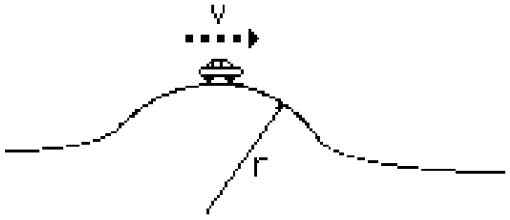
Name_____

Date _____ **Pd**____

Unit III: Worksheet 5

Assume that the car shown below is going at a constant speed



1a. Is the car experiencing an acceleration? If your response is yes, in what direction is the acceleration? Explain how you know.

b. Sketch a qualitative force diagram for the car when it's at the top of the hill. (Justify the relative forces in your force diagram.)

c. Suppose the speed of the car is 11.1 m/s (≈ 25 mph) and the radius of curvature (r) is 25 m; calculate the magnitude of the centripetal acceleration of the car.

d. If the mass of the car is 1200 kg, calculate the net force required to cause this centripetal acceleration.

e. Now, sketch a **quantitative** force diagram for the car.

f. Calculate the speed required for the net force to equal the force of gravity.

g. Suppose the car were going faster than the speed that you calculated for question 7; describe what would happen to the car.

Assume that the car below is going at a constant speed.

2a. Is the car experiencing an acceleration? If your response is yes, in what direction is the acceleration? Explain how you know.

b. Sketch a qualitative force diagram for the car when it's at the bottom of the hill. (Justify the relative forces in your force diagram.)

c. Suppose the speed of the car is 15.6 m/s (≈ 35 mph) and the radius of curvature (r) is 23 m; calculate the magnitude of the centripetal acceleration of the car.

d. If the car's mass is 1200 kg, what net force would be required to cause this centripetal acceleration?

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e. Now, sketch a **quantitative** force diagram for the car.

f. If the driver of the car weighs 540 N, calculate the magnitude of the upward force that the seat exerts on the driver.

A woman flying aerobatics executes a maneuver as illustrated in Figure 1 below:

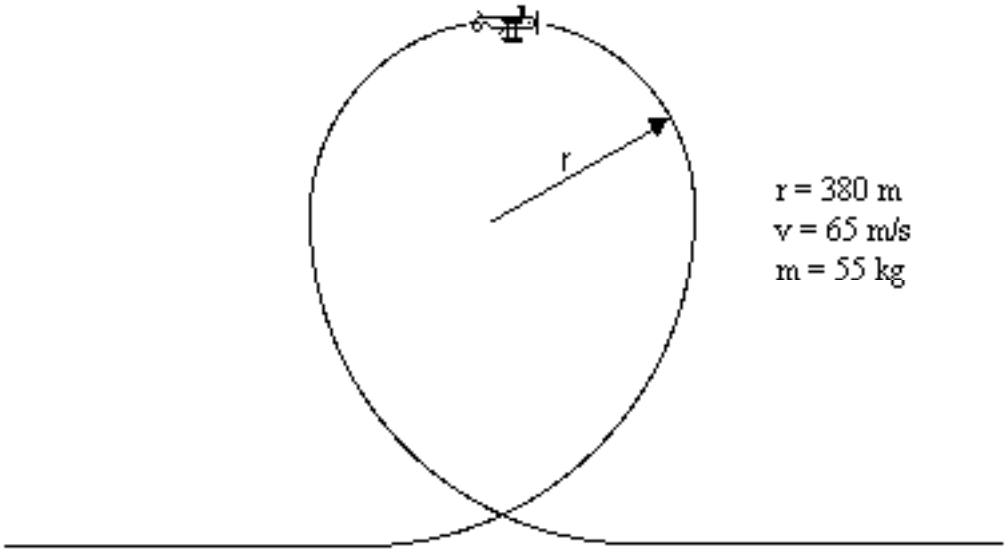

Figure 1

3a. Calculate the value of the net force acting on the woman flying the airplane when at the top of the loop, as indicated in Figure 1.

b. Construct a quantitative diagram of all relevant forces acting on the woman.

c. Does the woman feel lighter or heavier than normal at this position? Explain.

A popular amusement park ride, Figure 2, operates as follows: riders enter the cylindrical structure when it is stationary with the floor at the point marked "a". They then stand against the wall as the cylinder then begins to rotate. When it is up to speed, the floor is lowered to the position marked "b", leaving the riders "suspended" against the wall high above the floor.

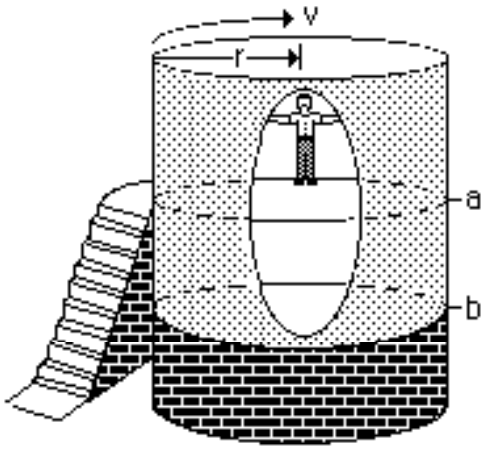

Figure 2

4. If the ride spins fast enough, the riders stay affixed to the wall when the floor is lowered from point "a" to point "b". Explain, without using equations, in detail why this occurs in a clear, coherent, paragraph-length explanation.