Circular Motion Key Points

Angular Speed	**Velocity**
Measured in: Conversions: Link to time period:	Measured in: Link to angular speed: Direction: Magnitude:

Acceleration	**Force**
Link to angular speed: Link to speed: Direction:	Link to acceleration: Link to speed: Link to angular speed: Direction:

Constant Speed

Two ways to get information:

1)

2)

To find radial acceleration:

To find overall acceleration:

Example:	Centripetal force provided by:

Variable Speed

Two ways to get information:

1)

2)

To find radial acceleration:

To find overall acceleration:

Type of circular motion:	Special conditions for motion:

Circular Motion Key Points

Angular Speed	Velocity
Measured in: $rad\ s^{-1}$ Conversions: $\frac{2\pi}{60}\ rad\ s^{-1} = 1\ rpm$ Link to time period: $\omega = \frac{2\pi}{T}$	Measured in: ms^{-1} Link to angular speed: $v = r\omega$ Direction: $Tangential$ Magnitude: $Depends\ on\ nature\ of\ circular\ motion\ (see\ below)$

Acceleration	Force
Link to angular speed: $a = r\omega^2$ Link to speed: $a = \frac{v^2}{r}$ Direction: $Radial\ (\&\ possibly\ tangential: see\ below)$	Link to acceleration: $F = ma$ Link to speed: $F = \frac{mv^2}{r}$ Link to angular speed: $F = mr\omega^2$ Direction: $Radial\ (\&\ possibly\ tangential: see\ below)$

Constant Speed

Two ways to get information:

1) Resolve perpendicular to motion (usually vertically)

2) Resolve radially (this gives centripetal force)

To find radial acceleration: Resolve radially and use $F = ma$

(Recall that $a = \frac{v^2}{r} = r\omega^2$)

To find overall acceleration: Equal to radial acceleration since tangential component is zero for constant speed. Direction is therefore always towards the centre.

Example:	Centripetal force provided by:
Banked curve	Friction between tyres and road
Object on a string	Tension in the string
Orbiting body	Gravitational force

Variable Speed

Two ways to get information:

1) Use conservation of energy (usually GPE and KE)

2) Resolve radially (this gives centripetal force)

To find radial acceleration: Resolve radially and use $F = ma$

(Recall that $a = \frac{v^2}{r} = r\omega^2$)

To find overall acceleration: Resolve tangentially and use $F = ma$, then use Pythagoras and $\tan\theta$ to combine these two perpendicular vectors (radial and tangential).

Type of circular motion:	Special conditions for motion:
Inner circles (could fall inwards)	$R \geq 0$ to complete circles (R always points inwards)
Outer circles (could fall outwards)	$R \geq 0$ to complete circles (R always points outwards)
Fixed circles (can't fall)	$v > 0$ to complete circles (R can point in or out)