Name _____ **Date** _____
Teacher _____ **Period** _____

Projectile Motion Worksheet

1. A ball is thrown horizontally at a speed of 10.0 m/s from a bridge 50.0-m above a river. Ignoring air resistance:

   a. How long will it take for the ball to reach the water?

   $-50.0\,m = 0 + \frac{1}{2}(-9.8\,m/s^2)\,t^2$

   $t^2 = \frac{50}{4.9} \Rightarrow t = 3.2\,s$ +1

   b. What is the horizontal velocity of the ball just before it hits the water?

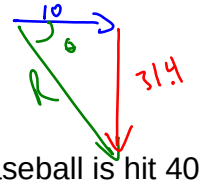
   $V_{0x} = V_x = 10.0\,m/s$ +1

   c. What is the vertical velocity of the ball just before it hits the water?

   $V_y = V_{0y} + At$

   $= 0 + (-9.8\,m/s)(3.2) = -31.4\,m/s$ +1

   d. What is the total velocity of the ball just before it hits the water?

   $R^2 = 10^2 + (31.4)^2$

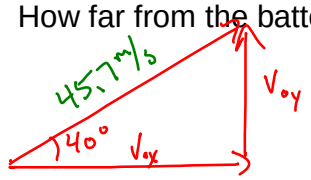
   $R = 33\,m/s$ +1

   $\theta = \tan^{-1}\left(\frac{31.4}{10}\right)$ +1

   $\theta = 72.3^\circ$ DOWN FROM HORIZONTAL

2. A baseball is hit 40.0^0 to the horizontal with a speed of 45.7 m/s. Assuming the ball is caught at the same height that it was hit:

   a. How far from the batter will the ball land?

   $V_{0x} = (45.7\,m/s)\cos 40^\circ$

   $= 35\,m/s$

   $R = \frac{V_0^2}{g}\sin 2\theta$

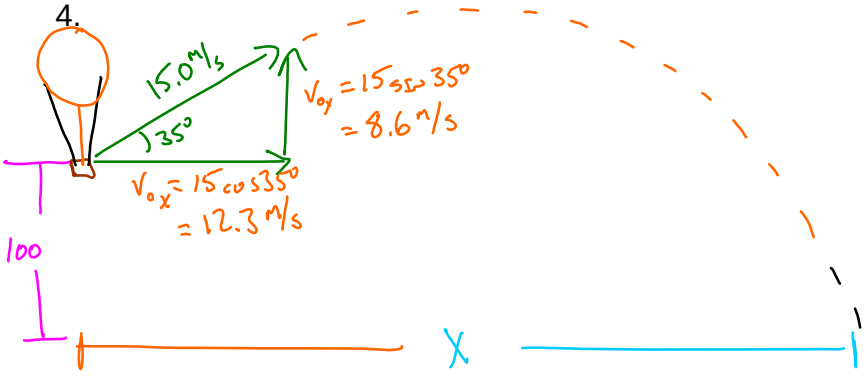
   $= \frac{45.7^2}{9.8}\sin 80^\circ = 210\,m$ +1

   b. How long does the fielder have to get to the ball?

   $X = V_{0x}t$ $\quad t = 6.0\,s.$ +1

   $210\,m = 35t$

3. A rock is thrown with a velocity of 15.0 m/s at an angle of 35.0^0 to the horizontal from a hot air balloon 100.0-m in the air. Where will the rock land?

4. 

   $Y = V_{0y}t + \frac{1}{2}A_y t^2$

   $-100 = (8.6\,m/s)t + \frac{1}{2}(-9.8\,m/s^2)t^2$

   $t = 5.5\,s$ +1

   $X = V_{0x}t$

   $= (12.3\,m/s)(5.5\,s) = 67.7\,m$ +1

+9

If you point a rifle horizontally at the center of a target 1.0×10^2 m away from you, where will the bullet hit the target if it leaves the muzzle at a speed of 1.0×10^3 m/s?

$X = 100\text{m}$

$V_{ox} = 1{,}000\text{ m/s}$

$X = V_{ox}t$

$100\text{m} = (1000\text{m/s})\,t$

$t = 0.1\text{s}$ +1

$y = V_{oy}t + \frac{1}{2}A_y t^2$

$= 0 + \frac{1}{2}(-9.8\text{m/s}^2)(0.1\text{s})^2$

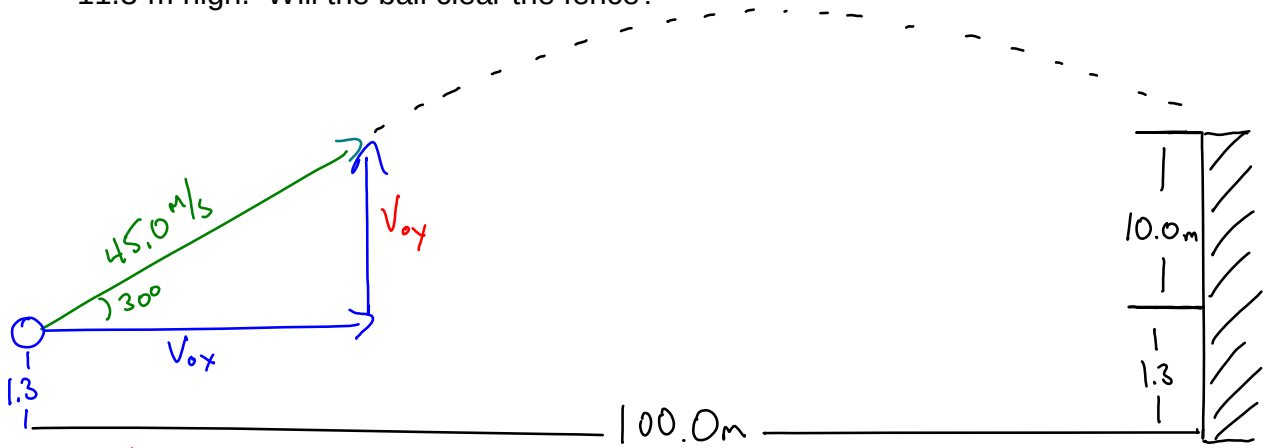
$y = -.049\text{m}$ +1

5. A golfer wants to chip a shot into the hole 50.0-m away on flat level ground. If the ball sails off the club at an angle of 45^0, what speed must it have initially?

$R = \frac{V_0^2}{g}\sin 2\theta$

$50\text{m} = \frac{V_0^2}{9.8\text{m/s}^2}\sin 90^\circ \Rightarrow$ $V_0 = 22.1\text{m/s}$ +1

6. A baseball is hit as it comes in 1.30-m over the plate. The blast sends the ball soaring at an angle of 30^0 above the horizontal with a speed of 45.0 m/s. The outfield fence is 100.0-m away and 11.3-m high. Will the ball clear the fence?



$V_{oy} = (45.0\text{m/s})\sin 30^\circ$

$= 22.5\text{ m/s}$

$V_{ox} = (45.0\text{m/s})\cos 30^\circ$

$= 39.0\text{m/s}$

$X = V_{ox}t$

$100 = (39.0\text{m/s})\,t$

$t = \frac{100}{39} = 2.56\text{s}$ +1

$y = V_{oy}t + \frac{1}{2}A_y t^2$

$= (22.5\text{m/s})(2.56\text{s}) + \frac{1}{2}(-9.8\text{m/s}^2)(2.56\text{s})^2$

$= 25.5\text{m}$

YES, BY 15.5m +1

+14 TOTAL

+5