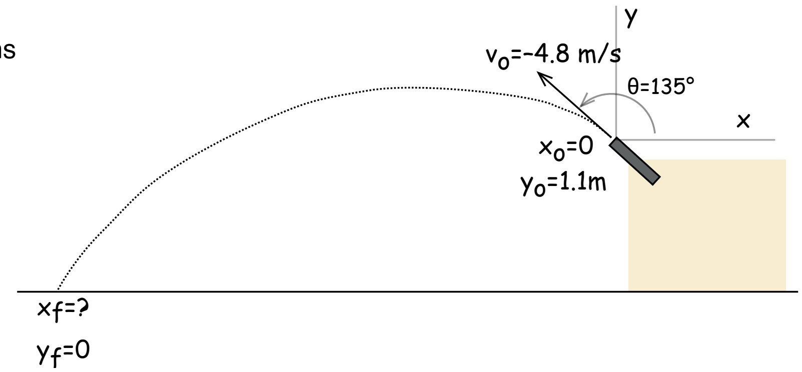
DYNAMICS WORKSHEET Name ______________________ St No __ __ __ __ __- __ __ __ __ Prob:__

1) Pictorial Representation

a. sketch showing important points in the motion
b) coordinate system
c. symbols for knowns and unknowns

known:
$v_0 = 4.8\text{m/s}, \theta = 135°$
$x_0 = 0,$
$y_0 = 1.1\text{m}$
$y_f = 0$
$w_x = 0,\ w_y = -mg$

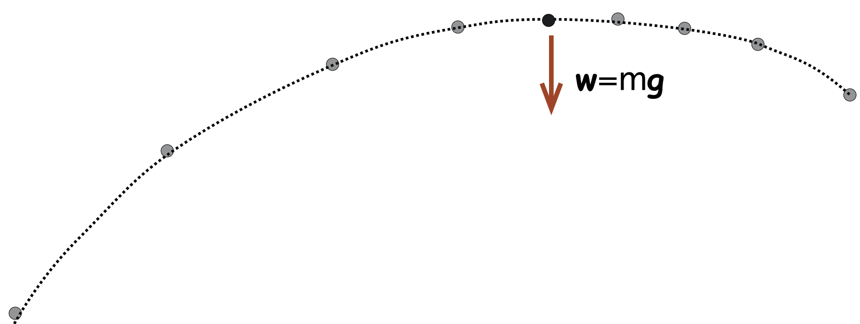
find: y_f



(You might save yourself some grief by just flipping left-to-right.)

2) Physical Representation

a. motion diagram
b. force identification
c. free-body diagram



3) Mathematical Representation

a. start with Newton's first of second law
b. include other information as needed
c. solve.

$$v_{0x} = v_0 \cos\theta = (-4.8\text{m/s})/\sqrt{2} = -3.39\text{m/s}$$
$$v_{0x} = v_0 \sin\theta = (4.8\text{m/s})/\sqrt{2} = 3.39\text{m/s}$$
$$a_x = w_x/m = 0, \quad a_y = w_y/m = -g$$
$$x = x_0 + v_{0x}t, \quad y = y_0 + v_{0y}t - \tfrac{1}{2}gt^2$$

Solve for $y = 0$ to get t_f, use quadratic eqn.

$$t_f = \frac{-v_{0y} \pm \sqrt{v_{0y}^2 - 2gy_0}}{-g} \qquad x_f = x_0 + v_{0x}t_f$$

Use the program "bc" on any unix system to calculate: type bc -l (the -l loads floating point library)

v0y=3.39
g=9.8
y0=1.1
(-v0y+sqrt(v0y^2 +2*g*y0))/-g
-.24072403888222143060 negative time, that's when it would have started if it started from the floor
(-v0y-sqrt(v0y^2 +2*g*y0))/-g
.93256077357609898162
xf=.9326*-3.39
xf
-3.161514 Thus the answer is x_f= -3.16 m

4) Assess

a. units? for t_f: [m/s]/[m/s^2] = [s], sqrt([m/s^2][m])/[m/s^2] = [m/s]/[m/s^2]=[s]; for x_f: [m/s][s]=[m] ok
b. reasonable? about 3 m is reasonable, it's longer than the horizontal shot, but not too long.