A block slides down a roof angled at 30° to the horizontal. It leaves the roof at a speed of 3 m/s and impacts the ground 5 m from the base of the building. Determine
a) the height at which the block left the building
b) the impact velocity
A projectile is launched from a 50 m high cliff with a velocity of 40 m/s 30° above the horizontal. Determine
a) the range of the projectile
b) the impact velocity
A block slides down a roof angled at 30° to the horizontal. It leaves the roof at a speed of 3 m/s and impacts the ground 5 m from the base of the building. Determine
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\[ V_x = 3 \cos 30° \frac{m}{s} = 2.5981 \frac{m}{s} \]
\[ d_x = 5 \text{ m} \]
\[ t = ? \]

\[ a_y = +9.8 \frac{m}{s^2} \]
\[ \alpha_y = +1.5 \frac{m}{s^2} \]
\[ t = ? \]
\[ d_y = ? \]
\[ V_{fy} = ? \]

a) \[ d_x = v_x t \]
\[ t = \frac{d_x}{v_x} = \frac{5}{2.5981} = 1.9245 \text{ s} \]
b) 

\[ \begin{align*} 
\text{Horizontal component:} \\
\v_x &= 2.5981 \text{ m/s} \\
\text{Vertical component:} \\
\v_y &= 20.360 \text{ m/s} \\
\text{Final velocity:} \\
\v_f &= \sqrt{\v_x^2 + \v_y^2} \\
&= \sqrt{(2.5981)^2 + (20.360)^2} \\
&= 20.5 \text{ m/s} \\
\text{Angle:} \\
\theta &= \tan^{-1}\left(\frac{\v_f}{\v_x}\right) \\
&= \tan^{-1}\left(\frac{20.360}{2.5981}\right) \\
&= 82.7^\circ \\
\end{align*} \] 

20.5 m 82.7° Below the Horizontal
A projectile is launched from a 50 m high cliff with a velocity of 40 m/s 30° above the horizontal. Determine
a) the range of the projectile
b) the impact velocity
a) 

\[ d_x = v_x t \]
\[ = (34.641)(5.8315) \]
\[ = 202 \text{ m} \]

b) 

\[ v_{f_y} = v_{i_y} + 2a_y t_y \]
\[ v_{f_y} = \sqrt{v_{i_y}^2 + 2a_y d_y} \]
\[ = \sqrt{(34.641)^2 + 2(-9.8)(-50)} \]
\[ = 50.8 \text{ m/s} \]

\[ \theta = \tan^{-1} \left( \frac{v_{f_y}}{v_x} \right) \]
\[ = \tan^{-1} \left( \frac{37.148}{34.641} \right) \]
\[ = 47.0^\circ \]

50.8 m/s 47.0° BELOW THE HORIZONTAL