Answer on Question #74372-Physics-Classical Mechanics

A batter hits a baseball so that it leaves the bat with an initial speed 37 m/s at an angle of 53.Find the position of the ball and the magnitude and direction of its velocity after 2 seconds. Treat the baseball as a projectile.

Solution

1) The position of the ball:

$$x = vt \cos \theta = 37 \cos 53 \, (2) = 44.5 \, m.$$

$$y = vt \sin \theta - \frac{gt^2}{2} = 37 \sin 53 \, (2) - \frac{9.8}{2} (2)^2 = 39.5 \, m.$$

2)

$$v_x = v \cos \theta = 37 \cos 53 = 22.27 \frac{m}{s}.$$

$$v_y = v \sin \theta - gt = 37 \sin 53 - 9.8(2) = -14.01 \, m.$$

The magnitude is

$$v = \sqrt{(v_x)^2 + (v_y)^2} = \sqrt{(22.27)^2 + (-14.01)^2} = 26.3 \frac{m}{s}.$$

The direction is

$$\alpha = \tan^{-1} \frac{14.01}{22.27} = 32.2° \, below \, the \, horizontal \, axis.$$

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