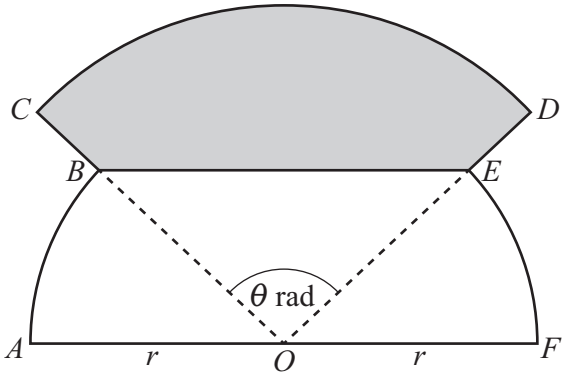
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The diagram shows the shape $OABCDEF$.
AOF is a straight line.
OAB and OEF are sectors of a circle with centre O and radius r.
Angle BOA = angle EOF.

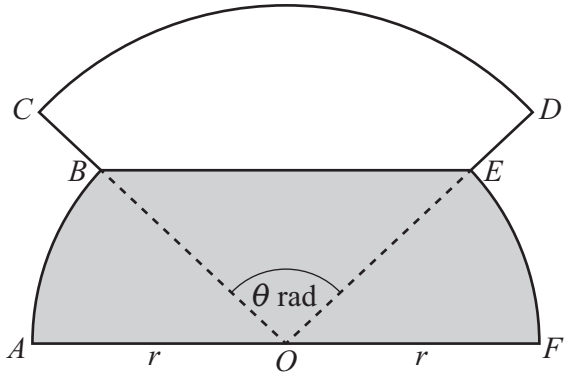
OCD is a sector of a circle with centre O and radius $\frac{4r}{3}$.

Angle COD is θ radians.
The point B lies on the line OC and the point E lies on the line OD.
The line BE is parallel to the line AOF.

(a) Find, in terms of r and θ, the area of the shaded region $BCDE$. [3]

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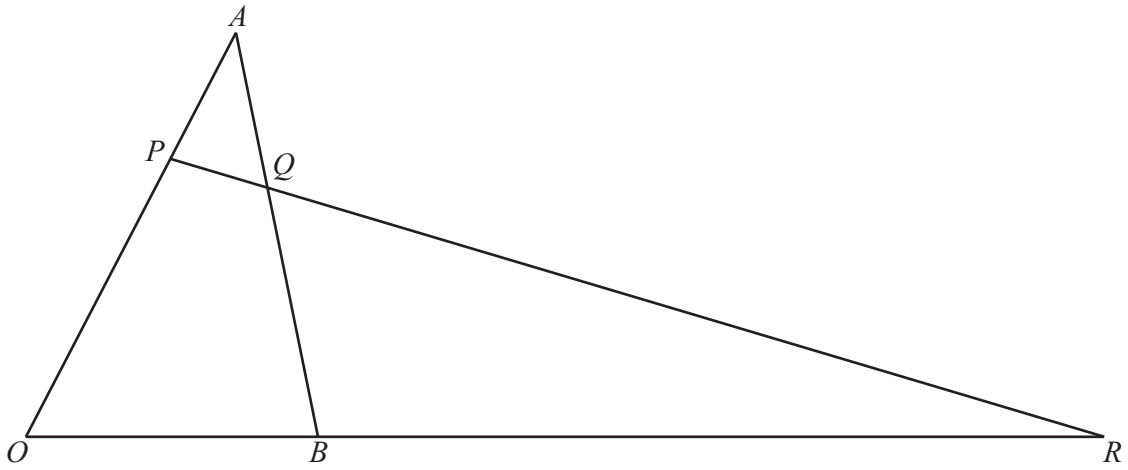
(b)



The diagram shows the shape from part **(a)** with region *OABEF* shaded.
Find, in terms of r and θ, the perimeter of the shaded region. [5]

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The diagram shows the triangle OAB, where $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

The point P lies on OA such that $\overrightarrow{OP} = \frac{3}{4}\overrightarrow{OA}$.

The point Q lies on AB such that $\overrightarrow{AQ} = \frac{1}{3}\overrightarrow{AB}$.

The straight line through P and Q meets the straight line through O and B at the point R.
It is given that $\overrightarrow{OR} = \lambda\mathbf{b}$ and $\overrightarrow{PR} = \mu\overrightarrow{PQ}$, where λ and μ are constants.

(a) Find $\overrightarrow{OR}$ in terms of **a**, **b** and μ. [6]

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