Unit 6 Projectile Motion Study Sheet Name _____#:_____

Pythagorean Theorem ➔ $c^2 = a^2 + b^2$ $g = 9.81\ m/s^2$ **SOH CAH TOA**

1) Jamie serves a volleyball from a height of _____ **m** and gives it an initial velocity of _____**m/s straight up**. **How high will it go?**

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

How long will it take the ball to reach its maximum height?

Formula: **Set-Up with Units:**

Answer = _____

2) An avid Ohio State fan is sitting on the very top row of seats in the football stadium. When the Buckeyes score a touchdown, the fan puts his soda on the top of the stadium and jumps up to cheer. Unfortunately, he knocks his soda over the wall and it splats on the pavement below. The fan knows that the stadium is _____**m tall. With what velocity does the soda strike the pavement?**

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

3) An Alaskan rescue plane drops a package of emergency rations to a stranded party of explorers. The plane is traveling horizontally at _____ at a height of _____above the ground.

a) How long does it take for the package to reach the ground?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

b) What horizontal distance does the package travel before striking the ground?

Formula: Set-Up with Units:

Answer = _____

4) Find the magnitude and the direction of the package just before it hits the ground. **First**, determine the vertical velocity.

Formula: Set-Up with Units:

Answer = _____

Second, use Pythagorean to determine the total velocity.

Formula: Set-Up with Units:

Answer = _____

Third, use $\mathbf{v_y}$ and $\mathbf{v_x}$ to determine the angle below the horizon.

Formula: Set-Up with Units:

Answer = _____

5) During a thunderstorm, a tornado lifts a car to a height of _____ above the ground. Increasing in strength, the tornado flings the car horizontally with an initial speed of _____.

a) How long does it take the car to reach the ground?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

b) What horizontal distance does it travel during this time?

Formula: Set-Up with Units:

Answer = _____

6) Streams of water in a fountain shoot from one level to the next. A particle of water in a stream takes _____to travel between the first and second level. The receptacle on the second level is a horizontal distance of _____away from the spout on the first level. If the water is projected at an angle of _____$^{\mathbf{0}}$, what is the initial speed of the particle?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

7) The fastest recorded pitch in Major League Baseball, thrown by Nolan Ryan in 1974, was clocked at _____. If a pitch were thrown horizontally with this velocity, how far would the ball fall vertically by the time it reached home plate, _____away?

Set-Up:

a) What is the speed in m/s?

Answer = _____

b) How long does it take to reach home plate?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

c) What is the vertical drop from the point of release?

Formula: Set-Up with Units:

Answer = _____

8) A person standing at the edge of a seaside cliff kicks a stone over the edge with a speed of _____. The cliff is _____ above the water's surface.

a) How long does it take to strike the ground?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

b) What is the vertical component of the speed?

Formula: Set-Up with Units:

Answer = _____

c) What is the total velocity of the rock?

Formula: Set-Up with Units:

Answer = _____

9) A tennis ball is thrown straight up with an initial velocity of _____ **m/s. It is caught at the same distance above the ground from which it was thrown.**

How high does the ball rise?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

How long does the ball remain in the air?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

10) Tim is flying a helicopter when he drops a rescue raft. After the raft has fallen _____**s:**

What is the raft velocity?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

How far has the raft fallen during this time?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

If Tim's helicopter was rising at _____m/s when the raft was released. After _____ s, what is the raft's new velocity be?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

11) A weather balloon is floating at a constant height above Earth when it releases a pack of instruments.
If the pack hits the ground with a velocity of _____m/s, how far does the pack fall?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

How long does the pack fall?

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

12) During a baseball game, a batter hits a high pop-up. If the ball remains in the air for _____ **s, how high it rise?**

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

13) In 1978, Geoff Capes of the United Kingdom won a competition for throwing _____ **lb** bricks; he threw a brick a distance of _____ **m**. Suppose the brick left Capes' hand at an angle of _____ **º with respect to the horizontal** and the bricks land at the same height he threw them from.

Find the initial speed of the brick.

Drawing **Formula:** **Set-Up with Units:**

Answer = _____

If Capes threw the brick straight up with the speed found in (a), what is the maximum height the brick could achieve? (Ignore air resistance.)

Drawing **Formula:** **Set-Up with Units:**

Answer = _____