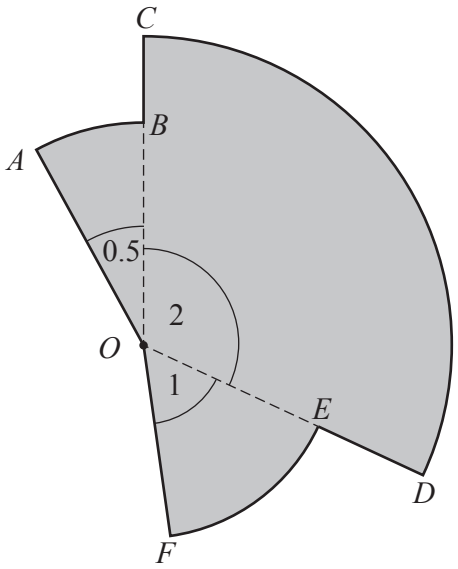
9 In this question all lengths are in centimetres and all angles are in radians.



The diagram shows a company logo. Each part of the logo is a sector of a circle with centre O.

Sector AOB has radius x.
Sector COD has radius $x+2$.
Sector EOF has radius y.
The shaded region has area $A\,\text{cm}^2$ and perimeter 24.

It is given that x and y can vary.

(a) Show that $A = \frac{91}{8}x^2 - 68x + 132$. [4]

(b) Use differentiation to find the minimum possible area of the logo. [5]

10 The expansion of $\left(a+\frac{x}{a}\right)^n$ in ascending powers of x begins $b^4 + 48b^3x$, where n, a and b are positive integers.

(a) Show that $a^{\frac{n}{2}-4} = \left(\frac{48}{n}\right)^2$. [4]