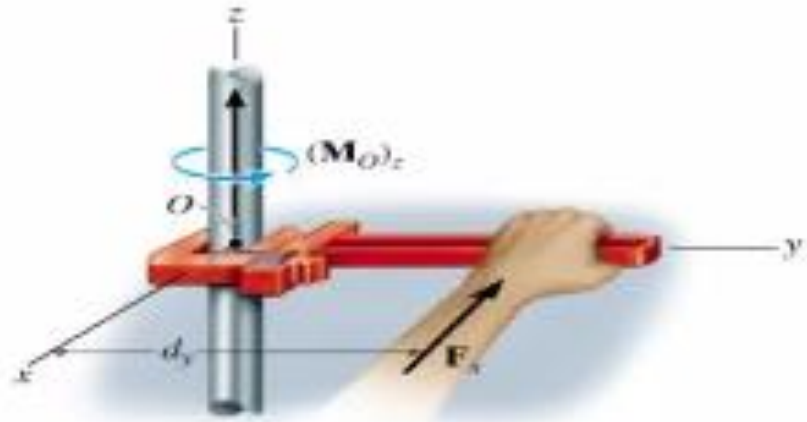
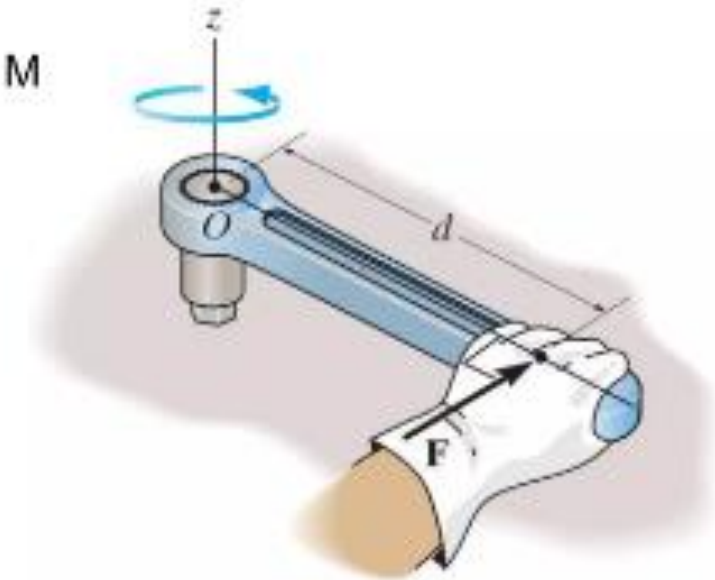
Introduction to Moments

The tendency of a force to rotate a rigid body about any defined axis is called the Moment of the force about the axis

The **turning effect** caused by a force on the body is called as a moment of force



M



The moment, M, of a force about a point provides a measure of the tendency for rotation (sometimes called a torque).

$$M = F * d$$

- The Moment of Force (**F**) about an axis through Point (A) or for short, the Moment of **F** about A, is the product of the magnitude of the force and the perpendicular distance between Point (A) and the line of action of Force (**F**)
  - $M_A = Fd$

APPLICATIONS

Principle of Moment

It states that if a system is in equilibrium then the sum of its clockwise moments will be equal to the sum of its counterclockwise moments.

Clockwise moment = counter clockwise moment.

$F_1 \times d_1 = F_2 \times d_2$.

- Clockwise Moment- A force causes an object or body to rotate in a clockwise direction. It is taken as positive.
- Counterclockwise Moment – A force causes an object or body to turn in an anti-clockwise direction. It is taken as negative.

Clokwise direction is positive.

Counter clockwise direction is negative.

The term **Equilibrium** is defined as "it occurs when all the forces acting on a body are balanced".

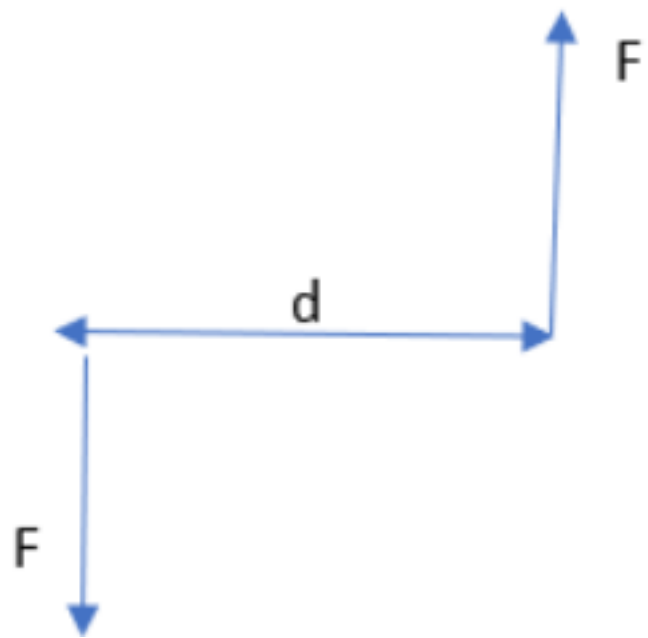
Couple

A couple is defined as a pair of two forces that are equal in magnitude but their direction are opposite to each other and the motion of lines do not coincide.

The formula of the couple:

$$\tau = F \times d.$$

S.I unit of couple = Newton-meter (Nm) and the dimensions are $[ML^2T^2]$.



Here the forces are equal and opposite so we get the result of force is zero and there is no linear acceleration.

Few Applications of the couple

- Opening and closing the cap of the bottle.
- Using the Key, unlock the locker.
- Turning the screwdriver.
- Helm wheel applied by the bus driver.