Answer on Question #39107, Physics, Mechanics

Question:

A 54.8-kg baseball pitching machine is placed on a frozen pond. It fires a 0.133-kg baseball at an angle of 30 degrees with the vertical at a speed of 18.5 m/s. What is the recoil velocity (in cm/s) of the machine?

Answer:

The law of conservation of momentum:

$$mv_x = Mu$$

where m is baseball's mass, M mass of pitching machine, u is the recoil velocity:

$$v_x = v\sin 30 = \frac{v}{2}$$

Therefore the recoil velocity equals:

$$u = \frac{mv_x}{M} = \frac{0.133 * 18.5}{2 * 54.8} = 22.4\,\frac{cm}{s}$$

Answer: $22.4\,\frac{cm}{s}$