## Question \#83584, Physics / Mechanics | Relativity |

Soldiers are firing a cannon. They fire a projectile at 1000 meters per second with a 30 degree angle above the desert floor.In the absence of air resistance. What are the horizontal and vertical components of the initial velocity? How long will it take the round to hit the ground and how far down range will it go? How high will it's peak be?

## Solution

$v_{0}=1000 \mathrm{~m} / \mathrm{s}$
$g=10 \mathrm{~m} / \mathrm{s}^{2}$
$\beta=30^{\circ}$

the horizontal and vertical components of the initial velocity -

$$
\begin{aligned}
& v_{x}=v_{0} \cos \beta=1000 \cdot \frac{\sqrt{3}}{2}=866(\mathrm{~m} / \mathrm{s}) \\
& v_{y}=v_{0} \sin \beta=1000 \cdot \frac{1}{2}=500(\mathrm{~m} / \mathrm{s})
\end{aligned}
$$

the flight range of the body $-l=\frac{v_{0}^{2} \sin 2 \beta}{g}=\frac{1000^{2} \frac{\sqrt{3}}{2}}{10} \approx \mathbf{8 5 0 0 0} \mathbf{m}=\mathbf{8 5} \mathbf{~ k m}$
maximum lift height $-\boldsymbol{h}=\frac{v_{0}^{2}(\sin \beta)^{2}}{2 g}=\frac{\mathbf{1 0 0 0}^{2} \cdot \mathbf{0 . 2 5}}{20} \approx \mathbf{1 2 5 0 0} \mathrm{~m}=12.5 \mathrm{~km}$
Answer provided by https://www.AssignmentExpert.com

