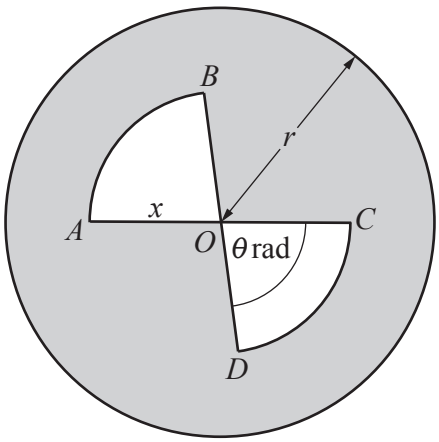
7



The diagram shows a circle with centre O and radius r. OAB and OCD are sectors of a circle with centre O and radius x, where $0 < x \leqslant r$. Angle AOB = angle $COD = \theta$ radians, where $0 < \theta < \pi$.

(a) Find, in terms of r, x and θ, the perimeter of the shaded region. [3]

(b) Find, in terms of r, x and θ, the area of the shaded region. [1]

It is given that x can vary and that r and θ are constant.

(c) Write down the least possible area of the shaded region in terms of r and θ. [2]

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8 Find $\int_0^a \left(\frac{2}{x+1} - \frac{1}{x+2}\right) \mathrm{d}x$, where a is a positive constant. Give your answer, as a single logarithm, in terms of a. [5]

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