## Answer on Question \#67146-Physics-Other

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

## Solution

We use the formulas for projectile motion:

$$
\begin{gathered}
x=v_{0} t \cos \theta=40 t \cos \theta=10 \rightarrow t=\frac{1}{4 \cos \theta} \\
y=v_{0} t \sin \theta-\frac{1}{2} g t^{2}=40 t \sin \theta-\frac{1}{2}(9.8) t^{2}=7 \\
40 \frac{1}{4 \cos \theta} \sin \theta-\frac{1}{2}(9.8)\left(\frac{1}{4 \cos \theta}\right)^{2}=7 \\
10 \tan \theta-\frac{1}{32}(9.8)\left(\tan ^{2} \theta+1\right)=7
\end{gathered}
$$

The quadratic equation gives:

$$
\begin{aligned}
\tan \theta_{1} & =0.747748 \rightarrow \theta_{1}=36.8^{\circ} \\
\tan \theta_{2} & =31.9053 \rightarrow \theta_{2}=88.2^{\circ}
\end{aligned}
$$

Answer: 36. $8^{\circ}$ or $88.2^{\circ}$.
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