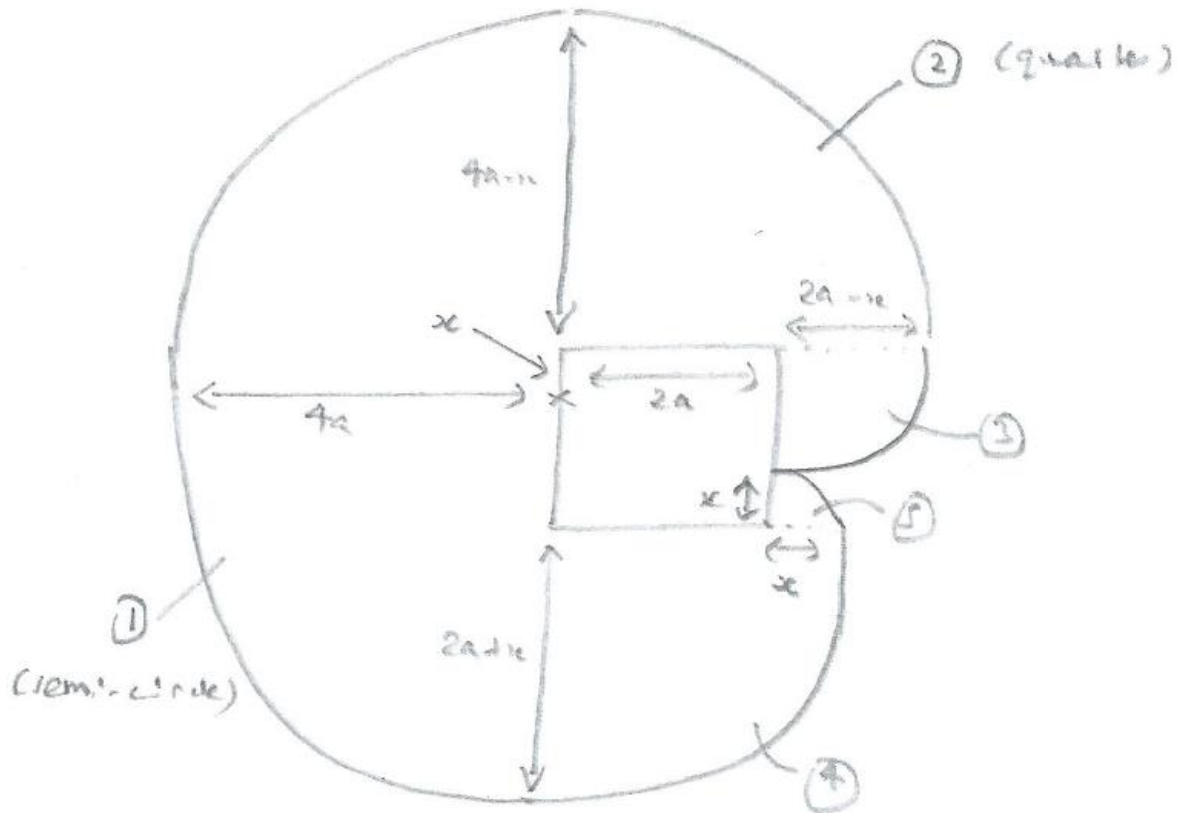# STEP 2006, Paper 1, Q2 - Solution (2 pages; 12/5/18)

Area, $A = \frac{\pi}{2}(4a)^2 + \frac{\pi}{4}(4a - x)^2 + \frac{\pi}{4}(2a - x)^2$ [(1)+(2)+(3)]

$+\frac{\pi}{4}(2a + x)^2 + \frac{\pi}{4}x^2$ [(4)+(5)]

$= \frac{\pi}{4}\{32a^2 + [16a^2 - 8ax + x^2] + [4a^2 - 4ax + x^2]$

$+[4a^2 + 4ax + x^2] + x^2\}$

$= \frac{\pi}{4}\{56a^2 - 8ax + 4x^2\}$

$= \pi\{14a^2 - 2ax + x^2\}$

$= \pi\{(x - a)^2 + 13a^2\}$

Minimum for A occurs at $x = a$, when $A = 13\pi a^2$

Maximum for A occurs at $x = 0$ or $x = 2a$ when $A = 14\pi a^2$