Question: -

In radius of a circle which is inscribed in a isosceles triangle one of whose angle is $2\pi / 3$, is $\sqrt{3}$, then area of triangle (in sq units) is **(2006, 2M)**

(a) $4\sqrt{3}$ (b) $12 - 7\sqrt{3}$

(c) $12 + 7\sqrt{3}$ (d) None of these

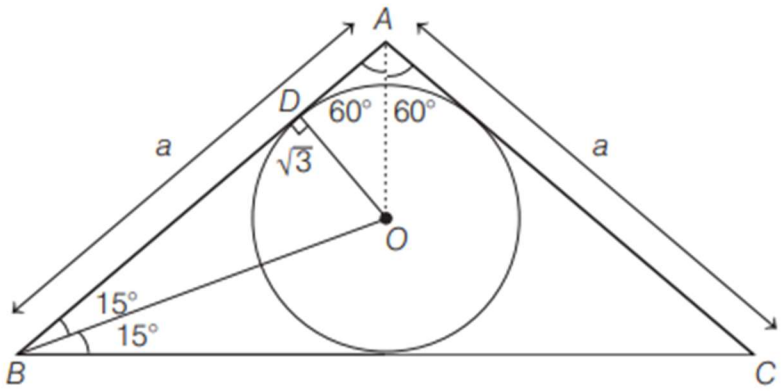
Solution: -

Let $AB = AC = a$ and $\angle A = 120°$.

$\therefore$ Area of triangle $= \frac{1}{2} a^2 \sin 120°$

where, $a = AD + BD = \sqrt{3} \tan 30° + \sqrt{3} \cot 15°$

$$= 1 + \frac{\sqrt{3}}{\tan (45° - 15°)}$$



$$\Rightarrow \quad a = 1 + \sqrt{3}\left(\frac{1 + \tan 45° \tan 30°}{\tan 45° - \tan 30°}\right)$$

$$= 1 + \sqrt{3}\left(\frac{\sqrt{3} + 1}{\sqrt{3} - 1}\right) = 4 + 2\sqrt{3}$$

$\therefore$ Area of a triangle

$$= \frac{1}{2}(4 + 2\sqrt{3})^2 \left(\frac{\sqrt{3}}{2}\right) = (12 + 7\sqrt{3}) \text{ sq units}$$