Force System

1. Coplanar.
   - Collinear
   - Concurrent
   - Parallel
   - Non-concurrent & Non-parallel.

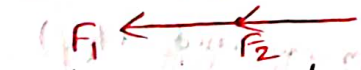
2. Non-Coplanar
   - Concurrent
   - Parallel
   - Nonconcurrent & Non-parallel

Collinear forces.

Lines of action of all forces are in same straight line

Like collinear, coplanar forces.

Forces acting in same direction & in single plane & single line

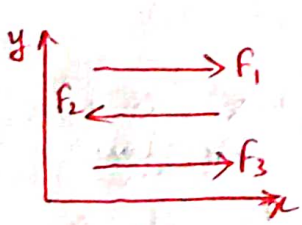


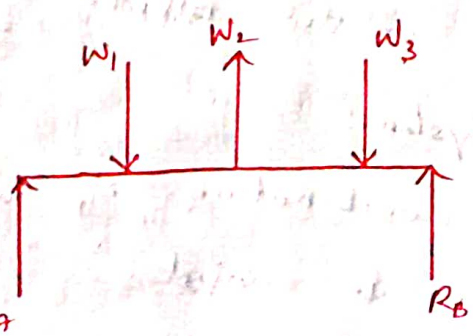
UnLike collinear coplanar forces

Forces acting in opposite direction & in single plane and single line

Parallel forces.

Forces that are parallel to each other

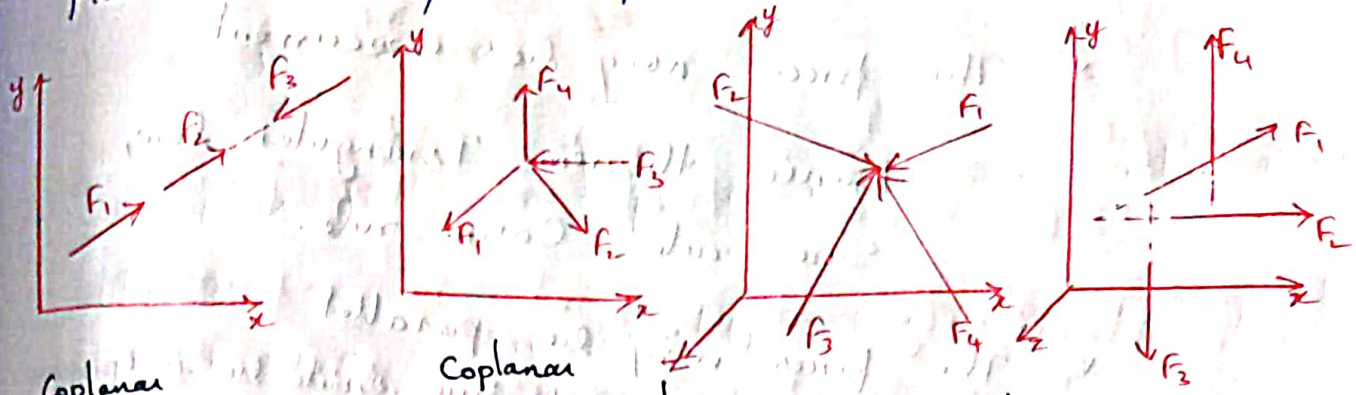




Coplanar parallel forces.

Coplanar Forces:

Forces that are acting on a single common plane are coplanar forces.



Coplanar collinear | Coplanar concurrent | Non-coplanar

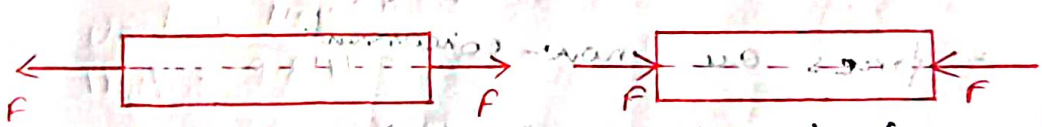
Non-coplanar: ~~same~~ concurrent forces. | ~~not~~ non-parallel forces.

TENSILE FORCE

Force acting along the axis (centre line) of the object which tries to elongate the object

COMPRESSIVE FORCE

Force acting along the axis of an object which tries to shorten the object.



Tensile force | Compressive force

RESULTANT OF COPLANAR FORCES:

A resultant is a single force that can replace a number of force acting on a rigid body which causes the same effect of all forces.

TWO-FORCE System:

* when 2 forces are present in a system, it will be in equilibrium if the forces are equal, collinear, coplanar and opposite to each other.

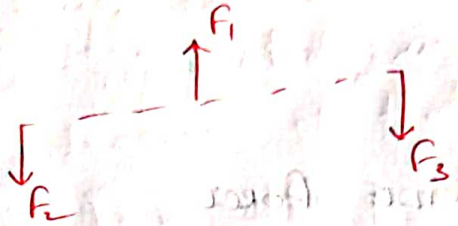
* In other conditions, the 2-force cannot be in equilibrium.

THREE FORCE SYSTEM

* 3 coplanar forces are acting

* The forces may be concurrent.
  Lamis theorem, Triangular law, Sine rule, Cosine rule

* The forces may be parallel
  (one force should be in opposite direction)



FOUR (OR) MORE FORCES.

* forces are concurrent

$$\Sigma f = 0 \quad \{\Sigma f_x = 0 ; f_y = 0 ; f_z = 0\}$$

* forces are non-concurrent

$$\Sigma f = 0 \text{ \& } \Sigma M = 0$$

EQUILIBRIUM:

A particle is said to be in equilibrium if it is at rest or at uniform motion.

In other words; resultant of all forces acting on it is zero and the algebric sum of moments is also zero

Mathematically, expressed as

$$\Sigma F = 0 ; \quad \{\Sigma f_x = 0 ; \Sigma f_y = 0 ; \Sigma f_z = 0\}$$

$$\Sigma M = 0$$

forces parallel to x-axis, y-axis & z-axis