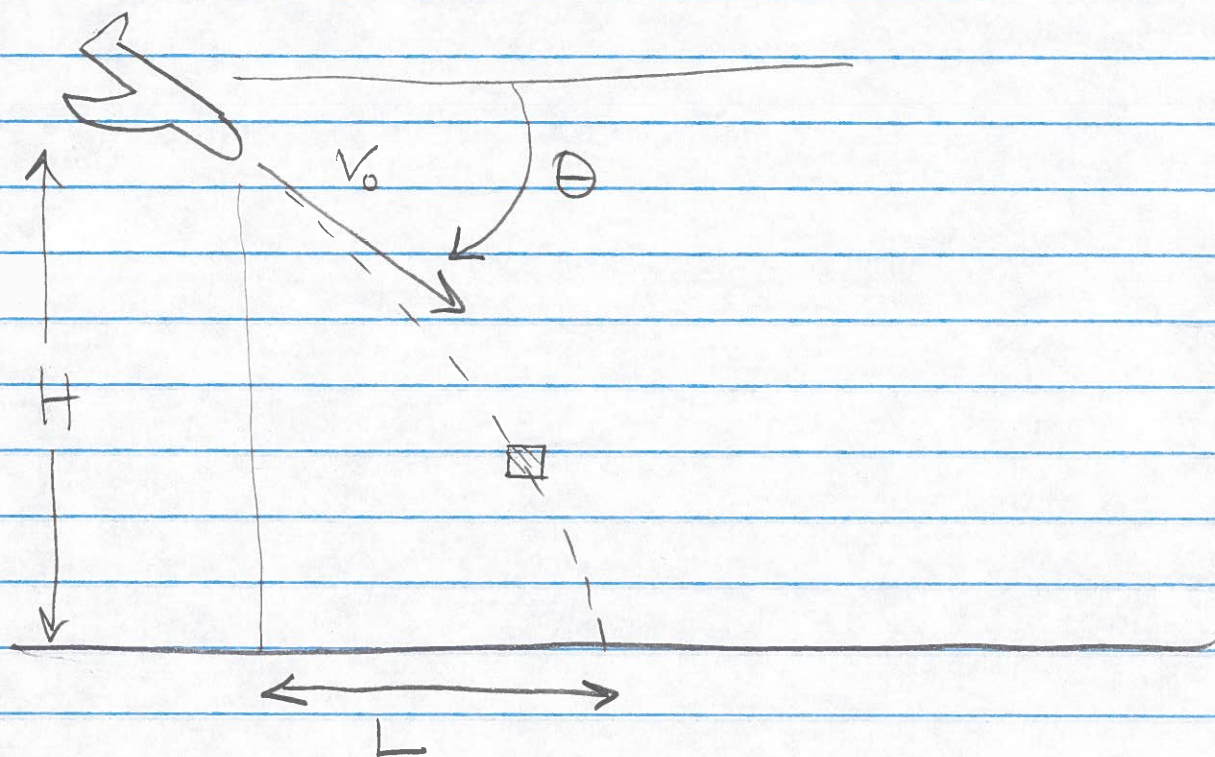




Airplane is flying at  $v_0 = 80 \frac{\text{m}}{\text{s}}$  at an angle  $\theta = 30^\circ$  below horizontal when it releases a box.  
Box travels

$$L = 800 \text{ m}$$

horizontally before it hits the ground.

a) how long is box in the air?

$$v_x = v_0 \cos(\theta) = \left(80 \frac{\text{m}}{\text{s}}\right) \cos(30^\circ) = 69.3 \text{ m/s}$$

This horizontal speed remains constant, so we can figure out the time  $t$  in the air like so  $\rightsquigarrow$

$$x_f - x_i = L = v_x t$$

$$\rightarrow t = \frac{L}{v_x} = \frac{800 \text{ m}}{69.3 \frac{\text{m}}{\text{s}}} = \boxed{11.6 \text{ s}}$$

b) What was the altitude  $H$  of the plane when it released the box?

$$y_f - y_i = -H = v_y t + \frac{1}{2} a_y t^2$$

$$\text{Here, } v_y = -v_0 \sin \theta = -\left(80 \frac{\text{m}}{\text{s}}\right) \sin(30^\circ) \\ = -40 \frac{\text{m}}{\text{s}}$$

$$a_y = -9.8 \frac{\text{m}}{\text{s}^2}$$

$$\rightarrow -H = \left(-40 \frac{\text{m}}{\text{s}}\right)(11.6 \text{ s}) - \frac{1}{2}(9.8 \frac{\text{m}}{\text{s}^2})(11.6 \text{ s})^2$$

$$\rightarrow \boxed{H = 1115 \text{ m}}$$