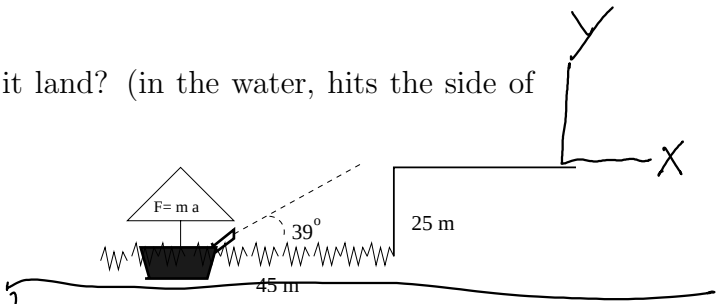
Quiz 2 **Dr. Weppner**

A cannon ball is fired from a ship (right at the water line) at a 39^o angle towards a cliff which is 25 meters high and 45 meters away. The initial speed of the cannon ball is 55 m/s.

Figure out the cannon ball motion. Where does it land? (in the water, hits the side of the cliff, on top of the cliff), How far away?

Draw a diagram, show all work for full credit.



For constant acceleration motion is given as:
$v_y = v_{0y} + at$
$\Delta y = v_{0y}t + \frac{1}{2}at^2$
$v_y{}^2 = v_{0y}{}^2 + 2a\Delta y$
$\Delta x = v_{0x}t$
if in freefall $a = g = 9.81 m/s^2$ towards the earth
if $c + bt + at^2 = 0$ then t = $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$V_{0x} = 55 \cos 39^\circ = 42.7 m/s$

$V_{0y} = 55 \sin 39^\circ = 34.6 m/s$

$45 m = 42.7 m/s\, t$

$t = 1.05 s$ when cliff is reached

height at this time?

$\Delta y = 34.6 m/s\,(1.05 s) - \frac{1}{2}(9.8 m/s^2)(1.05 s)^2$

$= 36.3 m - 5.4 m = 30.9 m$

over cliff!!

Whole journey lets try...

$V_y^2 = (34.6 m/s)^2 - 2(9.8 m/s^2)(25 m)$

$V_y^2 = 1197 m^2/s^2 - 490 m^2/s^2$

$V_y^2 = 707 m^2/s^2$

$|V_y| = 26.6 m/s$ Size only!

direction downward

$V_y = V_{oy} - gt$ (whole trip)

$-26.6 m/s = 34.6 m/s - 9.8\, t$

$t = 6.24 s$

so $\Delta x = (42.7 m/s)(6.24 s)$

$= 266 m$