



Consider a ball thrown upward. Let \mathcal{T} be the time taken for the ball to reach the top, and v_0 be the initial vertical velocity.

Determine the velocity $v_{\mathcal{T}/4}$ at the time $t = \frac{\mathcal{T}}{4}$.

- A) $v_{\mathcal{T}/4} = \frac{1}{4} v_0$
- B) $v_{\mathcal{T}/4} = \frac{1}{2} v_0$
- C) $v_{\mathcal{T}/4} = \frac{2}{3} v_0$
- D) $v_{\mathcal{T}/4} = \frac{3}{4} v_0$

First solve for time \mathcal{T} to reach the top: $v_{top} = v_0 - g\mathcal{T}$, but $v_{top} = 0$, so

$$\mathcal{T} = \frac{v_0}{g}.$$

At $\frac{\mathcal{T}}{4}$, we have

$$v_{\mathcal{T}/4} = v_0 - g \frac{\mathcal{T}}{4}.$$

Using $t = \frac{v_0}{g}$, we have

$$v_{\mathcal{T}/4} = v_0 - g \frac{v_0}{4g} = \frac{3v_0}{4}.$$

Answer **D**.

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