$$\cancel{2}\cancel{h}\frac{v_0^2}{g} - \overset{4}{\cancel{8}}\frac{v_0^2}{g}\cancel{h}\sin^2\alpha = \overset{2}{\cancel{4}}h^{\cancel{2}}\sin^2\alpha - \overset{2}{\cancel{4}}\cancel{h}\frac{v_0^2}{g}\sin^2\alpha$$

$$\frac{v_0^2}{g} = \sin^2\alpha\left(2h - 2\frac{v_0^2}{g} + 4\frac{v_0^2}{g}\right) = \sin^2\alpha\left(2h + 2\frac{v_0^2}{g}\right)$$

$$\Rightarrow \sin^2\alpha = \frac{v_0^2}{2g}\frac{1}{h + \frac{v_0^2}{g}} = \frac{1}{2}\frac{1}{\left(\frac{gh}{v_0^2} + 1\right)}$$

<u>Controlli semplici</u>:

$h = 0 \qquad \sin^2\alpha = \frac{1}{2} \Rightarrow \alpha = 45°$ (come doveva essere)

$h \gg \frac{v_0^2}{g} \qquad \sin^2\alpha \approx \frac{1}{2\frac{gh}{v_0^2}} \ll 1 \Rightarrow \alpha \approx 0$

Calcolare la gittata massima

$$d_{max} = d\left(\sin^2\alpha = \frac{1}{2}\frac{1}{\left(\frac{gh}{v_0^2} + 1\right)}\right)$$

$$\begin{cases} \sin\alpha = \dfrac{v_0}{\sqrt{2gh + 2v_0^2}} \\ \cos\alpha = \sqrt{1 - \dfrac{v_0^2}{2gh + 2v_0^2}} \end{cases}$$

$$d_{max} = \frac{v_0^2}{g}\frac{v_0}{\sqrt{2gh + 2v_0^2}}\sqrt{1 - \frac{v_0^2}{2gh + 2v_0^2}}$$

$$+ \sqrt{1 - \frac{v_0^2}{2gh + 2v_0^2}}\sqrt{\frac{v_0^4}{g^2}\frac{v_0^2}{2gh + 2v_0^2} + \frac{2hv_0^2}{g}}$$