

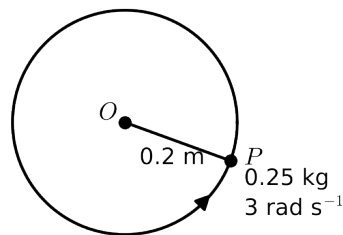
1B Acceleration of an Object Moving on a Horizontal Circular Path

Why an object moving in a circle at constant speed is accelerating:

The acceleration of an object moving on a circular path with constant linear speed v and constant angular speed ω (magnitude and direction):

Units to check before substituting:

1. A particle is moving on a horizontal circular path of radius 20 cm with constant angular speed 2 rad s^{-1} . Calculate the acceleration of the particle.
2. A particle of mass 150 g moves in a horizontal circle of radius 50 cm at a constant speed of 4 m s^{-1} . Find the force towards the centre of the circle that must act on the particle.
3. One end of a light inextensible string of length 20 cm is attached to a particle P of mass 250 g. The other end of the string is attached to a fixed point O on a smooth horizontal table. P moves in a horizontal circle centre O at constant angular speed 3 rad s^{-1} . Find the tension in the string.



4. A smooth wire is formed into a circle of radius 15 cm. A bead of mass 50 g is threaded onto the wire. The wire is horizontal and the bead is made to move along it with a constant speed of 20 cm s^{-1} . Find the horizontal component of the force on the bead due to the wire.

5. A particle P of mass 10 g rests on a rough horizontal disc at a distance 15 cm from the centre. The disc rotates at constant angular speed of 1.2 rad s^{-1} , and the particle does not slip. Calculate the force due to the friction acting on the particle.

6. A car of mass $M \text{ kg}$ is travelling on a flat road round a bend which is an arc of a circle of radius 140 m. The greatest speed at which the car can travel round the bend without slipping is 45 km h^{-1} . Find the coefficient of friction between the tyres of the car and the road.