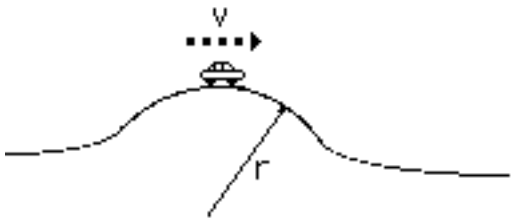
Name_____

Unit VIII: Worksheet 2

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

1.

a. Construct a qualitative motion map of the car by placing dots on the road.



b. In what direction is the car experiencing an acceleration Explain how you know.

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

d. Suppose the speed of the car is 11.1 m/s (≈ 25 mph) and the radius of curvature (r) is 25 m; determine the magnitude of the centripetal acceleration (a_c) of the car.(4.9m/s^2)

e. If the mass of the car is 1200 kg, what $F_{net\text{-}c}$ would be required to cause this a_c? (5880N)

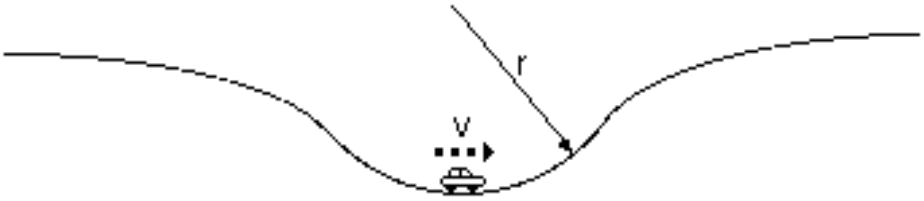
f. Place quantitative force values on the forces you drew in part c.

g. At what speed would the centripetal force equal the force of gravity?(15.8m/s)

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

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

   a. Construct a qualitative motion map of the car by placing dots on the road.



   b. In what direction is the car experiencing an acceleration Explain how you know.

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

   d. Suppose the speed of the car in Figure 2 is 15.6 m/s (≈ 35 mph) and the radius of curvature (r) is 23 m; determine the magnitude of the centripetal acceleration (a_c) of the car.($10.6 m/s^2$)

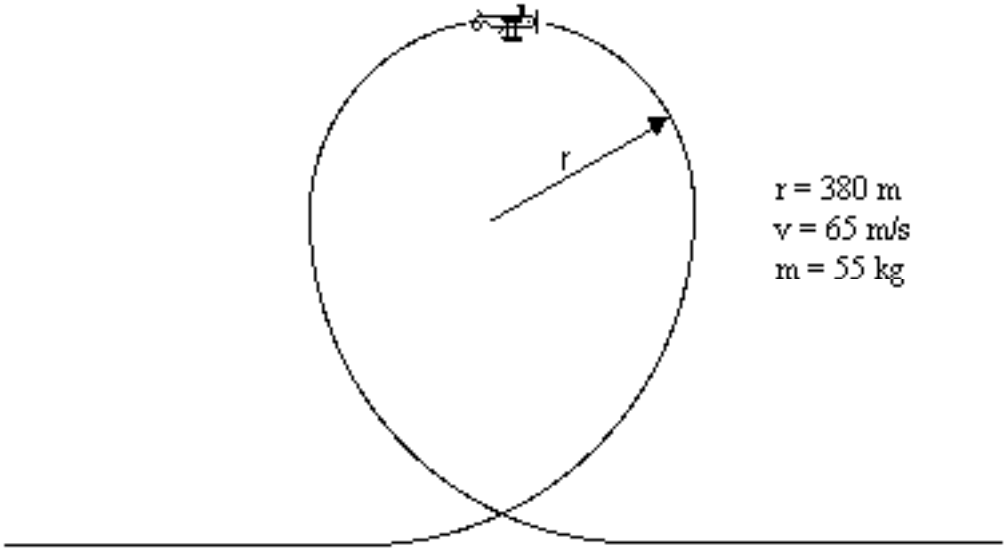
   e. If the mass of the car is 1200 kg, what F_{net-c} would be required to cause this a_c?($1.3 \times 10^4 N$)

   f. Place quantitative force values on the forces you drew in part c.

   g. If the driver of the car weighs 540 N, what is the magnitude of the upward force that the seat exerts on the driver?(1112.4N)

   h. How does the driver feel (apparent weight) at the bottom of the hill?

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

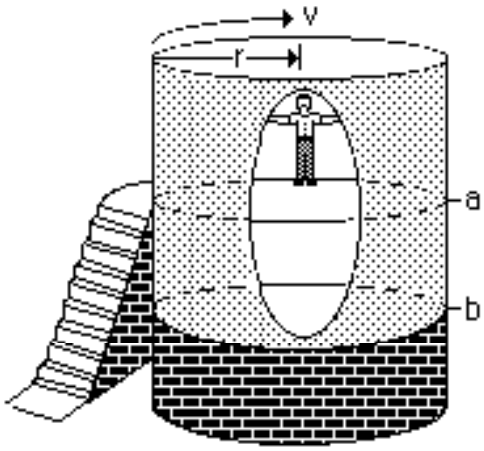


a. Determine the value of the centripetal force acting on the woman flying the airplane when at the top of the loop.(611.5N)

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? Justify your answer.

4. 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.



r = 1.5 m
μ = 0.50
m = 73 kg

Figure 2

What is the maximum period of rotation necessary to keep the riders from sliding down the wall when the floor is lowered from point "a" to point "b"? (Show all of your work and explain your reasoning.)(t=1.7s) Please note this answer was originally published incorrectly.