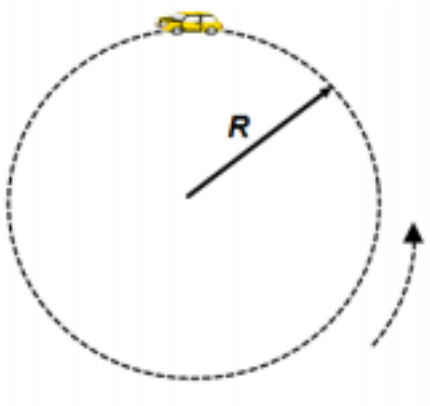
Name:_____

Circular Motion Test

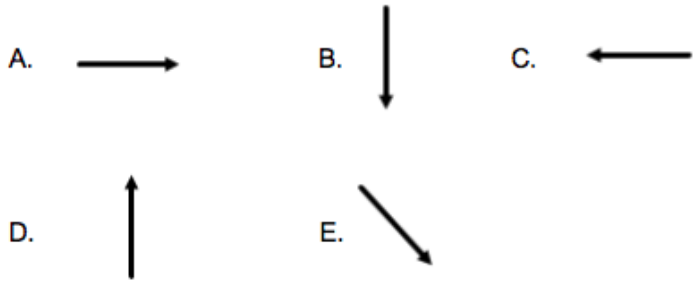
Use the following diagram to answer questions 1-3



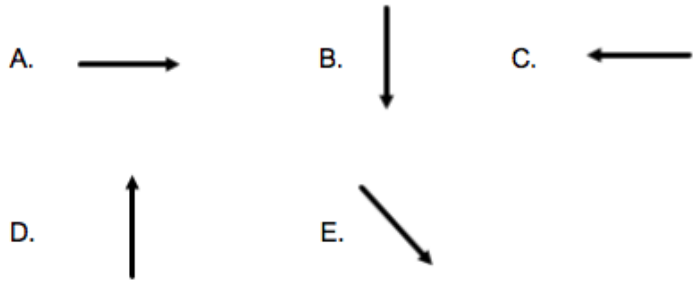
1. A car moves around a circular path of a constant radius at a constant speed. Which of the following statements is true?

    a. The car's velocity is constant
    b. The car's acceleration is constant
    c. The car's acceleration is zero
    d. The car's acceleration is directed toward the center

2. A car moves around a circular path of a constant radius at a constant speed. When the car is at the **top** of the circular path, what is the direction of the **velocity**?



3. A car moves around a circular path of a constant radius at a constant speed. When the car is at the **top** of the circular path, what is the direction of the **acceleration**?



4. An object moves in a circular path at a constant speed. Which of the following is true?

    a. The car's acceleration is not zero and causes the car to slow down.
    b. The car's acceleration is zero because it has a constant speed.
    c. The car's acceleration is not zero and causes the change in the direction of the car's velocity.
    d. The car's acceleration is not zero and causes the car to speed up.

5. **TRUE OR FALSE**: The geocentric theory puts the Earth at the center of our universe

    a. True
    b. False

6. An object travels in a circular path of radius r at a constant speed v. What happens to the object's acceleration if the radius of the circle is doubled and the speed stays unchanged?

    a. It doubles
    b. It quadruples
    c. It is cut to a half
    d. Stays unchanged

7. An object travels in a circular path of radius **r** at a constant speed **v**. What happens to the object's centripetal acceleration if the radius of the circle is quadrupled and the speed is quadrupled?

    a. It doubles
    b. It quadruples
    c. It is cut to a half
    d. It is cut to a quarter

8. When an object experiences uniform circular motion, the direction of the net force is

    a. is directed away from the center of the circular path.
    b. is directed toward the center of the circular path.
    c. in the same direction as the motion of the object.
    d. in the opposite direction of the motion of the object.

9. A car goes around a curve of radius **r** a t a constant speed **v**. Then it goes around a curve of radius **2r** at speed **2v**. What is the centripetal force on the car as it goes around the second curve, compared to the first?

    a. one-half as big
    b. four times as big
    c. one-fourth as big
    d. twice as big

10. The speed of the Earth, while traveling in its elliptical orbit around the Sun,

    a. decreases as it nears the Sun.
    b. increases as it nears the Sun.
    c. is zero at two points in the orbit.
    d. is constant.

11. **TRUE OR FALSE**: Only planets can exert a gravitational force on other masses.

    a. True
    b. False

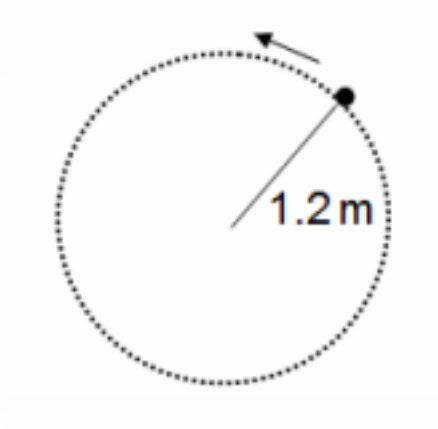
12. What event will produce the greatest increase in the gravitational force between the two masses?

    a. Doubling the large mass
    b. Doubling the distance between the masses
    c. Reducing the small mass by half
    d. Reducing the distance between the masses by half

(Continue)

A 0.2 kg ball rotates at a constant speed of 3 m/s on the end of 1.2 m long string. The string describes a horizontal circle

13. What is the centripetal acceleration of the object?



    a. 1.2 m/s^2
    b. 3.0 m/s^2
    c. 7.5 m/s^2
    d. 3.2 m/s^2

14. What is the centripetal force exerted on the object?

    a. 1.0 N
    b. 1.2 N
    c. 0.2 N
    d. 1.5 N

15. A 2.0 kg object rests 2.0 m from the center of a rough turntable as the turntable rotates. The period of the turntable's rotation is 5.0 seconds. What is the tangential velocity of the object?

    a. 1.2 m/s
    b. 2.5 m/s
    c. 13 m/s
    d. 21 m/s

16. A tennis ball is being whirled around a string at 12 m/s. If the tennis ball's centripetal acceleration is 30 m/s^2, then what must the radius of the circle be?

    a. 0.4 m/s
    b. 1.6 m/s
    c. 2.4 m/s
    d. 4.8 m/s

(Continue)

Free Response: On each question below you have the possibility of earning 2 points; 1 point for work shown with the correct formula, and another point for a correct answer in with proper units.

17. A string can withstand a force of 135 N before breaking. A 2.0 kg mass is tied to the string and whirled in a horizontal circle with a radius of 1.10 m. What is the maximum tangential velocity that the mass can be whirled at before the string breaks?

18. Calculate the force of gravity between Earth ($m=6.0 \times 10^{24}$ kg) and the moon ($m=7.4 \times 10^{22}$ kg). The average distance between the centers of the Earth and the moon is 3.8×10^{8} m.

19. A dying star is accelerated by gravity at 0.063 m/s^2 toward an object that is 8.7×10^{10} m away. For this to occur, how much mass must the object possess?

20. A 2.7×10^3 kg satellite orbits the Earth at a distance of 1.8×10^7 m from the Earth's center at a speed of 4.7×10^3 m/s. What force does the Earth exert on the satellite?