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AQA, Edexcel, OCR, MEI

A Level

A Level Mathematics

C2 Trigonometry

Name:

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Total Marks: /68

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C2 - Trigonometry
MEI, OCR, AQA, Edexcel

1. Consider the equilateral triangle below:

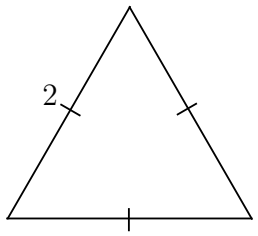

Figure 1: An equilateral triangle of side length 2.

(a) By splitting the triangle into two congruent right angled triangles show that $\sin 30^\circ = \frac{1}{2}$ and $\cos 30^\circ = \frac{\sqrt{3}}{2}$. [3]

(b) By drawing an independent right angled triangle, show that $\cos 45^\circ = \sin 45^\circ = \frac{1}{\sqrt{2}}$. [3]

(c) Without using a calculator, what are the values of $\cos(-45^\circ)$ and $\sin(-45)^\circ$? *You may wish to either consider what quadrant of the unit circle -45° lies in or to sketch out the graphs of $y = \sin x$ and $y = \cos x$.* [3]

(d) What is 45° in radians? [2]

(e) Hence, or otherwise evaluate $\sin \frac{3\pi}{4}$ and $\cos \frac{3\pi}{4}$. [2]

2. Simplify the following expresions:

(a) $\sin^2 \theta + \cos^2 \theta$. [1]

(b) $\sin^2(2\theta) + \sin^2(\theta) + \cos^2(2\theta) + 1$. [2]

(c) $\tan \theta \cos \theta$. [2]

(d) $\frac{\sin^2 \theta}{1-\cos^2 \theta}$. [2]

(e) $\frac{\sin^3 \theta}{\cos \theta - \cos^3 \theta}$. [3]

(f) $\frac{\tan^2 \theta}{(1-\cos \theta)(1+\cos \theta)}$. [3]

3. Solve the equation $\sin(2x) = 1$ for $0° < x < 360°$. Give your answer in exact form. [3]

4. Solve the equation $\sin^2(2x) = 1$ for $0° < x < 360°$. Give your answer in exact form. [3]

5. Solve the equation $2\cos(3x) = \sqrt{3}$ for $0 < x < 2\pi$. Give your answer in exact form. [4]

6. Solve the equation $\tan^2 x - 2\tan x + 1 = 0$ for $0 < x < 2\pi$. Give your answer in exact form. [4]

7. Solve the equation $2\cos^2 x = 3 - 3\sin x$ for $0 < x < \pi$ by writing the equation as a quadratic in $\sin x$. Give your answer in exact form. [4]

8. Consider the triangle below:

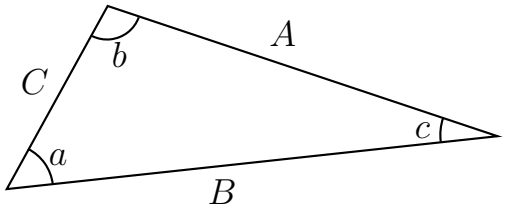

Figure 2: A triangle with side lengths A, B, C and angles a, b, c.

(a) State the general formula for the *area* of the triangle. [1]

(b) State the sine rule. [2]

(c) State the cosine rule. [2]

(d) Calculate the area of the triangle when $A = 5, B = 6$ and $c = \frac{\pi}{3}$. [2]

(e) Calculate the length C using the values in part (d). [3]

9. Consider the sector of a circle below:

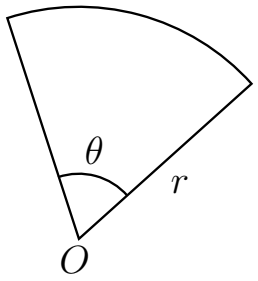

Figure 3: A circle sector of radius r and angle θ.

(a) State the formula for the *arc length* of the sector. [1]

(b) State the formula for the *area* of the sector. [2]

(c) Calculate the area of the segment when $r = 5$ and $\theta = \frac{\pi}{3}$. [2]

(d) Calculate the arc length of the segment when $r = 4$ and $\theta = 40°$. [2]

10. Consider the sector of a circle below. The shaded region R is a segment bounded by a chord on the circle.

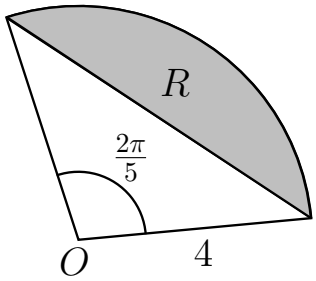

Figure 4: A circle sector of radius 4 and angle $\frac{2\pi}{5}$.

(a) Calculate the area of the sector. [2]

(b) Calculate the area of the shaded segment R. [5]