

14. As the distance between two bodies increases, the force of attraction between the bodies
- a. increases
 - b. decreases
 - c. remains the same
15. The centripetal force on an object in circular motion is
- a. in the same direction as the tangential speed.
 - b. in the same direction as the centripetal acceleration.
 - c. in the direction opposite the tangential speed.
 - d. in the direction opposite the centripetal acceleration.

CONCEPTUAL QUESTIONS

16. Discuss the following statement: "A satellite is continually in free fall."

17. Earth exerts a 1.0 N gravitational force on an apple. Does the apple accelerate toward Earth, or does Earth accelerate towards the apple? Explain your answer.

18. Why is centripetal force known as a net force? Give three different examples of objects in circular motion and the force(s) providing the centripetal force.

1)

2)

3)

19. Assume two masses, m_a and m_b , separated by a distance, d , have a gravitational force, F acting between them. Fill in the values for gravitational force (in terms of multiples of F) when the masses and distance change according to the table.

Distance	Mass A	Mass B	Force
d	m_a	$2m_b$	
d	$2m_a$	m_b	
d	$2m_a$	$2m_b$	
$2d$	m_a	m_b	
$d/2$	m_a	m_b	
$d/3$	$3m_a$	m_b	

CALCULATIONS

20. A car on a roller coaster loaded with passengers has a mass of 2000 kg. At the lowest point of the track, the radius of curvature of the track is 24 m and the roller car has a speed of 17 m/s. Find the centripetal acceleration of the roller coaster car at the lowest point on the track and the net force on the roller car at this point.
21. What is the speed of a 95 kg fullback who makes a turn on a football field and experiences a centripetal force of 637 N as he moves in a circle that has a radius of 12.0 m.

22. A 0.45 kg ball attached to the end of a 1.3 m cord and swung in a horizontal circle. What is the maximum speed the ball can go if the breaking tension of the string is 75N.
23. Two trucks with equal mass are attracted to each other with a gravitational force of 6.7×10^{-4} N. The trucks are separated by a distance of 3.0 m. What is the mass of one of the trucks?
24. Two large spheres are suspended close to each other. Their centers are 2.2 m apart. One sphere weighs 920 N. The other sphere has a weight of 149 N. What is the gravitational force between them?
25. What is the force of gravity acting on a 2.00×10^3 kg spacecraft when it orbits at a distance equal to two Earth radii from the Earth's center?
26. What must be the speed of a satellite moving in a circular orbit about the Earth at an *altitude* of 3600 km?