
CIRCULAR MOTION

Centripetal Force $F = mv^2/r$ (this is the force necessary to hold an object in a circular path at constant speed)

mv^2/r tells only the AMOUNT of force necessary...it says nothing about what PROVIDES the force

Some common CAUSES of centripetal force are

- * friction $F = \mu N$
- * gravity (weight) $W = mg$
- * pull on a rope or string
- * structural strength of a piece of wood, metal, etc.

AMOUNT of centripetal force can be equated with CAUSE, e.g.

- friction: $\mu F_N = mv^2/r$ or for certain situations $\mu mg = mv^2/r$
- gravity: $mg = mv^2/r$ this reduces to $v = \sqrt{\frac{GM_E}{r}}$ (always) = \sqrt{gr} (in a special case) which tells us that in the case of a satellite or space shuttle or astronaut orbiting a planet, velocity is independent of mass

Centripetal Acceleration $a = v^2/r$ (directed toward center...caused by change in DIRECTION, not speed)

UNI VERSAL GRAVITATION

Kepler's Laws

1. Planets travel in elliptical orbits
2. A line from the planet to the sun sweeps out equal areas in equal times
3. ...not responsible for this one...look it up if interested

$$F = \frac{G m_1 m_2}{d^2}$$

"Inverse square" relationship

SIMPLE HARMONIC MOTION

Pendulum

period; mass; length; amplitude
only length affects period; longer length means longer period

$$T = 2\pi \sqrt{\frac{L}{g}}$$

"Restoring force" increases as displacement from rest position increases

In general for SHM

- force is greatest at extremes, least at center
- acceleration is greatest at extremes, least at center
- velocity is greatest at center, least at extremes