Answer on Question #67146-Physics-Other

A ball is thrown towards a wall 10m away with a velocity of 40m/s. At what angle must it be thrown if it is to enter a hole on the wall at a height of 7m from the ground, neglecting wind effects?

Solution

We use the formulas for projectile motion:

$$x = v_0 t \cos \theta = 40t \cos \theta = 10 \rightarrow t = \frac{1}{4\cos \theta}$$
$$y = v_0 t \sin \theta - \frac{1}{2}gt^2 = 40t \sin \theta - \frac{1}{2}(9.8)t^2 = 7$$
$$40\frac{1}{4\cos \theta}\sin \theta - \frac{1}{2}(9.8)\left(\frac{1}{4\cos \theta}\right)^2 = 7$$
$$10\tan \theta - \frac{1}{32}(9.8)(\tan^2 \theta + 1) = 7$$

The quadratic equation gives:

$$\tan \theta_1 = 0.747748 \rightarrow \theta_1 = 36.8^\circ$$
$$\tan \theta_2 = 31.9053 \rightarrow \theta_2 = 88.2^\circ$$

Answer: 36. 8° *or* 88. 2°.

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