

Questions

- Sometimes people say that water is removed from clothes in a spin dryer by centrifugal force throwing the water outward. What is wrong with this statement?
- Will the acceleration of a car be the same when the car travels around a sharp curve at a constant 60 km/h as when it travels around a gentle curve at the same speed? Explain.
- Suppose a car moves at constant speed along a hilly road. Where does the car exert the greatest and least forces on the road: (a) at the top of a hill, (b) at a dip between two hills, (c) on a level stretch near the bottom of a hill?
- Describe all the forces acting on a child riding a horse on a merry-go-round. Which of these forces provides the centripetal acceleration of the child?
- A bucket of water can be whirled in a vertical circle without the water spilling out, even at the top of the circle when the bucket is upside down. Explain.
- How many “accelerators” do you have in your car? There are at least three controls in the car which can be used to cause the car to accelerate. What are they? What accelerations do they produce?
- A child on a sled comes flying over the crest of a small hill, as shown in Fig. 5–31. His sled does not leave the ground (he does not achieve “air”), but he feels the normal force between his chest and the sled decrease as he goes over the hill. Explain this decrease using Newton’s second law.
- If the Earth’s mass were double what it is, in what ways would the Moon’s orbit be different?
- Which pulls harder gravitationally, the Earth on the Moon, or the Moon on the Earth? Which accelerates more?
- The Sun’s gravitational pull on the Earth is much larger than the Moon’s. Yet the Moon’s is mainly responsible for the tides. Explain. [*Hint:* Consider the difference in gravitational pull from one side of the Earth to the other.]
- Will an object weigh more at the equator or at the poles? What two effects are at work? Do they oppose each other?
- The gravitational force on the Moon due to the Earth is only about half the force on the Moon due to the Sun. Why isn’t the Moon pulled away from the Earth?
- Is the centripetal acceleration of Mars in its orbit around the Sun larger or smaller than the centripetal acceleration of the Earth?
- Would it require less speed to launch a satellite (a) toward the east or (b) toward the west? Consider the Earth’s rotation direction.
- When will your apparent weight be the greatest, as measured by a scale in a moving elevator: when the elevator (a) accelerates downward, (b) accelerates upward, (c) is in free fall, (d) moves upward at constant speed? In which case would your weight be the least? When would it be the same as when you are on the ground?
- What keeps a satellite up in its orbit around the Earth?
- Astronauts who spend long periods in outer space could be adversely affected by weightlessness. One way to simulate gravity is to shape the spaceship like a cylindrical shell that rotates, with the astronauts walking on the inside surface (Fig. 5–32). Explain how this simulates gravity. Consider (a) how objects fall, (b) the force we feel on our feet, and (c) any other aspects of gravity you can think of.



FIGURE 5–31 Question 7.

- Why do bicycle riders lean inward when rounding a curve at high speed?
- Why do airplanes bank when they turn? How would you compute the banking angle given its speed and radius of the turn?
- A girl is whirling a ball on a string around her head in a horizontal plane. She wants to let go at precisely the right time so that the ball will hit a target on the other side of the yard. When should she let go of the string?
- Does an apple exert a gravitational force on the Earth? If so, how large a force? Consider an apple (a) attached to a tree, and (b) falling.

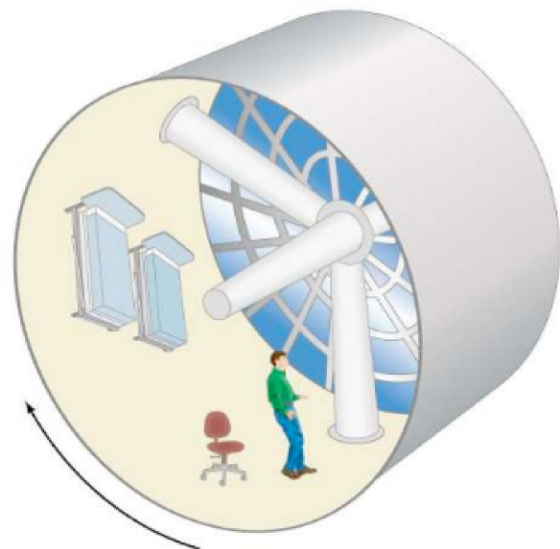


FIGURE 5–32 Question 21 and Problem 45.