Pearson Edexcel

A Level Mathematics 9MA0

Unit Test

6 Trignometry

Time allowed: 50 **minutes**

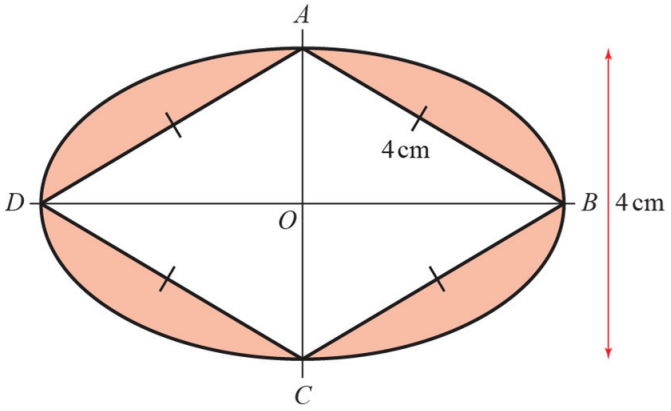
School:

Name:

Teacher:

Question	Points	Score
1	8	
2	5	
3	6	
4	8	
5	4	
6	7	
7	12	
Total:	50	

1. Figure 1 shows a logo comprised of a rhombus surrounded by two arcs. Arc BAD has centre C and arc BCD has centre A. Some of the dimensions of the logo are shown in the diagram. [8]



Prove that the shaded area of the logo is $\frac{2}{3}(16\pi - 24\sqrt{3})$.

2. (a) When θ is small, show that the expression $\frac{1+\sin(\theta)+\tan(2\theta)}{2\cos(3\theta)-1}$ can be written as $\frac{1}{1-3\theta}$. [4]

(b) Hence write down the value of $\frac{1+\sin(\theta)+\tan(2\theta)}{2\cos(3\theta)-1}$ when θ is small. [1]

Total: 5

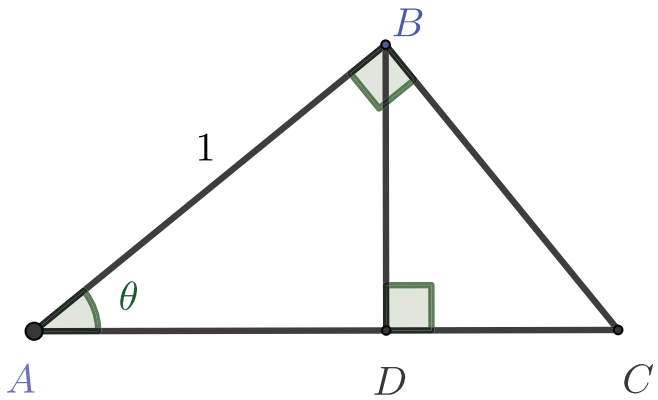
3. (a) Prove that [3]

$$\frac{\tan(x) - \sec(x)}{1 - \sin(x)} = -\sec(x), \qquad x \neq (2n+1)\frac{\pi}{2}$$

(b) Hence solve, in the interval $0 \leq x \leq 2\pi$, the equation $\frac{\tan(x)-\sec(x)}{1-\sin(x)} = \sqrt{2}$. [3]

Total: 6

4. Figure below shows the right-angled triangles and $\triangle ABC, \triangle ABD$ and $\triangle BCD$, with $AB = 1$ and $\angle BAD = \theta$. [8]



Prove that $1 + \tan^2(\theta) = \sec^2(\theta)$.

5. Solve $6\sin(\theta + 60) = 8\sqrt{3}\cos(\theta)$ in the range $0 \leq \theta \leq 360°$. [4]

   Round your answer to 1 decimal place.

6. (a) Prove that $(\sin(3\theta) + \cos(3\theta))^2 \equiv 1 + \sin(6\theta)$. [3]

   (b) Use the result to solve, for $0 \leq \theta \leq \frac{\pi}{2}$, the equation $(\sin(3\theta) + \cos(3\theta)) = \sqrt{\frac{2+\sqrt{2}}{2}}$. [4]

   Give your answer in terms of π. Check for extraneous solutions. Total: 7

7. (a) Express $5\cos(\theta) - 8\sin(\theta)$ in the form $R\cos(\theta + \alpha)$, where $R > 0$ and $0 < \alpha < \pi$. [4]

   Write R in surd form and give the value of α correct to 4 decimal places.

   The temperature of a kiln, $T°C$, used to make pottery can be modelled by the equation

$$T = 1100 + 5\cos\left(\frac{x}{3}\right) - 8\sin\left(\frac{x}{3}\right),$$

   for $0 \leq x \leq 72$, where x is the time in hours since the pottery was placed in the kiln.

   (b) Calculate the maximum value of T predicted by this model and the value of x, to 2 decimal places, when this maximum first occurs. [4]

   (c) Calculate the times during the first 24 hours when the temperature is predicted, by this model, to be exactly $1097°C$. [4]

Total: 12