Circular Motion IB Physics Content Guide

Big Ideas

- Objects moving in a circle are experiencing acceleration since the direction of the velocity is constantly changing
- Centripetal acceleration and centripetal force are always directed toward the center of the circle
- The net force for a body in circular motion is equal to the centripetal force
- It is useful to draw a free body diagram to determine what forces are present at a given position

Content Objectives

1 – Defining Circular Motion

I can convert between angular displacement in revolutions and radians			
I can describe and calculate the properties of period and frequency			
I can calculate angular velocity			
I can describe and calculate tangential velocity based on the angular velocity and radius			
I can determine the direction and magnitude of centripetal acceleration and centripetal force			

2 – Vertical Circular Motion

I can draw correctly proportioned free body diagrams for horizontal and vertical circular motion			
I can compare the forces on an object at different positions in vertical circular motion			
I can identify the combination of forces that make up the net force that results in circular motion.			
I can determine the magnitude and direction of the forces needed to move in a vertical circle			

3 – Circular Motion, Friction, and Angles

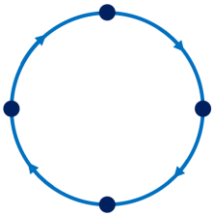
I can draw a free body diagram when circular motion is produced by a reaction or friction force			
I can solve problems that involve friction to create circular motion			
I can solve circular motion problems that incorporate components of an angled force			

Circular Motion

Shelving Guide

	Variable Symbol	Unit
Distance		
Angular Distance		
Angular Velocity		
Linear Velocity		
Centripetal Acceleration		
Centripetal Force		

Draw in vectors for v, a_c, and F_c →



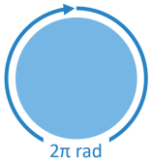
Data Booklet Equations:

$v = \omega r$

$a = \frac{v^2}{r} = \frac{4\pi^2 r}{T^2}$

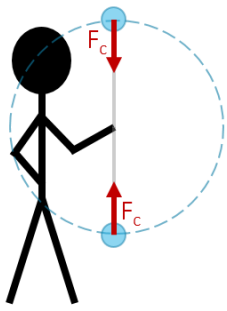
$F = \frac{mv^2}{r} = m\omega^2 r$

Defining Circular Motion

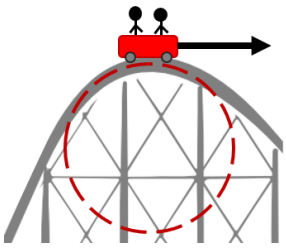
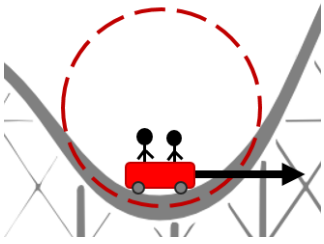


Period			Angular Velocity		

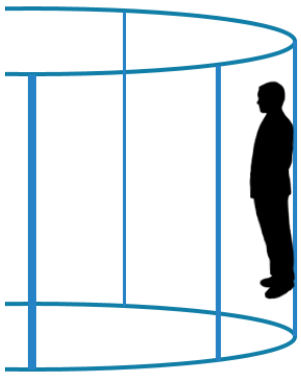
Vertical Circular Motion



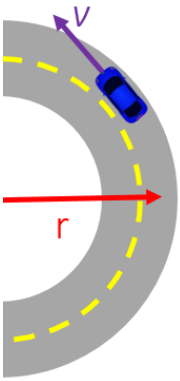
Top:	Bottom:
$F_{net} = F_c =$	$F_{net} = F_c =$

Top:		Bottom:	
			
$F_{net} = F_c =$		$F_{net} = F_c =$	

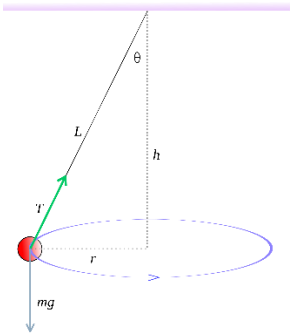
Circular Motion with Friction and Angles



Relationships between variables:



Relationships between variables:



Relationships between variables: