Warm-up

Assume air resistance is negligible:

- Eileen is in a hot-air balloon and is rising vertically at a speed of 11.7 $m \cdot s^{-1}$. She was 25.3 m above the ground when she accidentally dropped a bag of apples.

a) - What is the bag's maximum height above the ground?

b) - How much time does it take to reach the ground?

c) - How fast was the bag of apples going the instant it hits the ground?

$u = 11.7\ m \cdot s^{-1}$

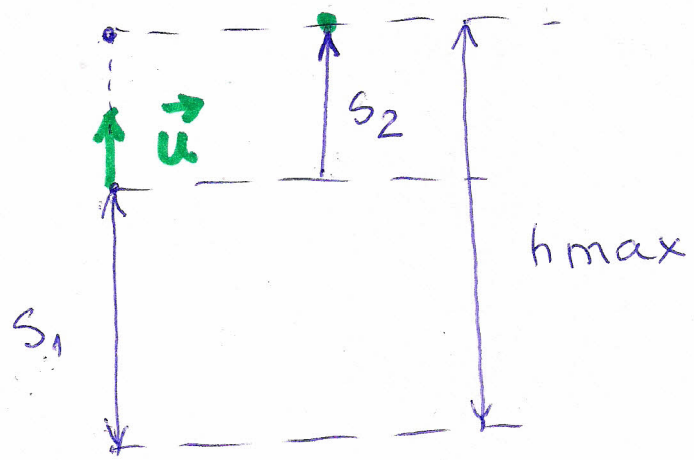
$s_1 = 25.3\ m$

a) $h_{max} = ?$

b) $t_{total} = ?$

c) $v = ?$

$0 = v = u - g \cdot t_{up}$ $\quad \boxed{t_{up} = \frac{u}{g}}$



a) $v^2 = u^2 - 2g \cdot s_2$

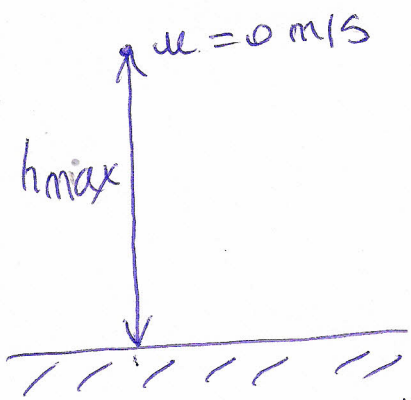
$$\boxed{s_2 = \frac{u^2}{2g}} = \frac{(11.7\ m \cdot s^{-1})^2}{2 \cdot 9.81\ m/s^2}$$

$s_2 = 6.98\ m$

$h_{max} = s_1 + s_2 = 25.3\ m + 6.98\ m$

$h_{max} = 32.28\ m = 32.3\ m$

b)



$h_{max} = g \frac{t^2}{2}$ (Free fall)

$$\boxed{t_{down} = \sqrt{\frac{2 h_{max}}{g}}}$$

$$\boxed{t_{up} = \frac{u}{g}}$$

$t_{total} = t_{up} + t_{down}$

c) $v = u + g \cdot t_{\cancel{total}\ down} = 0\ m/s + g \cdot \cancel{t_{total}}\ t_{down}$