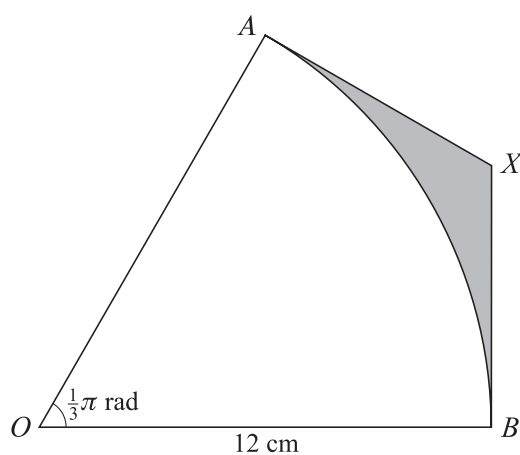**5**

In the diagram, OAB is a sector of a circle with centre O and radius $12\,\text{cm}$. The lines AX and BX are tangents to the circle at A and B respectively. Angle $AOB = \frac{1}{3}\pi$ radians.

  (i) Find the exact length of AX, giving your answer in terms of $\sqrt{3}$.   [2]

  (ii) Find the area of the shaded region, giving your answer in terms of π and $\sqrt{3}$.   [3]