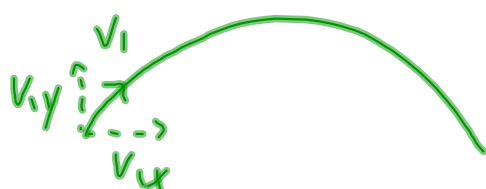


A juggler is doing his thing and decides to add a little variety. He continues to toss the balls along the same path but doubles his speed imparted to the ball as it leaves his hand. If he is to continue to catch the balls at the same level as release, how will his hand separation compare to the original width? Justify your answer.



If you double V_1 , what happens to d_x ?

If the speed at which he throws the ball doubles, both the horizontal and vertical components of his velocity will double. ($v_{1x} = v_1 \cos\theta$ and $v_{1y} = v_1 \sin\theta$).

Since the hand separation is given by d_x and $d_x = v_x t$, we need to determine the impact on time. Time is given by

$$t = \frac{v_2 - v_1}{a} \quad \text{So, if the vertical component of velocity doubles then so will the time.}$$

$$\begin{aligned} \text{Since } d_x &\propto v_x t \\ d_x &\propto (2)(2) \\ d_x &\propto 4 \end{aligned}$$

Therefore, if he doubles his velocity, he must increase his hand separation by 4 times further apart.

$$L = 7 \text{ m/s}^2$$