Core 4 Trigonometry Questions
(From AEA Papers)

For answers, see the AEA website

2002, Question 1:

1. Solve the following equation, for $0 \le x \le \pi$, giving your answers in terms of π.

$$\sin 5x - \cos 5x = \cos x - \sin x.$$

(8)

2003, Question 2:

2. Find the values of $\tan\theta$ such that

$$2\sin^2\theta - \sin\theta\sec\theta = 2\sin 2\theta - 2.$$

(8)

2004, Question 1:

1. Solve the equation $\cos x + \sqrt{(1 - \tfrac{1}{2}\sin 2x)} = 0$, in the interval $0° \le x < 360°$.

(9)

2005, Question 2:

2. Solve, for $0 < \theta < 2\pi$,

$$\sin 2\theta + \cos 2\theta + 1 = \sqrt{6}\cos\theta,$$

giving your answers in terms of π.

(8)

2006, Question 2:

2. Given that $(\sin\theta + \cos\theta) \ne 0$, find all the solutions of

$$\frac{2\cos 2\theta(\sin 2\theta - \sqrt{3}\cos 2\theta)}{\sin\theta + \cos\theta} = \sqrt{6}(\sin 2\theta - \sqrt{3}\cos 2\theta)$$

for $0 \le \theta < 360°$.

(10)

2007, Question 3:

3. (*a*) Solve, for $0 \leq x < 2\pi$,

$$\cos x + \cos 2x = 0.$$

(5)

(*b*) Find the exact value of x, $x \geq 0$, for which

$$\arccos x + \arccos 2x = \frac{\pi}{2}.$$

(6)

[$\arccos x$ is an alternative notation for $\cos^{-1} x$.]

2008, Question 3:

3. (a) Prove that $\tan 15° = 2 - \sqrt{3}$

(4)

(b) Solve, for $0 \leqslant \theta < 360°$,

$$\sin(\theta + 60°)\sin(\theta - 60°) = (1 - \sqrt{3})\cos^2\theta$$

(8)

2012, Question 2:

2. (a) Show that

$$\sin 3x = 3\sin x - 4\sin^3 x$$

(3)

Hence find

(b) $\int \cos x \left(6\sin x - 2\sin 3x\right)^{\frac{2}{3}} \, dx$

(3)

(c) $\int \left(3\sin 2x - 2\sin 3x \cos x\right)^{\frac{1}{3}} \, dx$

(4)

2012, Question 3:

3. The angle θ, $0 < \theta < \frac{\pi}{2}$, satisfies

$$\tan\theta \tan 2\theta = \sum_{r=0}^{\infty} 2\cos^r 2\theta$$

(a) Show that $\tan\theta = 3^p$, where p is a rational number to be found.

(8)

(b) Hence show that $\frac{\pi}{6} < \theta < \frac{\pi}{4}$

(2)

2013, Question 2:

2. (a) Use the formula for $\sin(A - B)$ to show that $\sin(90° - x) = \cos x$

(1)

(b) Solve for $0 < \theta < 360°$

$$2\sin(\theta + 17°) = \frac{\cos(\theta + 8°)}{\cos(\theta + 17°)}$$

(7)