

Circular Motion Problems

1. A 5.0 kg stone is whirled around in a horizontal circle of radius 1.0 meter at a speed of 5.0 m/s. Calculate the centripetal force on the stone. (125 N)
2. A ball of mass 1.0 kg is whirled around in a horizontal circle of radius 2.0 meters so that it makes 5 revolutions in 10 seconds. Calculate the centripetal force on the ball. (20 N)
3. A car rounding a turn of radius 50.0 m has a centripetal force of 2000 N exerted on it by the road when it has a speed of 10 m/s. Calculate the mass of the car. (1000 kg)
4. A 50 kg person is riding on a merry-go-round at a Carnival. The person makes a revolution every 20 seconds and the radius of the merry-go-round is 15 m. If the person is standing up and does not hang onto anything, what is the least value of the coefficient of friction necessary to keep him from sliding off? (0.15)
5. The moon is 3.82×10^8 m from the center of the Earth and it circles the earth once every 27.3 days (2.36×10^6 s) Calculate:
 - (a) the moon's centripetal acceleration and ($2.7 \times 10^{-3} \frac{\text{m}}{\text{s}^2}$)
 - (b) the centripetal force acting on the moon if the moon has a mass of 7.34×10^{22} kg. (2.0×10^{20} N)
6. An object of mass 5.00 kg is swung in a vertical circle of radius 1.0 m at a speed of 4.0 m/s.
 - (a) What centripetal force acts on the body? (80 N)
 - (b) If a rope is swinging this object, what tension is in the rope when the object is at the top of the circle? (31 N)
7. A 60 kg person is riding on a Ferris Wheel at a Carnival that has a diameter of 12 m. When the person is at the top of the vertical circle, he experiences the feeling that he weighs only 400 N. How fast is he going? (4.3 m/s)
8. How fast must the person on the Ferris Wheel in the previous question be going when at the top of the circle for him/her to experience a feeling of no weight at all? (7.7 m/s)
9. A stone of mass 3.0 kg is swung around in a vertical circle of radius 2.0 m at a constant speed of 10 m/s, by means of a steel rod. What is the tension in the rod when the stone is
 - (a) at the top of the circle? and (121 N)
 - (b) when it is at the bottom. (179 N)
10. The Earth circles the Sun in a nearly circular path once a year. The distance to the Sun is approximately 93 million miles. The centripetal force that acts on the Earth to keep it in its circular path is supplied by what we call Gravity. Use the fact that 1 mile contains 1600 meters to calculate the force of gravity, in Newtons, between the Earth and the Sun, if the mass of the Earth is 5.97×10^{24} kg. (3.5×10^{22} N)