

Answer on Question 55018, Physics, Mechanics | Kinematics | Dynamics

Question:

A stone thrown from ground level returns to the same level 4 seconds after. With what speed was the stone thrown? Take $g = 10 \text{ m/s}^2$.

Solution:

We can find the initial velocity of the stone from the kinematic equation:

$$v = v_0 + gt_{rise},$$

where, $v = 0 \text{ m/s}$ is the final velocity of the stone when it reaches the maximum height and then became returns to the ground level, $g = 10 \text{ m/s}^2$ is the acceleration of gravity and t_{rise} is the time when the stone reaches the maximum height (it is obviously that $t_{rise} = t/2$, where $t = 4\text{s}$ is the total time that the stone spent in air).

Let's take the direction of the y -axis upward. Then, we can rewrite our kinematic equation:

$$v_0 - gt_{rise} = 0,$$

$$v_0 = gt_{rise} = g \frac{t}{2} = 10 \frac{\text{m}}{\text{s}^2} \cdot \frac{4\text{s}}{2} = 20 \frac{\text{m}}{\text{s}}.$$

Answer:

$$v_0 = 20 \frac{\text{m}}{\text{s}}.$$