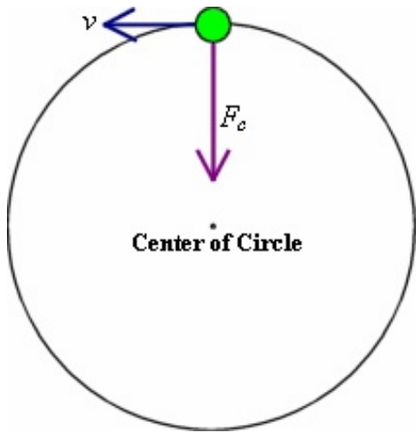
UNIFORM CIRCULAR MOTION

UNIT 1- SECTION 3-
PHYSICS 3204

- Remember that centripetal force is the net force. That is the Σ F on an object.

- There are three different types of centripetal motion studied.

1. On an horizontal plane



D= 2π r (circumference)

$v = \frac{2\pi r}{T}$ (T = Period)

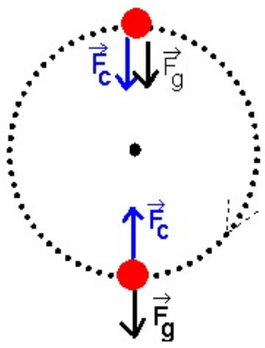
$F_c = \frac{mv^2}{r}$

$a_c = 4\pi^2 r f^2$

$F_c = m4\pi r f^2$

$f = \frac{1}{T}$ Or $f = \frac{\#cycles}{time}$

2. Vertical plane (use formulae from above



For tension

$F_{net} = T + F_g$

$F_c = T + F_g$

- Note forces towards the center are considered to be positive and outside are negative.

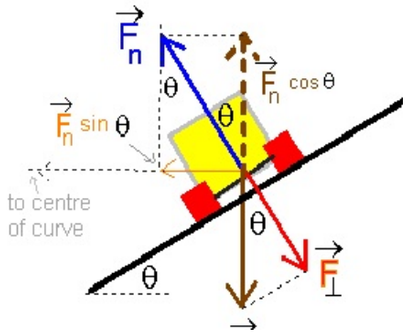
TOP	BOTTOM
$F_C = T+F_G$	$F_C = T-F_G$

- Note make sure to look at the following questions:

  => Bucket problem- minimum velocity to keep the bucket in centripetal motion (Tension =0).

  => Roller Coaster Problem the minimum velocity of to keep the roller coaster on the track (Force normal = 0).

3) Banked curve:



$F_C = F_n \sin\theta$

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

using the above two equations we get

$$r = \frac{v^2}{g\tan\theta} \quad \text{0r} \quad v = \sqrt{rg\tan\theta}$$

Note: If the turn is not banked, it is static friction that keeps the car on the road:

In the vertical direction, $F_n = mg$,

In the horizontal direction : $F_C = F_f$ (to keep the car from skidding off the curve)

$F_c = F_f$

$\frac{mv^2}{r} = \mu F_n$

$\frac{mv^2}{r} = \mu mg$ (divide by m on both sides)

$\frac{v^2}{r} = \mu g$ (divide by m on both sides)

Solve for v

$$v = \sqrt{rg\mu}$$