# STEP/Trigonometry: Exercises - Overview (30/6/23)

## Q1

How many solutions does the equation

$sin(2cos(2x) + 2) = 0$ have, for $0 \leq x \leq 2\pi$?

## Q2

What is the period of $2\,sin\left(3x + \frac{\pi}{4}\right) + 3cos\,(\frac{2x}{3} - \frac{\pi}{3})$?

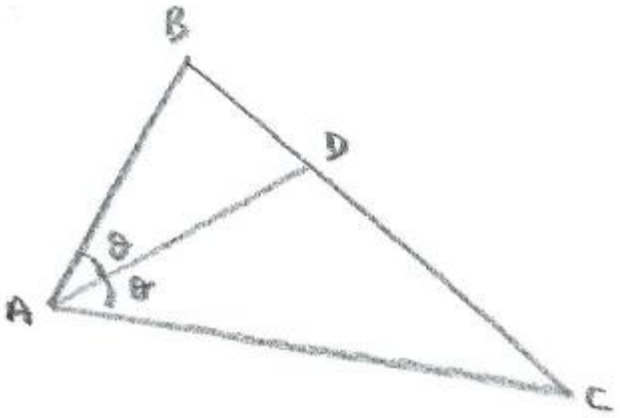
## Q3

Solve $sin\theta = cos4\theta$ for $0 < \theta < \pi$

## Q4

Angle Bisector Theorem

Referring to the diagram below, the Angle Bisector theorem says that $\frac{BD}{DC} = \frac{AB}{AC}$. Prove the Angle Bisector Theorem.



## Q5

Show that $\arctan\left(\frac{1+a}{\sqrt{1-a^2}}\right) - \arctan\left(\frac{a}{\sqrt{1-a^2}}\right) = \arctan\left(\frac{\sqrt{1-a}}{\sqrt{1+a}}\right)$

## Q6

Show that $\frac{sec\theta+1-tan\theta}{sec\theta+1+tan\theta} \equiv sec\theta - tan\theta$

## Q7

Write $\sqrt{2(1-cos\theta)}$ and $\sqrt{2(1+cos\theta)}$ in the form $asin(b\theta)$ or $acos(b\theta)$

## Q8

Show that $cos^4\theta + sin^4\theta = 1 - \frac{1}{2}sin^2(2\theta)$

## Q9

Show that $sec^2\theta(cosec\theta - sin\theta) \equiv cosec\theta$

## Q10

Show that $tan\theta + cot\theta \equiv sec\theta cosec\theta$

## Q11

Prove that $\frac{1+cosec\theta}{cot\theta} = \frac{1+\tan\left(\frac{\theta}{2}\right)}{1-\tan\left(\frac{\theta}{2}\right)}$

## Q12

Express $-cos\theta$ in the form $cos\alpha$ (where $\alpha$ is to be found in terms of $\theta$), using an algebraic method.

## Q13

Show that

(i) $cos^4\theta - sin^4\theta = cos2\theta$

(ii) $cos^4\theta + sin^4\theta = 1 - \frac{1}{2}sin^2(2\theta)$