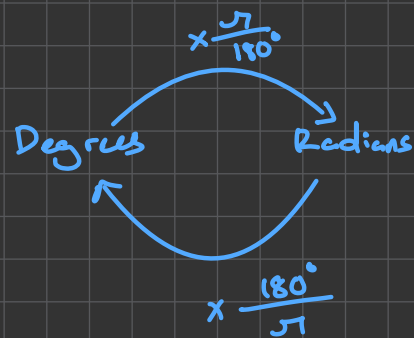




Centripetal Force

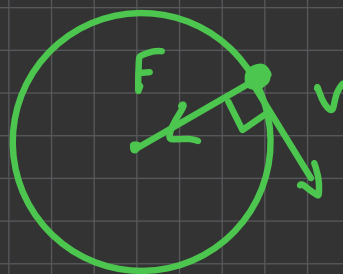
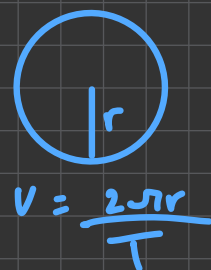
Net constant force which causes an object to move in a circular path

The force is:

- ① Always directed towards the centre
- ② Perpendicular to the velocity

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

$$a = \frac{v^2}{r} = \frac{\omega^2 r}{1}$$

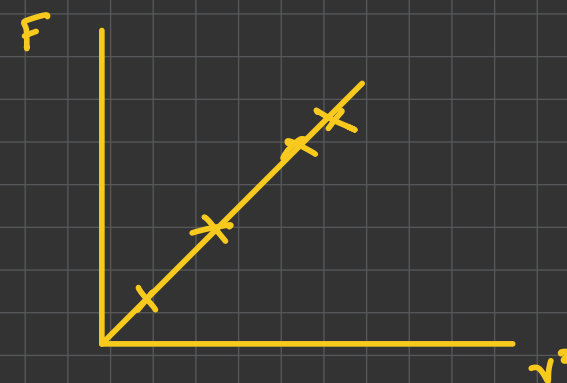
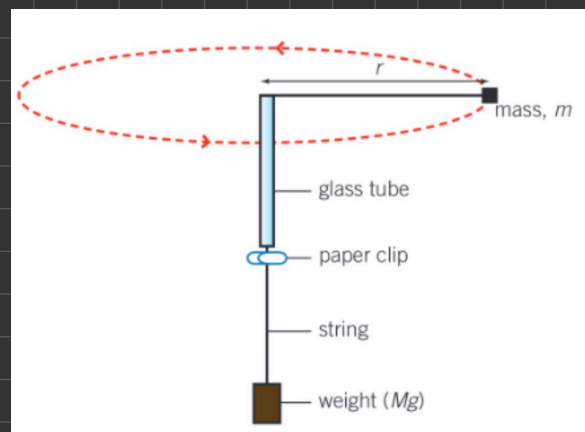


The speed of an object in circular motion does not change because

- The net force is directed perpendicular to the direction of motion (velocity)

- This means that there is no work done by this force and hence no change in speed

$$W = F \cos \theta \quad \cos 90^\circ = 0$$

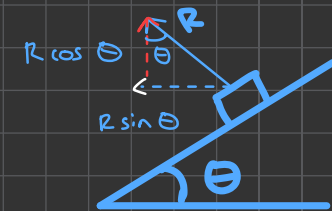


Plot a graph of F against v^2
Draw a line of best fit

If the centripetal force equation is true, the graph will be a straight line through the origin

$$F = \frac{mv^2}{r} \rightarrow y = \text{grad} \cdot x + c$$

$$\text{grad} = \frac{m}{r}$$



$$R \cos \theta = mg$$

$$R \sin \theta = \frac{mv^2}{r}$$

Conical pendulum

$$T \cos \theta = mg$$

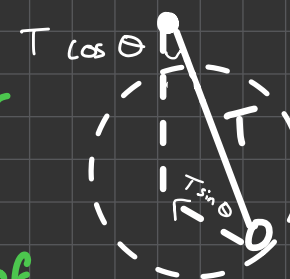
$$T \sin \theta = \frac{mv^2}{r}$$

$$T = \frac{mg}{\cos \theta}$$

$$\frac{mg \sin \theta}{\cos \theta} = \frac{mv^2}{r}$$

$$g \tan \theta = \frac{v^2}{r}$$

$$v = \sqrt{gr \tan \theta}$$



washing spinning



could also be:
mass on a string
roller coaster on a loop
plane doing a loop etc...

$$1: ma = mg + R$$

$$\frac{mv^2}{r} = mg + R$$

$$R = \frac{mv^2}{r} - mg$$

$$2: \frac{mv^2}{r} = R - mg$$

$$R = \frac{mv^2}{r} + mg$$

Circular motion Experiment

Keep the radius constant and vary the mass m .

Measure:

- the mass m , with a top pan balance and calculate the weight which acts as a centripetal force using $F = mg$

- The radius with a ruler:
10T with a stop clock to reduce % uncertainty

Calculate T by dividing by 10:

Calculate v : $v = \frac{2\pi r}{T}$

Calculate v for different values of m