

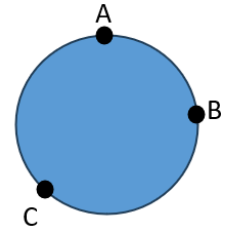


12.2 Horizontal Uniform Circular Motion

Due Wednesday, October 30, 2024

(Answers use 10 m/s^2 for g)

1. An object is moving in a clockwise direction around a circle at constant speed as shown to the left. Use your understanding of the concepts of velocity and acceleration to answer the next 4 questions.



a) Which vector below represents the direction of the velocity vector when the object is located at point B on the circle?



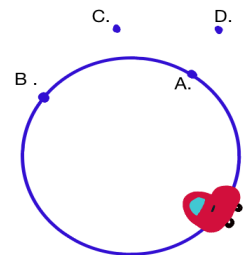
b) Which vector below represents the direction of the acceleration vector when the object is located at point C on the circle?



c) Which vector below represents the direction of the velocity vector when the object is located at point C on the circle?



d) Which vector below represents the direction of the acceleration vector when the object is located at point A on the circle?



2. A convertible car with its top down is traveling at constant speed around a circular track, as shown in the diagram to the right. When the car is at point A, the passenger in the car throws a ball straight up. At which point shown could the ball land after being thrown.

3. Identify the three controls on an automobile that are responsible for causing the car to accelerate.

4. Determine the speed of a rider on a carnival swing ride that makes a complete revolution around the circle (diameter = 21.2 meter) in 17.3 seconds.

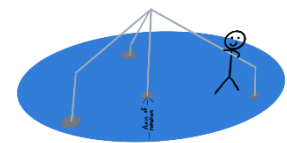


5. A car with a mass of 100-kg is racing at 22 m/s around a curve with a 56 meter radius. a) Find the car's centripetal acceleration. b) What minimum coefficient of static friction between the tires and road is necessary for the car to round the curve without slipping?



6. Five clowns are late for a party. They jump into their sporty coupe and start driving. Eventually they come to a curve in the road with a radius of 27.5 meters. What is the top speed at which they can drive successfully around the curve? The coefficient of friction between the car's tires and the road is 0.8 (Hint: Derive an equation for v in terms of g , μ , m , and r . I think you will be pleasantly surprised by what happens to m .)

7. A child sits on a rotating merry-go-round, 2.1 m from its center. If the speed of the child is 1.9 m/s, what is the minimum coefficient of friction between the child and the merry-go-round that will prevent the child from slipping?



8. You are a rookie civil engineer and are tasked with determining the minimum radius of curvature for a new road. The parameters are as follows: i) the minimum expected coefficient of friction is 0.65 between the road and the tires of a car; ii) the maximum speed of cars around the curve is 28.9 m/s (65 mi/hr). What is the minimum radius of curvature for the road?

Answers (using 10 m/s^2 for g)

1. A, C, D, A

2. C

3. Gas pedal, brakes, steering wheel

4. 3.85 m/s

5. a) 8.64 m/s^2 b) 0.86

6. 14.83 m/s

7. 0.17

8. 128 m