

Unit VIII: Worksheet 1

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



Fig 1

1. Construct a qualitative motion map of the car in Figure 1.

2. In what direction is the car experiencing an acceleration? Explain how you know.
3. 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.)
4. Suppose the speed of the car is 11.1 m/s ($\sim 25 \text{ mph}$), its mass is 1200 kg and the radius of curvature (r) is 25 m ; determine the magnitude of the centripetal force acting on the car.
5. Now, construct a **quantitative** force diagram for the car.
6. What is the acceleration (magnitude and direction) of the car?
7. How fast would the car be traveling if the normal force were reduced to zero?
8. 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 in Figure 2 is going at a constant speed.

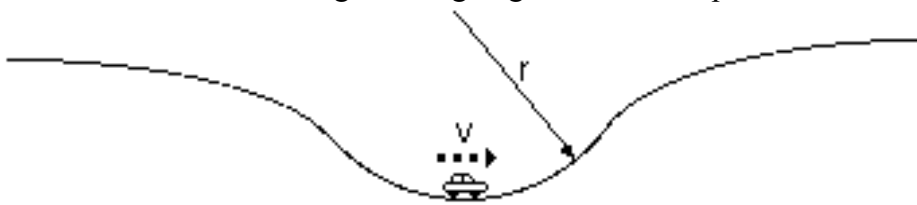


Figure 2

9. Construct a qualitative motion map of the car in Figure 2.
10. In what direction is the car in Figure 2 experiencing an acceleration? Explain how you know.
11. Construct a qualitative force diagram for the car when it's at the bottom of the hill. (Justify the relative forces in your force diagram.)
12. Suppose the speed of the car in Figure 2 is 15.6 m/s ($\approx 35 \text{ mph}$), its mass is 1200 kg and the radius of curvature (r) is 23 m ; determine the magnitude of the centripetal force acting on the car.
13. Now, construct a **quantitative** force diagram for the car.
14. What is the acceleration of the car? (If the acceleration is not equal to zero, then illustrate magnitude and direction with a vector diagram.)
15. If the driver of the car weighs 540 N , what is the magnitude of the upward force that the seat exerts on the driver?