A ball is thrown straight upwards from the ground. It passes a window on the way up and on the way down. At $t = 0$ it passes the bottom of the window on its way up. At $t = +0.100 \text{ s}$ it passes the top of the window on its way up. At $t = +3.43 \text{ s}$ it passes the top of the window on its way down.

Reminder: When subtracting two numbers whose values are very similar, it is usually necessary to keep excess significant figures to avoid peculiar results.

(a) What is the distance from the bottom to the top of the window (in meters)?
(b) What is the distance from the bottom of the window to the top of the ball's path (in meters)?

Time it spends over the top of window:

\[ t = 3.43 - 0.1 = 3.33 \text{ sec} \]

\[ t_{bc} = \frac{3.33}{2} = 1.665 \text{ sec} \]

\[ v_c = v_b + a \cdot t_{bc} \Rightarrow v_b = g \cdot t_{bc} = (9.8)(1.665) \Rightarrow v_b = 16.317 \frac{\text{m}}{\text{sec}} \]

\[ v_b = v_a - g \cdot t_{ab} \Rightarrow v_a = v_b + g \cdot t_{ab} = (16.317) + (9.8)(-1) \Rightarrow v_a = 7.597 \frac{\text{m}}{\text{sec}} \]

\[ a) \text{ From } a \text{ to } b \text{, } v_f^2 - v_i^2 = -2g \cdot d \Rightarrow (16.317)^2 - (7.597)^2 = -2 \cdot (9.8) \cdot d \Rightarrow d = 1.68 \text{ m} \]

\[ b) \text{ From } a \text{ to } c \text{, } v_c^2 - v_i^2 = -2g \cdot h \Rightarrow h = \frac{v_i^2}{2g} = \frac{(17.297)^2}{2(9.8)} \Rightarrow h = 15.3 \text{ m} \]