Circular Motion

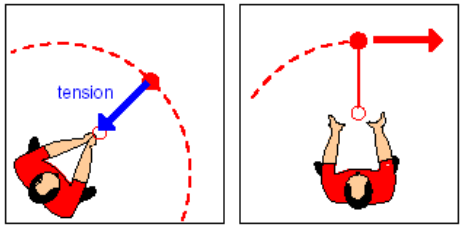
Definitions

Circular Motion: The motion of a body along a circular path created by centripetal forces.

Centripetal Force: Force required to keep an object moving in a circle.

Gravity provides the centripetal force which keeps the moon orbiting the Earth.

Newton's first law states that a body will continue at a constant velocity in a straight line unless it is acted on by an external force.



Remove the centripetal force and the object flies off at a tangent.

Terms

Tangent: A straight line that touches a curve at a point, but if extended does not cross it at that point.

Equations

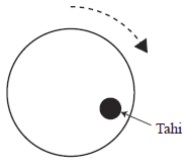
$a_c = \frac{v^2}{r}$	centripetal acceleration	a_c	m s^{-2}
	velocity	v	m s^{-1}
	radius	r	m
$F = ma$	Force	F	N
	mass	m	kg
	acceleration	a	m s^{-2}
$F_c = \frac{mv^2}{r}$	Centripetal Force	F_c	N
	mass	m	kg
	velocity	v	m s^{-1}
	radius	r	m

Tips

Questions

Going to the playground (2008;2)

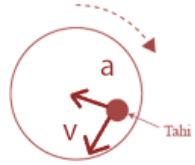
Tahi and Rua are at the playground. Tahi is sitting on a merry-go-round that is spinning clockwise. Tahi is 3.0 m from the centre and has a speed of 1.5 ms^{-1}.



(a) Draw labelled arrows on the diagram to show the direction of Tahi's velocity and acceleration.
(b) State the name of this acceleration.
(c) Calculate the size of Tahi's acceleration.
(d) State the direction of the horizontal force acting on Tahi and explain clearly why there must be a horizontal force acting on Tahi.

Answers

(a)



(b) Centripetal acceleration.

(c)
$$a = \frac{v^2}{r} = \frac{1.5^2}{3} = 0.75 \text{ m s}^{-2}$$

(d) There must be a force acting towards the centre of the circle as Tahi is constantly changing direction. Without a force Tahi would travel in a straight-line/tangent to the circle.