**Circular Motion 2**

1. A racecar is traveling at constant speed around a circular track. What happens to the centripetal acceleration of the car if the speed is doubled?

 A) It remains the same.

 B) It increases by a factor of 2.

 C) It increases by a factor of 4.

 D) It is decreased by a factor of one-half.

 E) It is decreased by a factor of one-fourth.



2. A 25-kg box is sliding down an ice-covered hill. When it reaches point A, the box is moving at 11 m/s. Point A is at the bottom of a circular arc that has a radius *R* = 7.5 m. What is the magnitude of the normal force on the box at Point A?

 A) 250 N B) 280 N C) 400 N D) 650 N E) 900 N

3. Which force is responsible for holding a car in a curve?

 A) the car's weight

 B) the force of friction

 C) the reaction force to the car's weight

 D) the vertical component of the normal force

 E) the horizontal component of the normal force

Use the following to answer questions 4-5:

A small car of mass *M* travels along a straight, horizontal track.

As suggested in the figure, the track then bends into a vertical circle of radius *R*.



4. What is the minimum acceleration that the car must have at the top of the track if it is to remain in contact with the track?

 A) 4.9 m/s2, downward D) 9.8 m/s2, downward

 B) 4.9 m/s2, upward E) 19.6 m/s2, upward

 C) 9.8 m/s2, upward

5. Which expression determines the minimum speed that the car must have at the top of the track if it is to remain in contact with the track?

 A) *v* = *MgR* B) *v* = *2gR* C) *v*2 = 2*gR* D) *v*2 = *gR*  E) *v* = *gR*

6. A 1500-kg car travels at a constant speed of 22 m/s around a circular track that has a radius of 85 m. Which statement is true concerning this car?

 A) The velocity of the car is changing.

 B) The car is characterized by constant velocity.

 C) The car is characterized by constant acceleration.

 D) The car has a velocity vector that points along the radius of the circle.

 E) The car has an acceleration vector that is tangent to the circle at all times.

7. A car traveling at 20 m/s rounds a curve so that its centripetal acceleration is 5 m/s2.

 What is the radius of the curve?

 A) 4 m B) 8 m C) 80 m D) 160 m E) 640 m

8. A certain string just breaks when it is under 400 N of tension. A boy uses this string to whirl a 10-kg stone in a horizontal circle of radius 10 m. The boy continuously increases the speed of the stone. At approximately what speed will the string break?

 A) 10 m/s B) 20 m/s C) 80 m/s D) 100 m/s E) 400 m/s

9. Sara drives around a curve that has a radius of 48 m. The speed of the car on the curve is 16 m/s. Determine the coefficient of static friction for the tires and the road.

 A) 0.42

 B) 0.54

 C) 0.17

 D) 0.33

 E) This cannot be determined without knowing the mass of the box.

10. A car enters a horizontal, curved roadbed of radius 50 m. The coefficient of static friction between the tires and the roadbed is 0.20. What is the maximum speed with which the car can safely negotiate the unbanked curve?

 A) 5 m/s B) 10 m/s C) 20 m/s D) 40 m/s E) 100 m/s

11. A 15 kg object is attached to a string of radius 3 m and spun in a vertical circle.

a. What is the minimum speed that the object must have at the top of the circle so that it completes the circle?

b. What is the magnitude of the centripetal acceleration at the top of that circle at that speed?

c. What is the direction of the objects acceleration at the top of the circle?

d. Where will the tension in the string be the greatest?

e. If the string breaks when its tension exceeds 500 N, what is the maximum speed that the ball can have at the point of greatest tension?