Answer on Question 67216, Physics, Mechanics, Relativity

Question:

A baseball is hit so that it travels straight upward after being struck by the bat. A fan observes that it takes 3.0 s for the ball to reach its maximum height.

(a) Find its initial velocity.

(b) Find the height it reaches.

Solution:

(a) We can find the initial velocity of the ball from the kinematic equation:

$$v_f = v_i + gt,$$

here, v_i is the initial velocity of the ball, $v_f = 0$ is the final velocity of the ball at the maximum height, $g = -9.8\ m/s^2$ is the acceleration due to gravity and t is the time.

Then, we get:

$$0 = v_i + gt,$$

$$v_i = -gt = -\left(-9.8\ \frac{m}{s^2}\right) \cdot 3.0\ s = 29.4\ \frac{m}{s}.$$

(b) We can find the maximum height that ball can reach from the kinematic equation:

$$h = \frac{v_i + v_f}{2} \cdot t = \frac{\left(29.4\ \frac{m}{s} + 0\ \frac{m}{s}\right)}{2} \cdot 3.0\ s = 44.1\ m.$$

Answer:

(a) $v_i = 29.4\ \frac{m}{s}$.

(b) $h = 44.1\ m$.