



STEP II, 2011 Q4

- 4 (i) Find all the values of θ , in the range $0^\circ < \theta < 180^\circ$, for which $\cos \theta = \sin 4\theta$. Hence show that

$$\sin 18^\circ = \frac{1}{4}(\sqrt{5} - 1).$$

- (ii) Given that

$$4 \sin^2 x + 1 = 4 \sin^2 2x,$$

find all possible values of $\sin x$, giving your answers in the form $p + q\sqrt{5}$ where p and q are rational numbers.

- (iii) Hence find two values of α with $0^\circ < \alpha < 90^\circ$ for which

$$\sin^2 3\alpha + \sin^2 5\alpha = \sin^2 6\alpha.$$



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