High School Physics Explained

Name:

# Centripetal Acceleration and Force

1. An ant is riding on the tip of a 10 cm long second hand of a clock. Find the linear velocity of the ant.

2. An object is moving in a horizontal circle of radius 3.00 m with a speed of 4.00 m/s. Calculate:
(a) the period of the motion;
(b) the Centripetal acceleration.

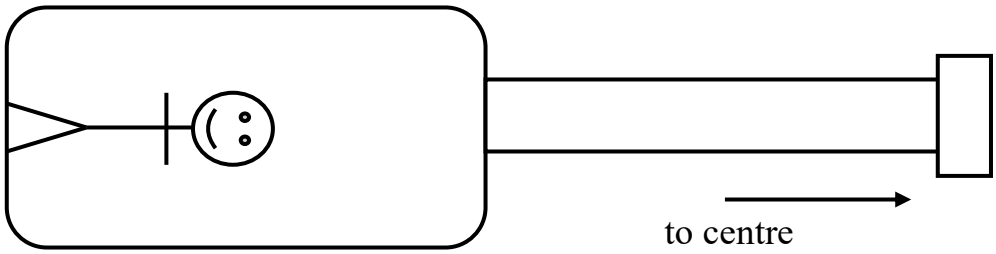
3. A motor-cyclist traversing a circular track of radius 50 meters revolutions per minute.
(a) What is the period of revolution (i.e., the time taken for one revolution)?
(b) What is the magnitude of the cyclist's velocity at any instant?
(c) What is the magnitude of the centripetal acceleration acting?

4. Calculate the Centripetal force required to keep a 5.0 kg mass revolving in a circular path of radius 125 cm with a period of 2.0 s.

5. A flywheel of radius 18 cm on a horizontal rotary engine rotates at 2400 revolutions per minute.
(a) What is the frequency of revolution in hertz?
(b) What is the centripetal acceleration of a point on the rim of the flywheel?

6. A centripetal force of 8.94 N is required to keep an object in a circular orbit. What is the mass of this object if it is traveling with a constant speed of 8.10 m/s and the radius of the path is 5.29 m?

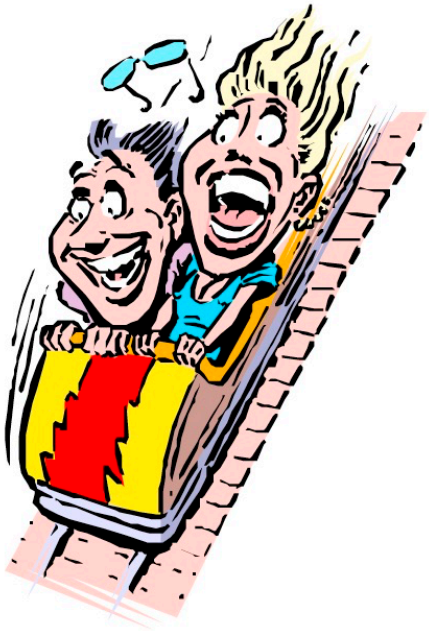
7. An astronaut is on a spinning space station so that he experiences artificial gravity. (See the film Space Odyssey 2001)




If the radius of the station is 1000m, what will be the tangential velocity?

8 As you go around a corner at 72km/hr you experience a force of 1120N from the seat of the car. If your mass is 70kg, what is the radius of the curve?

*9. A loop on a rollercoaster is designed so that you experience "weightlessness" at the top of the loop. This happens when the centripetal force equals the gravitational force. What speed must the rollercoaster attain at the top if the radius is 15m?



**10. The same rollercoaster will very different at the bottom of the loop. You will experience two forces up on your bottom, that of the centripetal force and the Normal force to your weight. Draw a diagram that shows these forces. Calculate the speed at the bottom of the loop if you "experience" three times your weight.

**Answers:**

1. 0.62m/s
2. a) 4.71s b) 5.33 $m/s^2$
3. a) 10s b) 31.4m/s c) 19.7 $m/s^2$
4. 61.9 N
5. a) 40 Hz b) 11369.8 $m/s^2$
6. 0.72 kg
7. 99.0 m/s
8. 25 m
9. 12.1 m/s
10. 17.15 m/s