

Circular Motion

Section 9.1

1. Distinguish between a rotation and a revolution.
2. What 2 factors does tangential speed depend upon?
3. A ladybug sits halfway between the axis and the edge of a rotating turntable. What will happen to the ladybug's linear speed if
 - a. the RPM rate is doubled?
 - b. the ladybug sits at the edge?
 - c. both a and b occur?

Section 9.2

1. Which part of Earth's surface has the greatest rotational speed about Earth's axis? Which part has the greatest linear speed relative to Earth's axis?

Section 9.3

1. What does Centripetal mean?
2. Why isn't centripetal force not a new kind of force?
3. How does centripetal force play a major role in the operation of an automatic washing machine?

Section 9.4

1. In figure 9.8, what provides the centripetal force?
2. What is centrifugal force and is it real?
3. If the string that holds a whirling can in its circular path breaks, what causes the can to move in a straight line path? What Law of physics supports your answer?

Circular Motion Problems

1. Calculate the tension in a 2.0 m length of string that whirls a 1.0 kg mass at 2.0 m/s in a horizontal circle.
2. Answer the previous question for the case of (a) twice the mass (b) twice the speed (c) twice the length of string (radial distance) and (d) twice the mass, twice the speed, and twice the radial distance all at the same time.
3. In the Olympic hammer-throw event, Ms. Harper throws a 7.3 kg lead ball attached to a 1.2 m cable. Ms. Harper swings the ball in a circle four times before letting it go. The ball attains a speed of 27 m/s. How much tension is in the cable just before it is released?
4. Mr. Robbins stands on the Earth's equator. Calculate his tangential speed. The Earth has a radius of 6.38×10^6 m. What is Mr. Robbins centripetal acceleration?
5. Adam swings a 2.0 kg stone at the end of a rope of length 1.2 m. He swings the stone so fast the tension on the rope is 250 N. How fast does Adam swing the stone? What is the centripetal acceleration of the stone?
6. Mr. Hinsley, who has a mass of 82 kg, ice skates in a circle of radius 8.0 m. Mr. Hinsley takes 6.3 s to complete the circle. What is his tangential speed? What is his centripetal acceleration? How much centripetal force is acting on him?
7. A 2800.0 kg plane flies in a circle of radius, r . When the speed of the airplane is 200.0 m/s, there are 8960 N of centripetal force on the plane. What is the radius of the circle?
8. Mr. Hinsley wants to swing a pail of water around in a vertical circle fast enough so that the water does not spill out. His arm is 63 cm long. How fast does Mr. Hinsley have to spin the water to make sure the water does not spill out?
9. The Earth orbits the sun once every 365.25 days at an average distance of about 1.5×10^{11} m. The mass of the Earth is 5.98×10^{24} kg. What is the centripetal acceleration of Earth? What is the centripetal force of the sun on Earth?
10. A 3.20 kg hawk circles overhead in search of prey. He circles once every 10.0 s in a circle 12.0 m in radius. What centripetal force acts on the hawk? What is the centripetal acceleration of the hawk?