Name_____

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Unit VIII: Worksheet 2

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

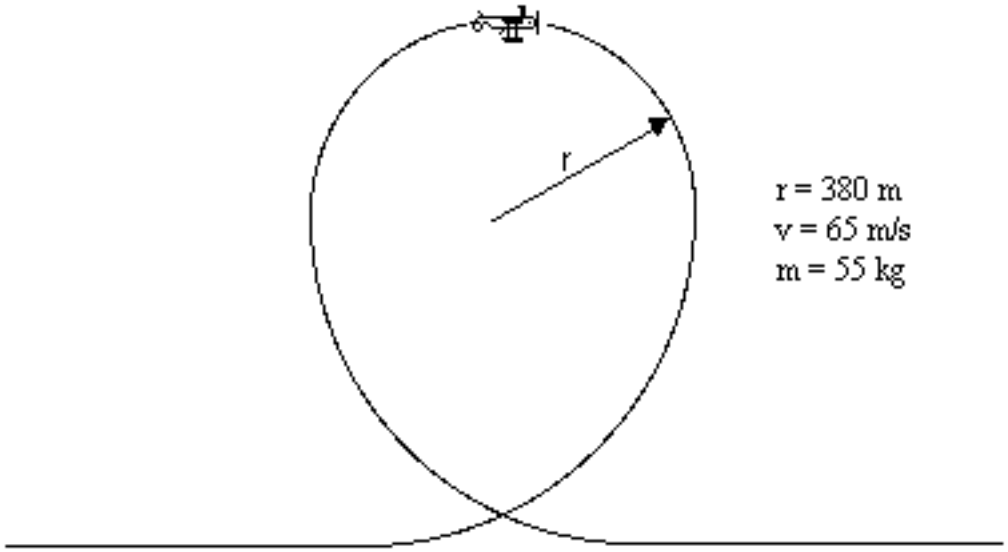


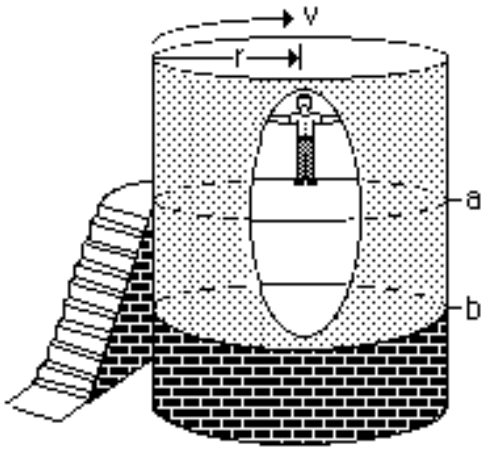
Figure 1

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

1b. Construct a quantitative diagram of all relevant forces acting on the woman.

1c. 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.



r = 1.5 m
μ = 0.50
m = 73 kg

Figure 2

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.)

Figure 3 depicts a popular loop-the-loop amusement park ride. The car and riders are initially pulled up the incline on the left to a height "H" above the ground. The car is then released, gaining enough speed as it goes down the incline to successfully traverse the entire course. The car has brakes to stop it on the right side of the course in Figure 3. There is, you will note however, the safety spring designed to safely stop the car in the event of brake failure.

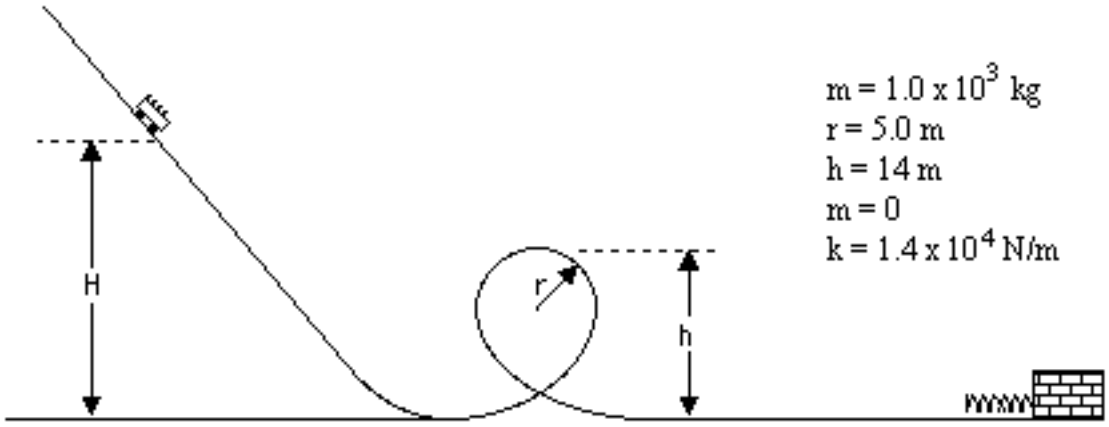


Figure 3

3. What must be the minimum speed of the car at the top of the loop to ensure that it would not fall off of the track?

4. What must be the minimum initial height "H" to insure that the car would not fall off of the track?

5. In the event that the brakes were to fail, how far would the car compress the emergency safety spring?

6. What would be the car's maximum acceleration if it were to be stopped by the emergency safety spring?