Example 19 If $\vec{a}$ and $\vec{b}$ are unit vectors, then what is the angle between $\vec{a}$ and $\vec{b}$ for $\sqrt{3}\vec{a}-\vec{b}$ to be a unit vector?

(A) $30°$ (B) $45°$ (C) $60°$ (D) $90°$

Solution (A) is the correct answer. We have

$$(\sqrt{3}\vec{a}-\vec{b})^2 = 3\vec{a}^2 + \vec{b}^2 - 2\sqrt{3}\,\vec{a}.\vec{b}$$

$$\Rightarrow \quad \vec{a}.\vec{b} = \frac{\sqrt{3}}{2} \Rightarrow \cos\theta = \frac{\sqrt{3}}{2} \Rightarrow \theta = 30°.$$