

Answer on Question #79666 - Physics - Mechanics

If  $r$  is the horizontal range of a projectile; and  $h$  is its greatest height, prove that initial speed is  $[2g(h+(r^2/16h))]^{1/2}$ .

If maximum height is  $h$ , the time to reach this height (and the time to fall than down) is

$$t = \sqrt{\frac{2h}{g}}$$

The range is

$$r = 2v_h \sqrt{\frac{2h}{g}}$$

The square of the horizontal speed is

$$v_h^2 = \frac{r^2 g}{8 \cdot h}$$

and the square of the vertical speed is

$$v_v^2 = 2 \cdot g \cdot h$$

Finally, the initial speed is

$$v = \sqrt{v_h^2 + v_v^2} = \sqrt{\frac{r^2 g}{8 \cdot h} + 2 \cdot g \cdot h} = \sqrt{2g \left( \frac{r^2 g}{8 \cdot h} + h \right)}$$

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