Projectile Motion Worksheet (Case 1) Name:_____KEY_____

Mod:_____

Date:_____

Directions: Answer the following questions below using the projectile motion equations. List all variables and show your work. Circle your final answer with the correct units.

1. An arrow is fired directly horizontal off a cliff that is 10.0 meters tall with a velocity of 65.5m/s.
   a. How long is the arrow in the air?
   b. What is the range of the arrow?

$v_{iy} = 0\frac{m}{s}$ $v_x = 65.5\frac{m}{s}$ $d_y = \frac{1}{2}gt^2$ $d_x = v_x t$

$v_{fy} = xxx$ $t =$ $t = \sqrt{\frac{2d_y}{g}}$ $d_x = \left(65.5\frac{m}{s}\right)(1.43s)$

$g = -9.8\frac{m}{s^2}$ $d_x = ?$

$t = ?$ $t = \sqrt{\frac{(2)(-10m)}{-9.8\frac{m}{s^2}}}$ $d_x = 93.66m$

$d_y = -10m$

$t = 1.43sec$

2. A pool ball leaves a 0.60-meter high table with an initial horizontal velocity of 2.4 m/s.
   a. Predict the time required for the pool ball to fall to the ground.
   b. Predict the horizontal distance between the table's edge and the ball's landing location.

$v_{iy} = 0\frac{m}{s}$ $v_x = 2.4\frac{m}{s}$ $d_y = \frac{1}{2}gt^2$ $d_x = v_x t$

$v_{fy} = xxx$ $t =$ $t = \sqrt{\frac{2d_y}{g}}$ $d_x = \left(2.4\frac{m}{s}\right)(0.35s)$

$g = -9.8\frac{m}{s^2}$ $d_x = ?$

$t = ?$ $t = \sqrt{\frac{(2)(-0.60m)}{-9.8\frac{m}{s^2}}}$ $d_x = 0.84m$

$d_y = -0.60m$

$t = 0.35sec$

3. A soccer ball is kicked horizontally off a 22.0-meter high hill and lands a distance of 35.0 meters from the edge of the hill. Determine the initial horizontal velocity of the soccer ball.

$v_{iy} = 0\frac{m}{s}$ $v_x = ?$ $d_y = \frac{1}{2}gt^2$ $d_x = v_x t$

$v_{fy} = xxx$ $t =$ $t = \sqrt{\frac{2d_y}{g}}$ $v_x = \frac{d_x}{t}$

$g = -9.8\frac{m}{s^2}$ $d_x = 35m$ $v_x = \frac{35.0m}{2.12s}$

$t = ?$ $t = \sqrt{\frac{(2)(-22m)}{-9.8\frac{m}{s^2}}}$

$d_y = -22m$ $v_x = 16.51\frac{m}{s}$

$t = 2.12sec$

4. A rock is thrown with a velocity of 23.7m/s horizontally off the top of an elevated hill. If the time it takes to reach the ground is 5.70 seconds. What is the height of the hill?

$v_{iy} = 0\frac{m}{s}$ $v_x = 23.7\frac{m}{s}$ $d_y = \frac{1}{2}gt^2$

$v_{fy} = xxx$ $t = 5.70s$ $d_y = \frac{1}{2}\left(-9.8\frac{m}{s^2}\right)(5.70s)^2$

$g = -9.8\frac{m}{s^2}$ $d_x =$ $d_y = -159.20m$

$t = 5.70s$

$d_y = ?$

159.20m Tall Cliff

5. An airplane is making an emergency drop of medical supplies to solders on the ground. If the plane is traveling at 358.0 km/hr directly parallel to the ground from a height of 230.0m, how far ahead of the landing site should the plane drop the supplies?

$v_{iy} = 0\frac{m}{s}$ $\quad v_x = 99.44\frac{m}{s}$
$v_{fy} = xxx$ $\quad t = 6.85\text{s}$
$g = -9.8\frac{m}{s^2}$ $\quad d_x = ?$
$t = ?$
$d_y = -230m$

$$\frac{358km}{1hr} x \frac{1000m}{1km} x \frac{1hr}{3600s} = 99.44\frac{m}{s}$$

$$d_y = \frac{1}{2}gt^2$$
$$t = \sqrt{\frac{2d_y}{g}}$$
$$t = \sqrt{\frac{(2)(-230m)}{-9.8\frac{m}{s^2}}}$$
$$t = 6.85sec$$

$$d_x = v_x t$$
$$d_x = \left(99.44\frac{m}{s}\right)(6.85s)$$
$$d_x = 681.16m$$

6. You're a criminal investigator and need evidence to discover the mystery of a crash. A car traveled a horizontal distance of 22.3m before smashing into the ground after it ran off a horizontal road. The cliff is 7.2m high from the base to the top. At what speed was the car traveling at before it ran off the road?

$v_{iy} = 0\frac{m}{s}$ $\quad v_x = ?$
$v_{fy} = xxx$ $\quad t =$
$g = -9.8\frac{m}{s^2}$ $\quad d_x = 22.3\text{m}$
$t = ?$
$d_y = -7.2m$

$$d_y = \frac{1}{2}gt^2$$
$$t = \sqrt{\frac{2d_y}{g}}$$
$$t = \sqrt{\frac{(2)(-7.2m)}{-9.8\frac{m}{s^2}}}$$
$$t = 1.21sec$$

$$d_x = v_x t$$
$$v_x = \frac{d_x}{t}$$
$$v_x = \frac{22.3m}{1.21s}$$
$$v_x = 18.43\frac{m}{s}$$

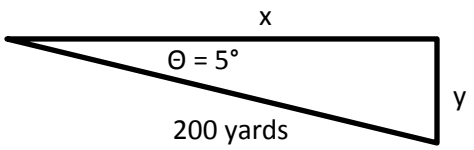
7. A bullet is fired from a gun with an unknown velocity towards an unwary deer in the valley. If the hunter is standing on top of a hill and fires the gun horizontally at the deer which is 200 yards away at an angle of 5.0 degrees below the horizontal. What is the initial velocity of the bullet?

$v_{iy} = 0\frac{m}{s}$ $\quad v_x = ?$
$v_{fy} = xxx$ $\quad t =$
$g = -9.8\frac{m}{s^2}$ $\quad d_x = 182.18\text{m}$
$t = ?$
$d_y = -15.94m$

$$y = 200\sin(5.0) = 17.43yards$$
$$x = 200\cos(5.0) = 144.24yards$$

$$17.43yards = 15.94m$$
$$144.24yards = 182.18m$$

$$d_y = \frac{1}{2}gt^2$$
$$t = \sqrt{\frac{2d_y}{g}}$$
$$t = \sqrt{\frac{(2)(-15.94m)}{-9.8\frac{m}{s^2}}}$$
$$t = 1.80sec$$



$$d_x = v_x t$$
$$v_x = \frac{d_x}{t}$$
$$v_x = \frac{182.18m}{1.80s}$$
$$v_x = 101.21\frac{m}{s}$$