

$$v_0 \sin \alpha - g t_p = 0 \rightarrow t_p = \frac{v_0 \sin \alpha}{g}$$

$$t_a = 2t_p = \frac{2v_0 \sin \alpha}{g}$$

$$h = y(t_p) = [v_0 \sin \alpha] t_p - \frac{1}{2} g (t_p)^2$$

$$= [v_0 \sin \alpha] \left[\frac{v_0 \sin \alpha}{g} \right] - \frac{1}{2} g \left[\frac{v_0 \sin \alpha}{g} \right]^2$$

$$= \frac{[v_0 \sin \alpha]^2}{g} - \frac{1}{2} \frac{[v_0 \sin \alpha]^2}{g}$$

$$h = \frac{[v_0 \sin \alpha]^2}{2g}$$