Question

Vertical speed is $v_{\perp} = v \cdot \sin\alpha$, where $v = 26.6\ \frac{m}{s}$ and $\alpha = 66.2°$. We need to know what is the tallest obstacle: h.

We will have:

$$v_{tallest} = v \cdot \sin\alpha - g \cdot t = 0 \Rightarrow t = \frac{v \cdot \sin\alpha}{g} \Rightarrow$$

$$\Rightarrow h = v \cdot \sin\alpha \cdot t - \frac{g \cdot t^2}{2} = v \cdot \sin\alpha \cdot \frac{v \cdot \sin\alpha}{g} - \frac{g}{2} \cdot \frac{v^2 \cdot \sin^2\alpha}{g^2} =$$

$$= \frac{v^2 \cdot \sin^2\alpha}{g} - \frac{v^2 \cdot \sin^2\alpha}{2g^2} = \frac{v^2 \cdot \sin^2\alpha}{2g^2}$$

So, according to the given values:

$$h = \frac{v^2 \cdot \sin^2\alpha}{2g^2} = \frac{(26.6)^2 \cdot \sin^2 66.2°}{2 \cdot (9.8)^2} = 3.1\ \text{m}.$$

Answer: 3.1 meters.