6

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]