

Answer on Question#51369, Physics, Mechanics | Kinematics | Dynamics

The equations of motion of a stone are $y(t) = H - v_0 t - \frac{g t^2}{2}$, $v(t) = v_0 + g t$, where

$$H = 40 \text{ m} \quad , \quad v_0 = 13 \frac{\text{m}}{\text{s}} \quad , \quad g = 9.81 \frac{\text{m}}{\text{s}^2} \quad .$$

a) When the stone reaches the ground, $y(t) = 40 - 13t - (9.81) \frac{t^2}{2} = 0$. Solving this quadratic equation, obtain $t \approx 1.82 \text{ s}$ - it takes this time for stone to reach the ground.

b) Using second equation of motion, obtain $v(1.82) \approx 30.85 \frac{\text{m}}{\text{s}}$ - that is the speed of the stone at impact.