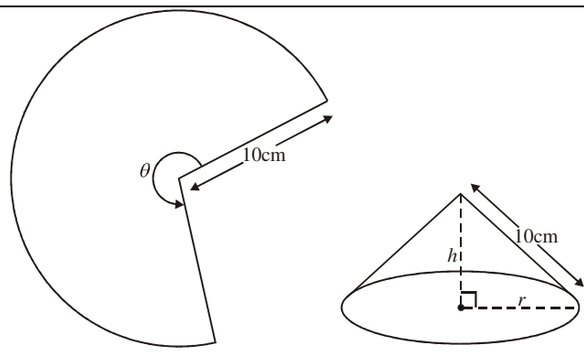
(a) Find the length of the arc ACB.

(2)

(b) Find the area of the shaded region.

(4)
(Total 6 marks)

2. The diagrams show a circular sector of radius 10 cm and angle θ radians which is formed into a cone of slant height 10 cm. The vertical height h of the cone is equal to the radius r of its base. Find the angle θ radians.



(Total 4 marks)

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3. The diagram below shows a quadrilateral ABCD with obtuse angles $A\hat{B}C$ and $A\hat{D}C$.

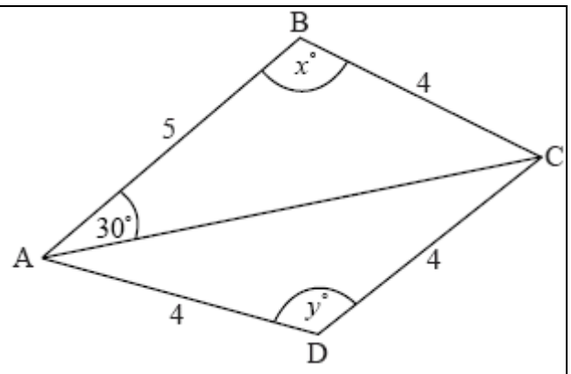

diagram not to scale

AB = 5 cm, BC = 4 cm, CD = 4 cm, AD = 4 cm,
$B\hat{A}C = 30°$, $A\hat{B}C = x°$, $A\hat{D}C = y°$.

(a) Use the cosine rule to show that $AC = \sqrt{41 - 40\cos x}$.

(1)

(b) Use the sine rule in triangle ABC to find another expression for AC.

(2)

(c) (i) Hence, find x, giving your answer to two decimal places.

(ii) Find AC.

(6)

(d) (i) Find y.

(ii) Hence, or otherwise, find the area of triangle ACD.

(5)

(Total 14 marks)

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4. The diagram below shows a triangle ABD with AB = 13 cm and AD = 6.5 cm.
Let C be a point on the line BD such that BC = AC = 7 cm.

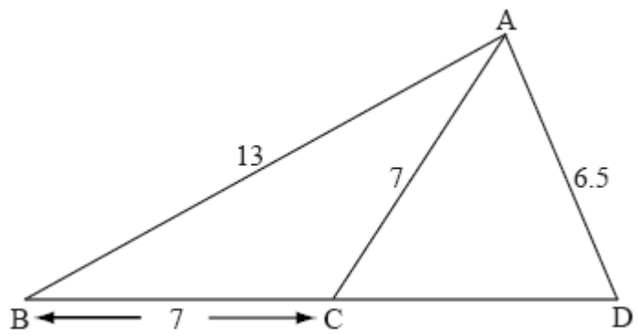

diagram not to scale

(a) Find the size of angle ACB.

(3)

(b) Find the size of angle CAD.

(5)
(Total 8 marks)

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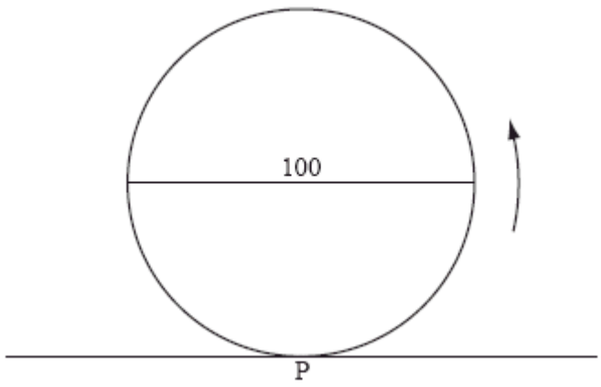
5. The following diagram represents a large Ferris wheel, with a diameter of 100 metres.



Let P be a point on the wheel. The wheel starts with P at the lowest point, at ground level. The wheel rotates at a constant rate, in an anticlockwise (counterclockwise) direction. One revolution takes 20 minutes.

(a) Write down the height of P above ground level after

(i) 10 minutes;

(ii) 15 minutes.

(2)

Let $h(t)$ metres be the height of P above ground level after t minutes. Some values of $h(t)$ are given in the table below.

t	$h(t)$
0	0.0
1	2.4
2	9.5
3	20.6
4	34.5
5	50.0

(b) (i) Show that $h(8) = 90.5$.

(ii) Find $h(21)$.

(4)

(c) **Sketch** the graph of h, for $0 \leq t \leq 40$.

(3)

(d) Given that h can be expressed in the form $h(t) = a \cos bt + c$, find a, b and c.

(5)

(Total 14 marks)

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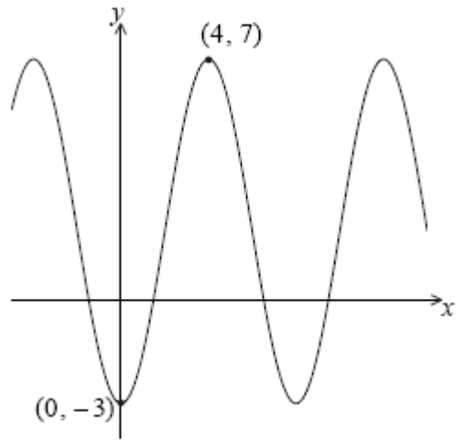
7. The graph of $y = p \cos qx + r$, for $-5 \leq x \leq 14$, is shown below.



There is a minimum point at (0, –3) and a maximum point at (4, 7).

(a) Find the value of

(i) p;

(ii) q;

(iii) r.

(6)

(b) The equation $y = k$ has exactly **two** solutions. Write down the value of k.

(1)

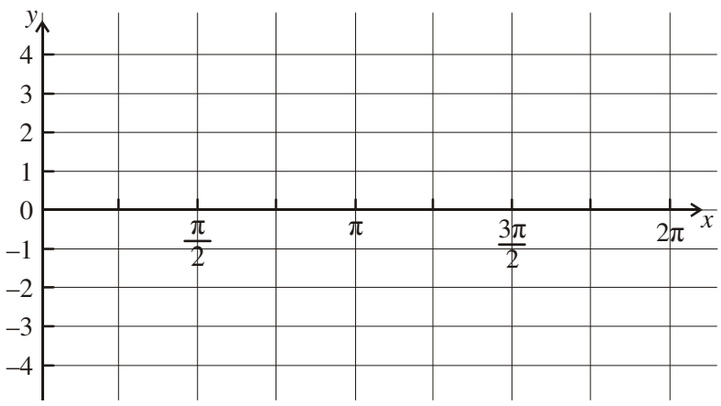
(Total 7 marks)

8. Consider $g(x) = 3 \sin 2x$.

(a) Write down the period of g.

(1)

(b) On the diagram below, sketch the curve of g, for $0 \leq x \leq 2\pi$.



(3)

(c) Write down the number of solutions to the equation $g(x) = 2$, for $0 \leq x \leq 2\pi$.

(2)

(Total 6 marks)

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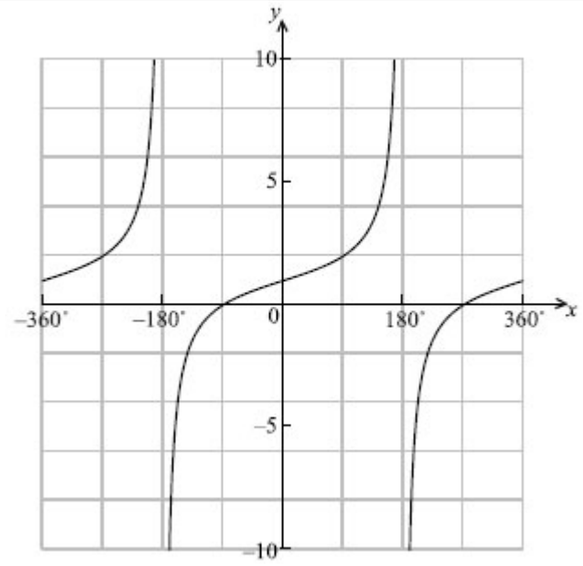
9. The diagram below shows the graph of $f(x) = 1 + \tan\left(\frac{x}{2}\right)$ for $-360° \le x \le 360°$.



(a) On the same diagram, draw the asymptotes. **(2)**

(b) Write down

(i) the period of the function;

(ii) the value of $f(90°)$. **(2)**

(c) Solve $f(x) = 0$ for $-360° \le x \le 360°$. **(2)**

(Total 6 marks)

10. (a) Factorize the expression $3\sin^2 x - 11\sin x + 6$.

(b) Consider the equation $3\sin^2 x - 11\sin x + 6 = 0$.

(i) Find the two values of $\sin x$ which satisfy this equation,

(ii) Solve the equation, for $0° \le x \le 180°$.

Working:

Answers:

(a) .....

(b) (i) .....

(ii) .....

(Total 6 marks)

11. Solve $\cos 2x - 3\cos x - 3 - \cos^2 x = \sin^2 x$, for $0 \leq x \leq 2\pi$.

(Total 7 marks)

13. Let $f(x) = \frac{3x}{2} + 1$, $g(x) = 4\cos\left(\frac{x}{3}\right) - 1$. Let $h(x) = (g \circ f)(x)$.

(a) Find an expression for $h(x)$.

(3)

(b) Write down the period of h.

(1)

(c) Write down the range of h.

(2)

(Total 6 marks)

Date:_____ Block:_____ Name:_____#____