

Chapter 6 - Circles, Torque, and Universal Gravitation

True/False

Indicate whether the statement is true or false.

- _____ 1. A fly riding on the blade of a fan spinning at a constant speed is not accelerating.
- _____ 2. The acceleration of an object in uniform circular motion always points toward the center of the circle.
- _____ 3. Centrifugal force is center-seeking acceleration.
- _____ 4. Centripetal acceleration is a scalar quantity.
- _____ 5. When an object moves in a circle, the net force toward the center of the circle is the centripetal force.
- _____ 6. The velocity vector of an object with a centripetal acceleration is never tangent to the circular path.
- _____ 7. Centripetal acceleration is directly proportional to the square of the tangential velocity.
- _____ 8. The outside edge of a spinning compact disc is moving at a higher velocity than an inside track on the disc.

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- _____ 9. The movement of an object or a point mass at a constant speed around a circle that has a fixed radius is called uniform:
 - a. circular motion
 - b. parabolic motion
 - c. elliptical motion
 - d. rotational motion
- _____ 10. A sprinter runs at a speed of 3.00 m/s on a circular track that has a radius of 40.00 m. Find the centripetal acceleration of the sprinter.
 - a. 0.225 m/s²
 - b. 4.44 m/s²
 - c. 0.750 m/s²
 - d. 0.0750 m/s²
- _____ 11. A 0.50-kg ball is attached to a string of 0.50 m and swung in a horizontal circle with a velocity of 1.0 m/s. Find the centripetal force of the ball.
 - a. 0.50 N
 - b. 1.0 N
 - c. 2.0 N
 - d. 2.5 N
- _____ 12. A 1.00-kg ball is attached to a string of 0.50 m and swung in a horizontal circle with a velocity of 2.00 m/s. Find the centripetal acceleration.
 - a. 0.25 m/s²
 - b. 2.0 m/s²
 - c. 4.0 m/s²
 - d. 8.0 m/s²
- _____ 13. The movement of an object at a constant speed around a circular radius is known as
 - a. unified celestial movement.
 - b. uninformed circumstantial monotony.
 - c. unilateral circus magic.
 - d. uniform circular motion.
- _____ 14. The centripetal force on an object in uniform circular motion is calculated using which formula?
 - a. $F_{\text{net}} = ma_c$
 - b. $F_{\text{net}} = 1/2a_c T^2$
 - c. $F_{\text{net}} = (v_i^2 \sin 2\theta_0)/g$
 - d. $F_{\text{net}} = (4\pi^2 r)/T^2$

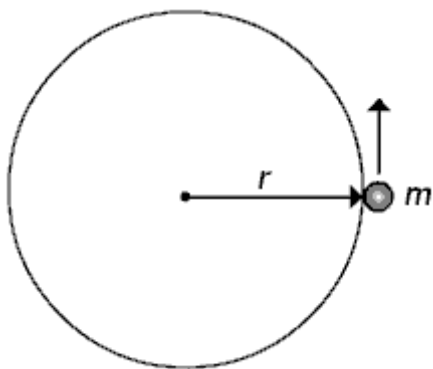
Short Answer

15. An object in uniform circular motion moves at a constant speed around a circle with a fixed radius. Why is the object said to be accelerating though it has a constant speed?
16. If there is no such thing as centrifugal force, what causes you to slide to the outside of the seat when riding an amusement park ride that spins you in circles?
17. Two people are riding a merry-go-round. One person is riding close to the inside edge of the platform, and the other is riding on the outside edge. The platform is 5 m wide, and the whole merry-go-round has a diameter of 20 m. The merry-go-round is making one rotation every 90 seconds.

In general terms, how does the acceleration of a person on a merry-go-round (or other rotating disc) vary with the radius of the disc?

Problem

18. A ball is tied to an elastic string of length 8.0 m and swung in a horizontal circle with a velocity of 0.8 m/s. When a metallic object is tied to a rope of length 2.75 m and swung in a horizontal circle, it makes one revolution in 2.9 s. The ratio of the centripetal force in the string to the centripetal force in the rope is $\frac{1}{3.0}$. Find the mass of the metallic object attached to the rope, if the centripetal force in the string is 0.20 N.



19. An invading barbarian whirls a stone in a leather sling. If the sling is 90 cm long, and the velocity of the stone is 90 m/s, what is the centripetal acceleration of the stone?
20. A spider twirls a fruit fly around in a circle with radius 17.6 cm at the end of a web. If the velocity of the fly is 110 cm/s, what is the centripetal acceleration of the fly?
21. A spider twirls a 25 mg fruit fly around in a circle with radius 17.6 cm at the end of a web. If the velocity of the fly is 110 cm/s, what is the centripetal force acting on the fly?
22. A spider twirls a fruit fly around in a circle at the end of a web. If the web is 17.6 cm long, and the velocity of the fly is 110 cm/s, how much time does it take for the fly to make one complete revolution?
23. An invading barbarian whirls a stone in a leather sling. If the sling is 90 cm long, and the velocity of the stone is 90 m/s, how much time does it take for the stone to make one revolution?

24. A cyclist moving at a speed of 20.0 m/s rounds a bend with a radius of 30.0 m. What is the centripetal acceleration of the cyclist?
25. A cheetah moving at a speed of 18 m/s rounds a bend with a radius of 15 m. What is the centripetal acceleration of the cheetah?
26. An antelope moving at a speed of 16 m/s rounds a bend. What is the radius of the tightest curve that the antelope can make if the centripetal acceleration does not exceed 20.0 m/s²?
27. Two people are riding a merry-go-round. One person is riding close to the inside edge of the platform, and the other is riding on the outside edge. The platform is 5.0 m wide, and the whole merry-go-round has a diameter of 20.0 m. The merry-go-round is making one rotation every 90 seconds.

What is the speed of the outside rider relative to that of the inside rider?

28. Two people are riding a merry-go-round. One person is riding close to the inside edge of the platform, and the other is riding on the outside edge. The platform is 5.0 m wide, and the whole merry-go-round has a diameter of 20.0 m. The merry-go-round is making one rotation every 90 seconds.

What centripetal acceleration is each rider experiencing?