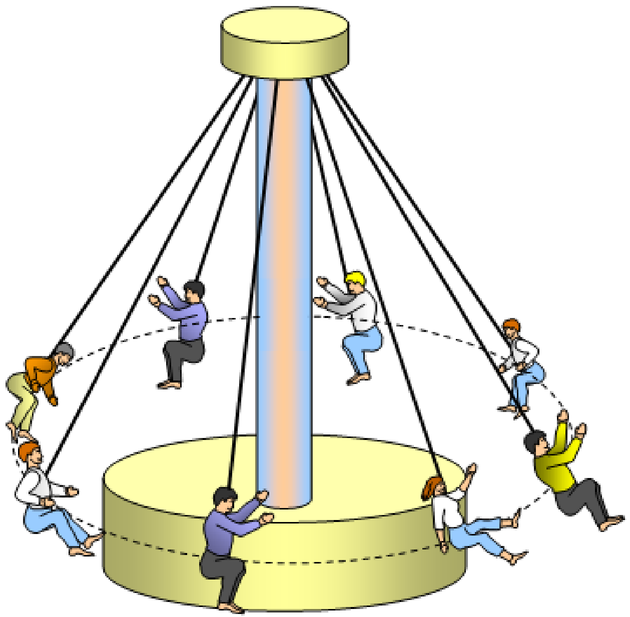
Horizontal Circular Motion

1	**Be careful with units when dealing with speed and angular velocity.** Remember $v = r\omega$ will only give the speed an object is moving round a circle in ms^{-1} if r is in metres and ω is in $rad\ s^{-1}$. Convert from rpm (revolutions per minute) to $rad\ s^{-1}$ by multiplying by 2π and dividing by 60.
2	**Make sure you know the key equations.** You must understand where these equations come from and you should know them by heart. For a particle moving in a circle at constant speed: a) Tangential speed $v = r\omega$ b) Radial acceleration $= r\omega^2 = \frac{v^2}{r}$ towards the centre of the circle
3	**Draw force diagrams carefully.** Make sure that you include all forces, such as reaction forces, tensions, friction and weight, acting in the correct directions. Draw in the direction of the acceleration (usually shown by a double arrow). Remember that the resultant force in the direction perpendicular to the radial acceleration is zero, and that you need to apply $F = ma$ in the radial direction.

Vertical Circular Motion

1	**Remember to use conservation of energy.** In many situations involving vertical circles, in which the acceleration is not constant, then conservation of energy is the easiest way to find the speed at a particular point.



Equilibrium of rigid bodies

1	**Always draw a diagram.** If you try to work without a diagram, you are very likely to make mistakes with signs, or to miss out forces. Make sure that you show angles clearly on your diagram.
2	**Make sure that you get the direction of moments right.** Remember that anticlockwise is considered to be positive and clockwise negative. Always draw a clear force diagram and use it to consider the direction of each force.
3	**Remember to include reaction forces at a support or hinge in the force diagram.** These have no effect when you take moments about the support or hinge, but you need to take them into account when you resolve forces or take moments about a different point.
4	**Work out a strategy to solve equilibrium problems.** Think about which unknown quantities you need to find, and look for ways of resolving and / or taking moments that will allow you to find them as efficiently as possible (ideally without having to solve simultaneous equations, although this may sometimes be unavoidable!)

Finding centre of mass

1	**In work on two dimensional shapes, make sure you write down the centre of mass of each component correctly.** It is important to draw a clear diagram to avoid errors.
2	**Make sure you find the distance from the appropriate axis.** Think carefully about which axis you are considering.
3	**Draw diagrams carefully.** When solving problems in which an object is suspended from a point, it is essential that you draw a clear diagram showing the line of action of the weight of the lamina.

Important formulae for solid of revolution

1	$\bar{x} = \dfrac{\int_a^b xy^2 dx}{\int_a^b y^2 dx}$ and $\bar{y} = 0.$

Centre of mass of a solid of revolution

1	**Write the integrand in terms of the appropriate variable.** Remember to use the equation of the curve to write everything in terms of x. Your strips will be parallel to the y axis. The limits are values of x.
2	**Don't forget the factor π when calculating volumes.** But bear in mind that it is likely to cancel when calculating centres of mass so, in that case, it is usually best to leave it as π rather than substituting a value.
3	**Use symmetry where appropriate.** For a solid of revolution formed by rotation about one of the coordinate axes, one of the coordinates of the centre of mass is always zero. If you are asked for both coordinates, make sure that you state that you are using symmetry.
4	**Use a table for composite solids.** A table showing the centre of mass for each of the constituent parts of a composite body is helpful when finding its centre of mass. Make sure you decide where to measure from when finding the position of the centre of mass.

Centre of mass of a plane figure

1	**Always draw a diagram.** When dealing with plane areas, don't just quote a formula, but also draw a diagram indicating clearly a representative point on the curve and the centre of a strip at that point.
2	**Write the integrand in terms of the appropriate variable.** Remember to use the equation of the curve to write everything in terms of x when your integral is with respect to x (i. e. with dx) or everything in terms of y when your integral is with respect to y (i. e. with dy). In the first case your strips will be parallel to the y axis and in the second they will be parallel to the x axis. Take care with the limits in the same way. An integral with respect to x should have limits which are values of x and an integral with respect to y should have limits which are values of y.
3	**Use a table for composite laminae.** As for solids, a table is helpful when finding the centre of mass of a composite figure. Make sure you decide where to measure from when finding the position of the centre of mass.