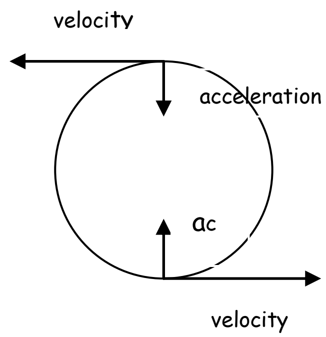
Uniform Circular Motion – 2.7 & 2.8

2.7: Centripetal acceleration: A particle travelling in a circle at uniform speed is accelerating??? Yes! Yes, because velocity is a vector and the direction is changing!

Velocity at any given moment is tangential to the path.

Acceleration is constant in magnitude and always directed inward.



a_c = centre-seeking accelerating or…..**centripetal acceleration**.

You will need some formulas from this section – copy the ones in 2.7 that are in the orange boxes! (You do not need to memorize the derivation of them…just be able to use them!).

2.8: Centripetal Force

Well, if there's centripetal (centre-seeking) acceleration, then there must be centripetal (centre-seeking) force. Newton says objects have inertia – they keep doing what they're doing UNLESS acted upon by an outside net force. So…an object will continue in a straight line (not a circle) unless it is acted upon by a net centre-seeking force.

This centripetal force (Fc) can be provided by one of the following:

1. Tension - T - (through a string or cable)
2. Normal Force – Fn – exerted perpendicular to a surface upon an object.
3. Gravity – Fg – exerted usually by earth upon all objects. This is needed when the objects swings in a vertical circle.

There are several formulas you will need to work with Fc – copy them down from 2.8 in your text. They are in orange boxes.

The role of gravity – if an object is moving in a horizontal circle (like I was doing in class – swinging a stopper on a string around my head), then we need not consider gravity. Tension (T) or normal force (Fn) will provide the centripetal force required to keep the object moving in a circle.

You WILL need to consider gravity if the object is swingin in a vertical circle ie: if I swing a pail of water over my head. In this case, the required Fc is the sum of tension AND Fg.

Fc = sum of all forces and must be centre-seeking

Fc = Fg + T **watch signs – set up or down as +ve

Think about this: at the top of the circle Fg is helping Fc (Fg is pulling towards the centre of the circle) while at the bottom of the circle Fg is hindering Fc (Fg is pulling away from the centre of the circle). Fg always pulls down towards earth.

Refer to a photocopied note I handed out in class for more detail.