Name : Solution   Id :   Sec. # : 26

A stone is thrown vertically upward with an initial speed of 20.0 m/s from the top of a building to the ground. If the building height is 50.0 m, determine

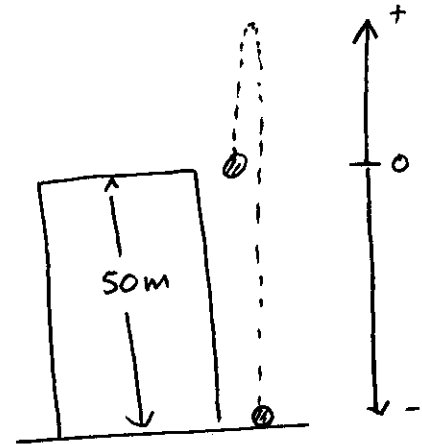(a) the time needed for the stone to reach its maximum height

$$V_0 = +20 \text{ m/s}$$

At maximum height, $V = 0$

$$\Rightarrow \quad V = V_0 - gt$$

$$0 = 20 - 9.8\,t$$

$$\Rightarrow \quad \boxed{t = \frac{20}{9.8} = 2.04 \text{ s}}$$

(b) the velocity of the stone just before it hits the ground.

$$\Delta y = y_2 - y_1 = -50 - 0 = -50 \text{ m}$$

$$V_0 = +20 \text{ m/s}$$

$$V = ?$$

$$V^2 = V_0^2 - 2g\,\Delta y$$

$$= (20)^2 - 2 \times 9.8 \times (-50)$$

$$= 1380 \ \left(\frac{m}{s}\right)^2$$

$$\Rightarrow \quad V = \pm \sqrt{1380} \text{ m/s}$$

since the velocity is a vector, and the stone is falling downward $\Rightarrow$ $\boxed{V = -37.1 \text{ m/s}}$