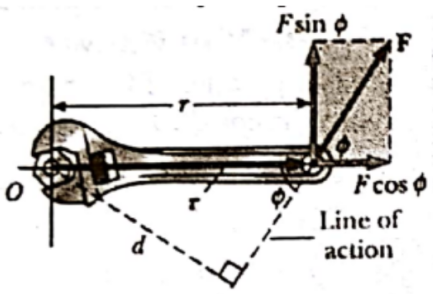
CH2 VECTORS & EQUILIBRIUM Pt2.

TORQUE.

→ Physical Quantity.
→ Angular Acceleration.

→ $\vec{\tau} = \vec{r} \times \vec{F} = rF\sin\phi\,\hat{n}$

$[\tau] = Nm.$

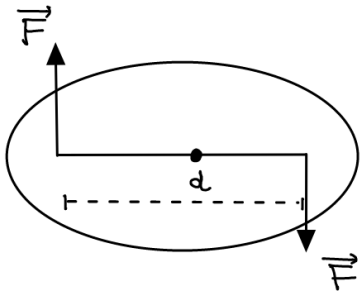


What would affect Torque?

→ Magnitude of Force.
→ Distance b/w line of action of force & pivot.
→ Sin θ.

COUPLE.

→ Two equal Force
→ Opposite to each



EQUILIBRIUM.

→ State of rest is maintained under many forces.

EQUILIBRIUM

STATIC
$\vec{a}=0$ $\vec{v}=0$

DYNAMIC
$\vec{a}=0$ $\vec{v}\neq 0$

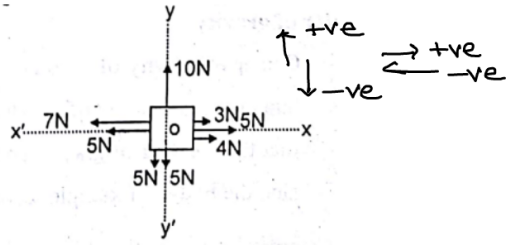
CONDITIONS FOR EQUILIBRIUM.

1st: $\sum_i \vec{F}_i = 0$

$\sum F_x = 0 = \sum F_y$

→ Translational Equilibrium.

eg.



$\sum F_x = (5+3+4-7-5)N = 0$

$\sum F_y = (10-5-5)N = 0$

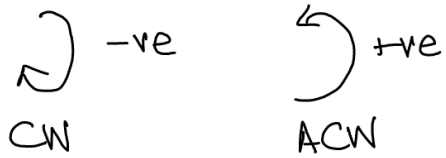
2nd condition:

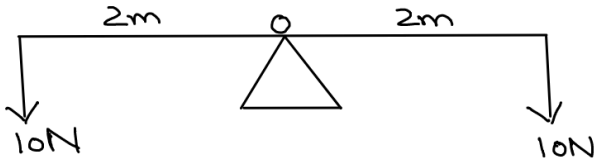
$$\Sigma \vec{\tau} = 0$$

$\rightarrow \Sigma$ AntiCW $\tau = \Sigma$ CW τ

$\rightarrow$ Rotational Equilibrium.

Eg:





$$CW: -(10N \times 2m) = -20Nm$$

$$ACW: (10N \times 2m) = 20Nm$$

$$\Sigma \tau_i = [20 + (-20)]Nm = 0$$

Rotational Eq.

Note:

Translational + Rotational eq.

$\Longrightarrow$ Complete Eq.

CENTER OF GRAVITY.

$\rightarrow$ Total weight is concentrated.
$\rightarrow$ Irrespective of shape
$\rightarrow$ Not always within the body.

Eg: Ring.