

Name: _____

Class Period: _____

Honors Physics:

Problem Set – Two-Dimensional Kinematics

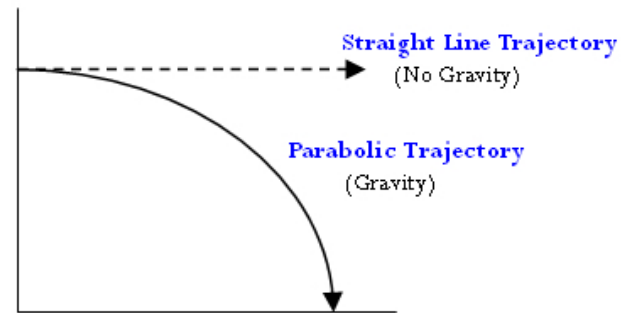
**Set calculator to degrees*

Conceptual Ideas

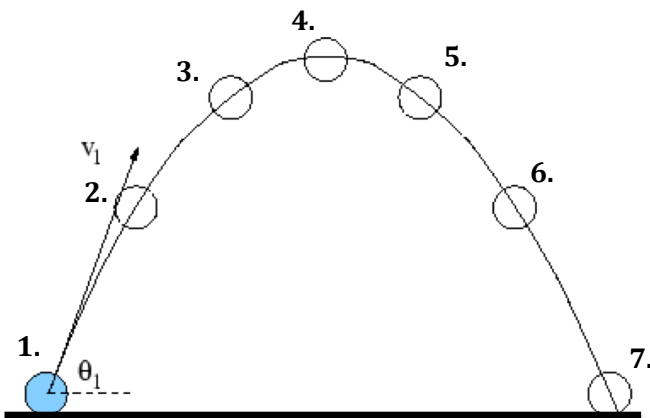
1. What are things that can ALWAYS be assumed with projectile motion?

2. For the $\frac{1}{2}$ Projectile shown below, please answer the following

- A. What kind of velocity does a $\frac{1}{2}$ projectile have at the beginning of its motion?
- B. What happens to the velocity in the y-direction as the objects moves?



3. The full projectile below has an initial velocity of 16.8 m/s directed at an angle of 56.0° .



- A. What are the values of the velocity in the x- and y- direction at the initial point (point #1)
- B. What are the values of the velocity in the x- and y- direction at the highest point (point #4)
- C. What are the values of the velocity in the x- and y- direction at the point of impact (point #7)
- D. What happens to the x-velocity throughout the course of the projectile's movement?

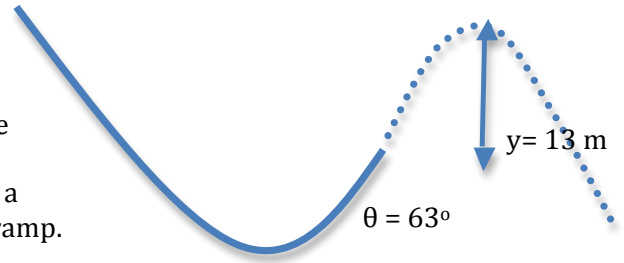
- E. What happens to the y-velocity throughout the course of the projectile's movement?

4. In one of our very first demonstrations with projectile motion, an apparatus was used to launch one ball out as a projectile, while allowing another to fall from the exact same height. Which hit the ground first? Why?

5. How does the launch angle affect the trajectory of a projectile?

Mathematical Ideas:

For each problem below, identify whether it is a $\frac{1}{2}$ projectile or full projectile.



6. In the women's Olympic ski jump competition the end of a typical ramp is angled 63.0° above the horizontal. With this launch angle, a skier attains a maximum height of 13.0 m above the end of the ramp.

Projectile Type: _____

- A. What is the initial velocity in the y-direction?
B. How long does it take the skier to reach this maximum height?
C. What is the value of the initial velocity (v_0)?
7. A projectile is launched with an initial velocity of 75.2 m/s at an angle of 34.5° above the horizontal. Find the following.

Projectile Type: _____

- A. What are the x- and y- components of the initial velocity?
B. What are the x- and y-components of the velocity of the projectile at $t = 0.750 \text{ s}$? Find the magnitude and angle (θ) of the resultant velocity at $t = 0.750 \text{ s}$
8. A tennis ball is slammed with an initial horizontal velocity of 28.0 m/s . The ball hits the tennis court at a horizontal distance of 19.6 m from the racket. What is the height of the tennis ball above the court when it leaves the racket?

Projectile Type: _____

9. A diver runs 1.60 m/s horizontally off the edge of the diving board. He reaches the water below in 3.00 s .

Projectile Type: _____

- A. How high was the diving board?
B. How far from the base of the diving board did he hit the water?

10. A basketball player shoots the ball with an initial velocity (v_0) = 14.0 m/s at an angle of 40.0° with respect to the ground.

Projectile Type: _____

What is the range or horizontal distance the ball travels if it is released 2.20 m above the ground?
**Hint: What will be the y-position of the ball when it lands?*

