

Answer on Question #69062-Physics-Mechanics-Relativity

1) Two arrows mass 0.1kg each are shot horizontally with the same speed of 30ms^{-1} , one from east and the other from south meeting at a point. Find the magnitude and direction of the total momentum of both arrows.

Solution

The magnitude of total momentum of both arrows is

$$P = \sqrt{(mv)^2 + (mv)^2} = \sqrt{2}mv = \sqrt{2}(0.1)(30) = 4.24 \frac{\text{kgm}}{\text{s}}$$

The direction of the total momentum of both arrows is north-west.

2) Two cars A & B are moving in the same direction along a straight line. Car A has 4 times the momentum and twice the kinetic energy of B.

a) determine the ratio of mass A to B.

b) the ratio of the velocity of A to B is?

Solution

a)

$$\frac{K_a}{K_b} = 2 = \left(\frac{m_a}{m_b}\right) \left(\frac{v_a}{v_b}\right)^2$$

$$\frac{p_a}{p_b} = 4 = \left(\frac{m_a}{m_b}\right) \left(\frac{v_a}{v_b}\right)$$

$$\left(\frac{m_a}{m_b}\right) = \frac{\left(\frac{p_a}{p_b}\right)^2}{\frac{K_a}{K_b}} = \frac{4^2}{2} = 8.$$

b)

$$\left(\frac{v_a}{v_b}\right) = \frac{\frac{p_a}{p_b}}{\left(\frac{m_a}{m_b}\right)} = \frac{4}{8} = \frac{1}{2}.$$

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