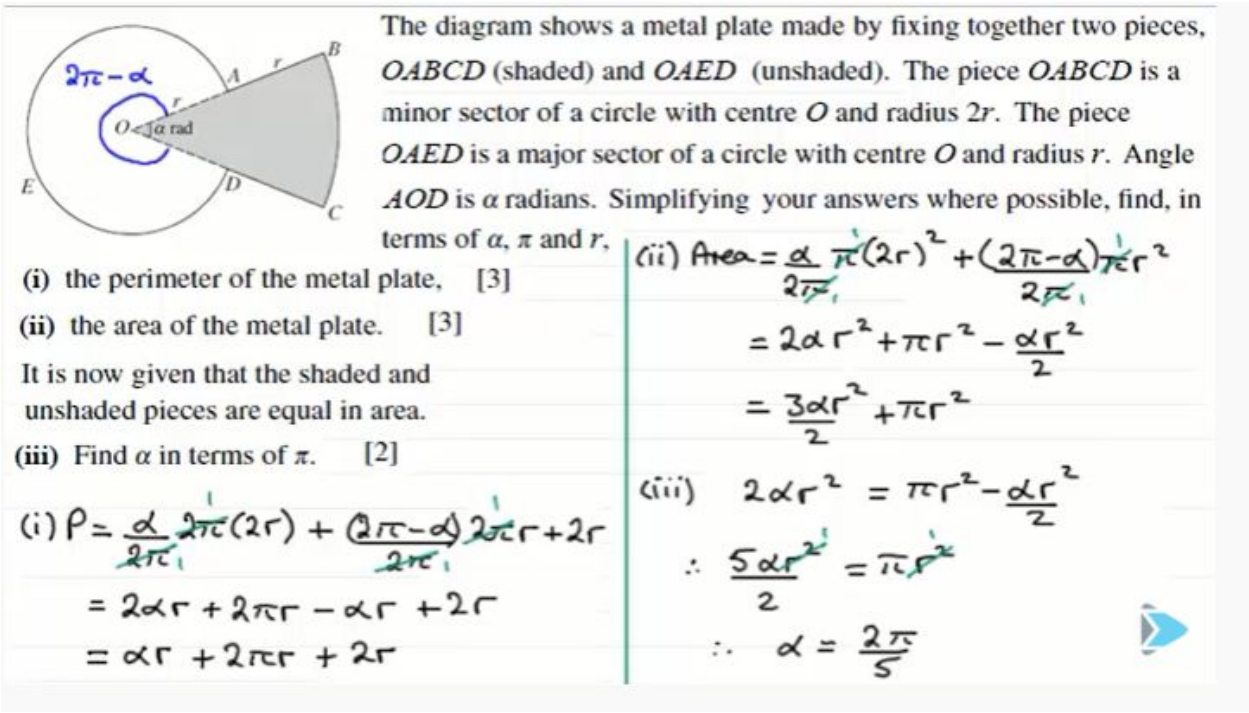
Air maths tuition

Interact, engage and perform

Arc length, Areas of Sectors | Past Paper Question | P1 CIE Nov 2013 Q6



The diagram shows a metal plate made by fixing together two pieces, $OABCD$ (shaded) and $OAED$ (unshaded). The piece $OABCD$ is a minor sector of a circle with centre O and radius $2r$. The piece $OAED$ is a major sector of a circle with centre O and radius r. Angle AOD is α radians. Simplifying your answers where possible, find, in terms of α, π and r,

(i) the perimeter of the metal plate, [3]

(ii) the area of the metal plate. [3]

It is now given that the shaded and unshaded pieces are equal in area.

(iii) Find α in terms of π. [2]

(i) $P = \frac{\alpha}{2\pi}(2\pi)(2r) + \frac{(2\pi-\alpha)}{2\pi}(2\pi)r + 2r$

$= 2\alpha r + 2\pi r - \alpha r + 2r$

$= \alpha r + 2\pi r + 2r$

(ii) $\text{Area} = \frac{\alpha}{2\pi}\pi(2r)^2 + \frac{(2\pi-\alpha)}{2\pi}\pi r^2$

$= 2\alpha r^2 + \pi r^2 - \frac{\alpha r^2}{2}$

$= \frac{3\alpha r^2}{2} + \pi r^2$

(iii) $2\alpha r^2 = \pi r^2 - \frac{\alpha r^2}{2}$

$\therefore \frac{5\alpha r^2}{2} = \pi r^2$

$\therefore \alpha = \frac{2\pi}{5}$

With the acknowledgement of Exam Solutions.

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