Notes on circular motion

# Equations to remember:

Radians to degrees:

The time it takes for an object to go around the circle once (aka the time period) T is related to the frequency (number of revolutions per second) via this equation: **f**

The centripetal force *F* acting on an object of mass *m* and speed *v* moving in a circle of radius r can be found using the following equation:

The centripetal acceleration *a* of an object moving with a velocity *v* in a circle of radius *r* can be found using:

# Easy things to remember

* Objects moving in a circle are not in equilibrium – they need a net force to act on them to keep them moving in a circle.
* The centripetal force is **not** a single force nor a real entity, but rather an imaginary summation of all the forces that only *together* provide the centripetal force.
* The centripetal force always acts towards the center of the circle, and since the velocity of the object is a tangent on the circular path of the object, the centripetal force is also perpendicular to the velocity of the object.

# Questions to practice

1. Calculate the magnitude of the centripetal force that keeps the Earth in orbit around the sun (mass of earth = 6e24 kg, velocity = 30,000m/s, radius of orbit = 1.5e11)
2. What provides the force that keeps the earth in orbit?
3. If you were to swing a bucket of water in vertical circle with a radius of 1m what is the minimum time the bucket could take to complete the circle without spilling water?

# Answers to questions

1. Therefore
2. The sun’s gravity provides the centripetal force to keep Earth orbiting it.
3. First find the minimum velocity of the bucket, then find how long it’ll take for the bucket to travel the circumference of the circle at this speed.
   * and give
   * Sub in gravity as *a*: 9.8
   * Sub in 1 for *r*: 9.8
   * *v = 3.13m/s*
   * Circumference of the circle =
   * Circumference / velocity = **2.01s**