

Core 2 – Trig equations

Challenge 1



- (a) Express the equation

$$5 \sin 2x - 4 \cos 2x = 0$$

in the form

$$\tan 2x = k,$$

where k is a constant.

(2 marks)

- (b) Hence find all solutions of the equation

$$5 \sin 2x - 4 \cos 2x = 0$$

in the interval $0^\circ < x < 180^\circ$, giving your answers to the nearest 0.1° .

(4 marks)

Challenge 2

(a) Given that

$$7 \sin^2 x - 2 \cos^2 x + 6 \sin x = 1,$$

show that

$$3 \sin^2 x + 2 \sin x - 1 = 0. \quad (2 \text{ marks})$$

(b) Hence find all solutions of the equation

$$7 \sin^2 x - 2 \cos^2 x + 6 \sin x = 1,$$

in the interval $0^\circ \leq x \leq 360^\circ$, giving your answers to the nearest 0.1° .

No credit will be given for an approximate numerical method.

(5 marks)



Challenge 3

- (a) Find all the solutions of the equation

$$\sin(3x + 45^\circ) = 0.7$$

in the interval $-90^\circ \leq x < 90^\circ$, giving your answers to the nearest 0.1° . (6 marks)

No credit will be given for simply reading values from a graph.

- (b) Describe a sequence of geometrical transformations that maps the curve $y = \sin x$ onto the curve $y = \sin(3x + 45^\circ)$. (3 marks)



Final Challenge

(a) (i) Express $\sin^2 x$ in terms of $\cos x$. (1 mark)

(ii) By writing $\cos x = y$, show that the equation

$$7 \cos x + 2 - 4 \sin^2 x = 0$$

is equivalent to

$$4y^2 + 7y - 2 = 0 \quad (2 \text{ marks})$$

(b) Solve the equation $4y^2 + 7y - 2 = 0$. (2 marks)

(c) Hence, solve the equation

$$7 \cos x + 2 - 4 \sin^2 x = 0$$

giving all solutions to the nearest 0.1° in the interval $0^\circ < x < 360^\circ$.

No credit will be given for simply reading values from a graph. (3 marks)

