Chapter 5 notes- Circular Motion

What happens to velocity as you move in a circle??

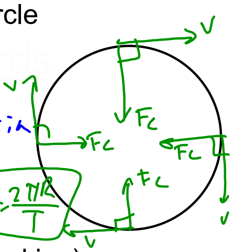
Linear/Tangential Speed	Circular/angular Speed
in straight line	in a circle
units = m/s	units = rpm, rps, radians/sec, Hertz (Hz) $= 1/s$
v	ω or f (only f in this chapter) frequency
$v = x/t = 2\pi r/T$ (T = period = TIME for one cycle)	$f = 1/T$

Since keep changing direction....must have acceleration if moving in a circle

Direction is ALWAYS inwards

FEELS Outwards = inertia

MAGNITUDE is constant



$\boxed{a_c = v^2/r}$ $\boxed{F_c = \frac{mv^2}{r}}$ $\boxed{v = \frac{2\pi R}{T}}$

(***c = centripetal = center seeking)

Direction varies....

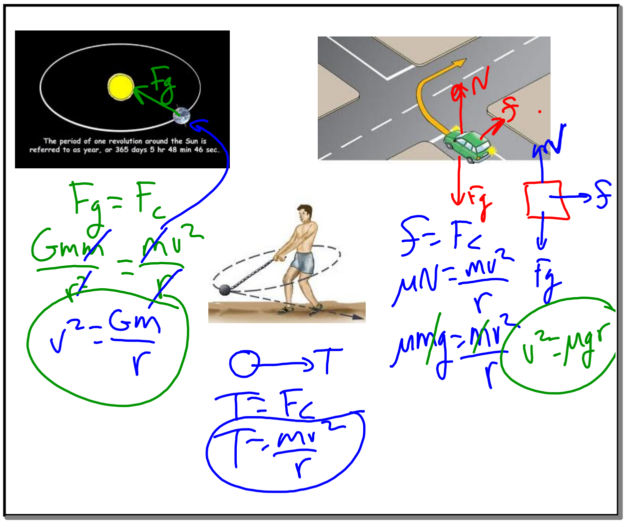
Centripetal Force = ALWAYS center

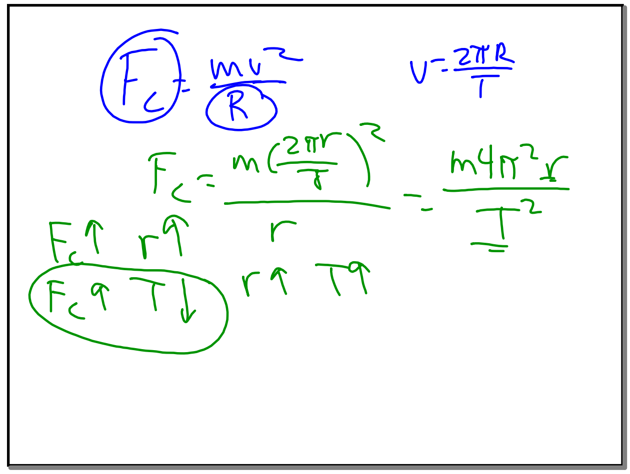
F = ma

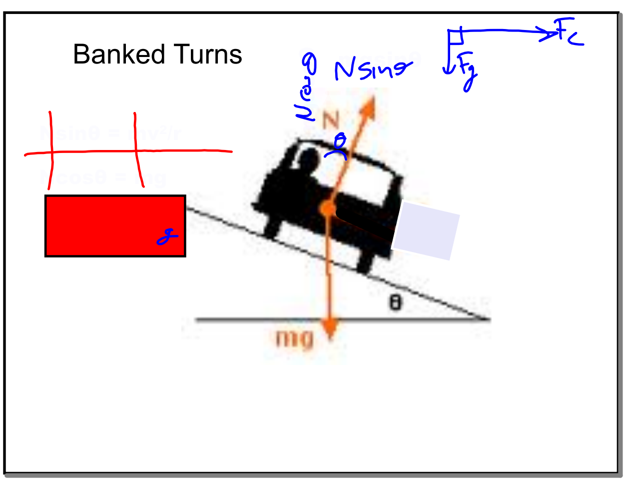
$F_c = mv^2/r$

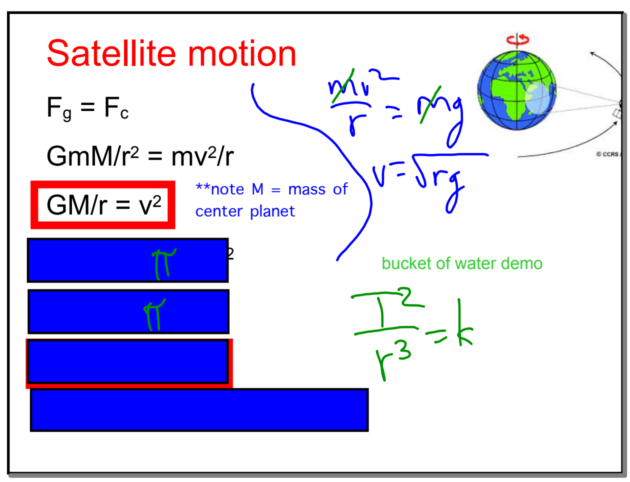
F_c is NEVER labeled on a FBD

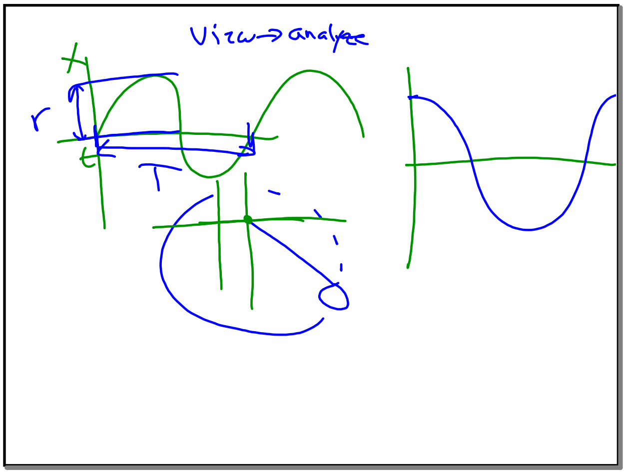
SOME force causes F_c

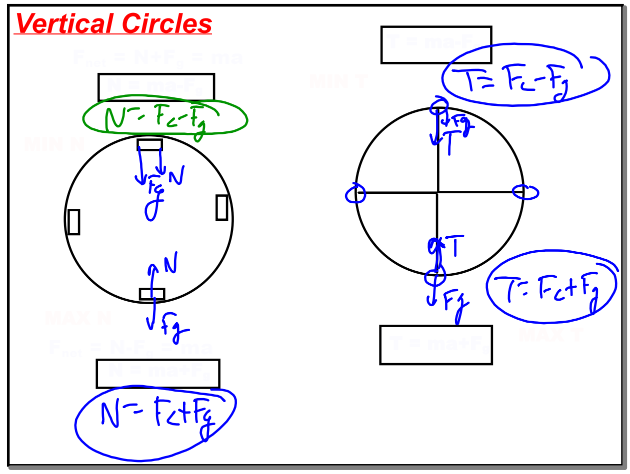

Fg
The period of one revolution around the Sun is referred to as year, or 365 days 5 hr 48 min 46 sec.
N
f
Fg
N
f
Fg
$F_g = F_c$
$\frac{Gm\cancel{m}}{r^{\cancel{2}}} = \frac{\cancel{m}v^2}{\cancel{r}}$
$v^2 = \frac{Gm}{r}$
$f = F_c$
$\mu N = \frac{mv^2}{r}$
$\mu \cancel{m} g = \frac{\cancel{m}v^2}{r}$
$v^2 = \mu g r$
T
$T = F_c$
$T = \frac{mv^2}{r}$


$F_c = \frac{mv^2}{R}$
$v = \frac{2\pi R}{T}$
$F_c = \frac{m\left(\frac{2\pi r}{T}\right)^2}{r} = \frac{m4\pi^2 r}{T^2}$
$F_c \uparrow \; r \uparrow$
$F_c \uparrow \; T \downarrow$
$r \uparrow \; T \uparrow$


Banked Turns
$N \sin\theta$
$N \cos\theta$
Fg
Fc
N
θ
mg
θ
f


Satellite motion
$F_g = F_c$
$GmM/r^2 = mv^2/r$
$GM/r = v^2$
**note M = mass of center planet
$\frac{\cancel{m}v^2}{r} = \cancel{m}g$
$v = \sqrt{rg}$
bucket of water demo
$\frac{T^2}{r^3} = k$


View → analyze
r
T


Vertical Circles
N = Fc - Fg
N
Fg
N = Fc + Fg
T = Fc - Fg
T
T = Fc + Fg