



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**.