Mathematics

Quadratic equation:

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

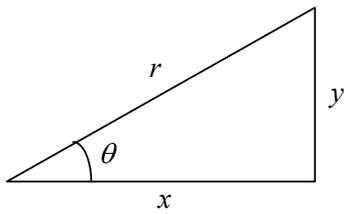
Trigonometry:

$$r^2 = x^2 + y^2$$

$$\sin\theta = y/r$$

$$\cos\theta = x/r$$

$$\tan\theta = y/x$$



Kinematics (for constant acceleration)**:**

$v = v_0 + at$

$x = \frac{1}{2}(v_0 + v)t$

$x = v_0 t + \frac{1}{2}at^2$

$v^2 = v_0^2 + 2ax$

Forces:

Newton's second law: $\sum \vec{\mathbf{F}} = m\vec{\mathbf{a}}$

First condition for equilibrium: $\sum \vec{\mathbf{F}} = 0$

Gravity:

Gravitational force near the earth: $F = mg$

Newton's law of universal gravitation: $F = G\frac{m_1 m_2}{r^2}$

g = 9.80 m/s^2 $G = 6.67\times10^{-11}$ N·m^2/kg^2

Friction:

Static: $0 \le f_s \le \mu_s F_N$ direction is always opposite to motion (or tendency to motion)

Kinetic: $f_K = \mu_K F_N$

Uniform Circular Motion

Period: $T = \frac{2\pi r}{v}$, where v is the speed of the object and r is the radius of the circle

Frequency: $f = \frac{1}{T}$

θ (in radians) = $\frac{\text{Arc length}}{\text{radius}}$

Centripetal Acceleration: $a_c = \frac{v^2}{r}$

Centripetal Force: $F_c = \frac{mv^2}{r}$ (directed towards the centre)