

Chapter 7

Rotational Motion and the Law of Gravity

$\Theta = s/r$ Θ is angle or angular displacement in radians, s is arc length in m, r is radius in m

1 radian = 57.3 degrees, 360 degrees = 2π radians = 1 revolution

ω greek symbol lower case omega, stands for angular velocity in rad/s

α greek symbol alpha, stands for angular acceleration in rad/s^2

formulas

Θ is same as d, but in radians

ω is same as v, but in radians/s

α is same as a, but in radians/ s^2

$$\omega = \Theta/t$$

$$\alpha = \omega/t$$

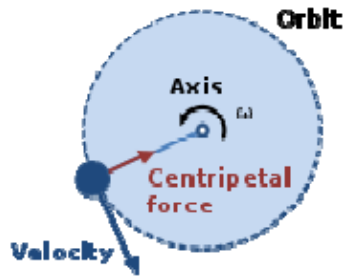
$$\omega_f = \omega_i + \alpha t$$

$$\Theta = \omega_i t + \frac{1}{2} \alpha t^2$$

$$\omega_f^2 = \omega_i^2 + 2\alpha \Theta$$

$v_t = r\omega$ tangential velocity is the linear speed an object travels as it goes in a circular path.

$a_t = r\alpha$ tangential acceleration is the linear acceleration of an object in a circular path.



Centripetal Acceleration-2 components of this; $a=(a_t^2+a_c^2)^{1/2}$

a_c (centripetal acceleration) which points to center and changes direction as object travels around a circular path;

a_t (tangential acceleration) is tangent to the circular path at all points and changes constantly

$$a_c=v^2/r=r\omega^2$$

Centripetal Force; could be a tension in a string or force of friction keeping an object in its circular path.

$$F=ma_c=mv_t^2/r$$

Newton's Law of Universal Gravitation-the attraction of objects due to their mass and distance between them.

$$F=Gm_1m_2/r^2 \quad G=6.673 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$$