

TMUA 2016, Paper 2, Q3

- 3 What is the value, in radians, of the largest angle x in the range $0 \leq x \leq 2\pi$ that satisfies the equation $8 \sin^2 x + 4 \cos^2 x = 7$?

- A $\frac{2\pi}{3}$
 B $\frac{5\pi}{6}$
 C $\frac{4\pi}{3}$
 D $\frac{5\pi}{3}$
 E $\frac{7\pi}{4}$
 F $\frac{11\pi}{6}$

Starting with $8 \sin^2 x + 4 \cos^2 x = 7$
 this gives $8 \sin^2 x + 4 - 4 \sin^2 x = 7$ using $\sin^2 x + \cos^2 x = 1$
 $\Leftrightarrow 4 \sin^2 x - 3 = 0$
 $\Leftrightarrow (2 \sin x - \sqrt{3})(2 \sin x + \sqrt{3}) = 0$ difference of two squares
 and this gives
 $\sin x = \frac{\sqrt{3}}{2}$ or $\sin x = -\frac{\sqrt{3}}{2}$
 so the values of x in the specified range
 are $x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

the largest of which is $\frac{5\pi}{3}$
 so the correct answer is D