Example Projectile Motion Test Name:_____

1. At the same moment a ball is projected horizontally (level with the ground) another ball (identical to the first) is dropped from the same height. Which reaches the ground first? More importantly, why?

2. To a physicist, what is considered to be a *projectile*? In other words, how is the term *projectile* defined?

3. Consider a projectile "in flight." Using the words *constant* and *changes*, fill out the following chart indicating whether or not the specific aspect of the projectile's motion is constant or changes:

Aspect of the projectile's motion	***Constant* or *Changes***
x-horizontal position	
y-vertical position	
v_x-horizontal velocity	
v_y-vertical velocity	
a_x-horizontal acceleration	
a_y-vertical acceleration	

4. In the previous question you specified whether or not a projectile's horizontal and vertical acceleration changed during flight or was constant. Now you need to specify values (or ranges of values in the case of a changing acceleration) for each. Make sure to note which value is for horizontal and which is for vertical acceleration.

5. After reading a projectile motion problem you should make a sketch of the *trajectory* of the projectile. What is meant by the word *trajectory*?

6. On your trajectory sketch you are also supposed to label quantities that you know or you are asked to find. List a few of those quantities that should be labeled.

7. If you are given a launch speed, $\boldsymbol{v}$, and angle of launch, θ (with the horizontal), how would you calculate the initial horizontal and vertical velocities ($\boldsymbol{v_x}$ & $\boldsymbol{v_y}$)? You may simply write an equation for each.

8. A projectile is launched with a *horizontal* velocity of 16 m/s and a *vertical* velocity of 12 m/s. What is the projectile's resultant (combined) velocity? Show all calculations.

9. A projectile is launched with a *horizontal* speed of 22 m/s. If the projectile was launched at an angle of 33 degrees above the horizontal, find the projectile's *vertical* speed. Show all calculations.

10. "A projectile is launched at angle of 35 degrees above the horizontal and at a speed of 24 m/s."
Is the speed mentioned in the statement preceding this question a *horizontal speed*, *resultant (combined) speed*, or *vertical speed*? What words are present (or absent) in the sentence that lets you know which speed it is?

For these questions let g = 9.80 m/s^2 down. Employ the projectile puzzle solving techniques used in class to answer the following:

11. A cat leaps horizontally from the top of a couch 0.90 meters above the floor toward a toy on the floor 1.50 meters away. With what speed must the cat leap to land directly on the toy?

v_{ave}=

12. A certain type of longbow fires arrows horizontally out a castle tower's arrow slit at 25 m/s. If the arrow is found embedded in the ground a mere 30.0 meters away from the base of the tower, from what height was the arrow launched?

Δy =

13. A famous German football player kicks a soccer ball off the roof of a 30.0 m tall building for an Adidas commercial. If the launch velocity of the ball is 39 m/s at 42.0° above the horizontal, at what distance from the base of the building does the ball land?

$\Delta x =$

14. Casey clubs a golf ball at speed of 45.7 m/s at an angle of 35.0° above the ground. Calculate the maximum height the ball obtains.

$\Delta y =$

Find the total time the ball is in the air.

$t =$

Calculate the horizontal range of the ball.

$\Delta x =$