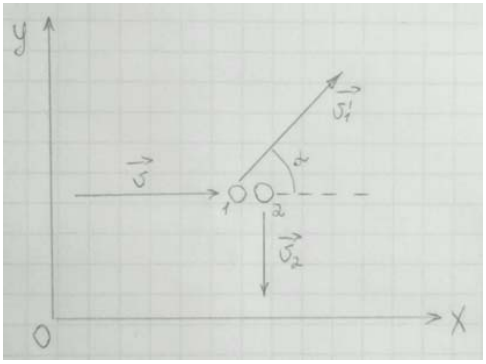
**1.** A mass ‘m’ moves with a velocity v and collides inelastically with another identical mass. After collision the 1st mass moves with velocity $v/\sqrt{3}$ in a direction perpendicular to the initial direction of motion. Find the speed of the 2nd mass after collision.

| |
|---|
| $m$ |
| $v$ |
| $v_2 = v/\sqrt{3}$ |
| $v_1 - ?$ |

*Solution.*




We have to use the law impulse conservation during inelastical collition.

$$m\vec{v} = m\vec{v}_1 + m\vec{v}_2 .$$

Let write the last vector equation in projectives onto the *X*- and *Y*-axes.

$$\begin{cases} mv = mv_1 \cos\alpha & (1) \\ 0 = mv_1 \sin\alpha - mv_2 & (2) \end{cases}.$$

From the Eq. (2), we can find that

$$v_1 = \frac{v_2}{\sin\alpha} = \frac{v}{\sqrt{3}\sin\alpha}.$$

Then, let write the Eq. (1):

$$mv = m \cdot \frac{v}{\sqrt{3}\sin\alpha} \cdot \cos\alpha, \quad tg\,\alpha = \frac{1}{\sqrt{3}}, \quad \alpha = 30^0.$$

So, the speed of the second mass after collision:

$$v_1 = \frac{v}{\sqrt{3}\sin 30^0} = \frac{v}{\sqrt{3}\cdot\frac{1}{2}} = v \cdot \frac{2\sqrt{3}}{3}.$$

**Answer**: $v \cdot \frac{2\sqrt{3}}{3}$.