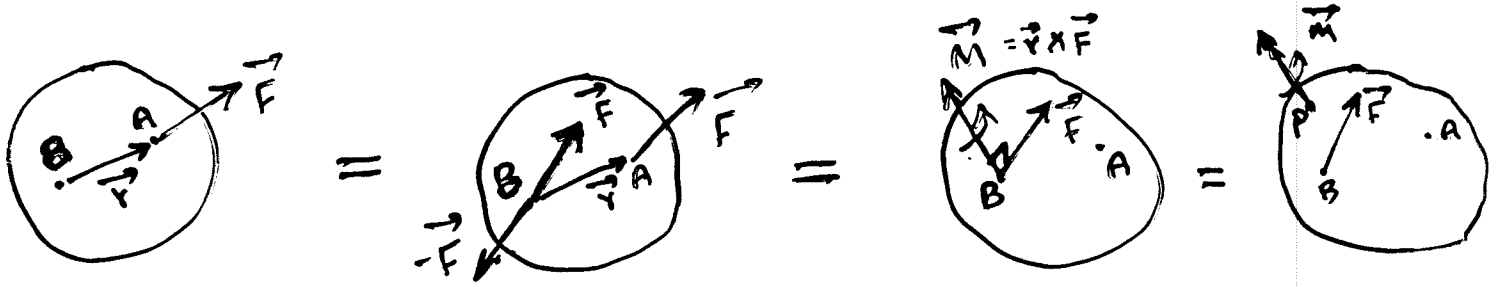


Equivalent (Force - Couple) System

Resolution of a Force into another force and a couple :

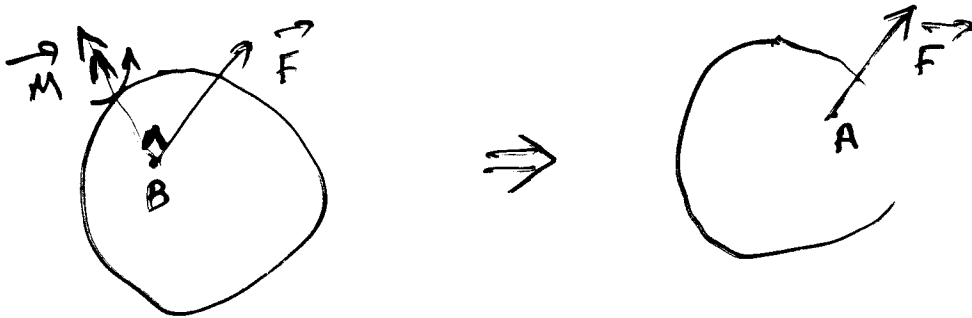


From the figure above, it can be concluded that any force \vec{F} acting on a rigid body may be moved to an arbitrary point B if a moment of a couple equals to the moment of \vec{F} about B is added. That moment and the force are usually attached at the same point (as B); however, since \vec{M} is a free vector, it can be applied anywhere in the body.

The combination of \vec{F} and \vec{M} is called Force-couple system.

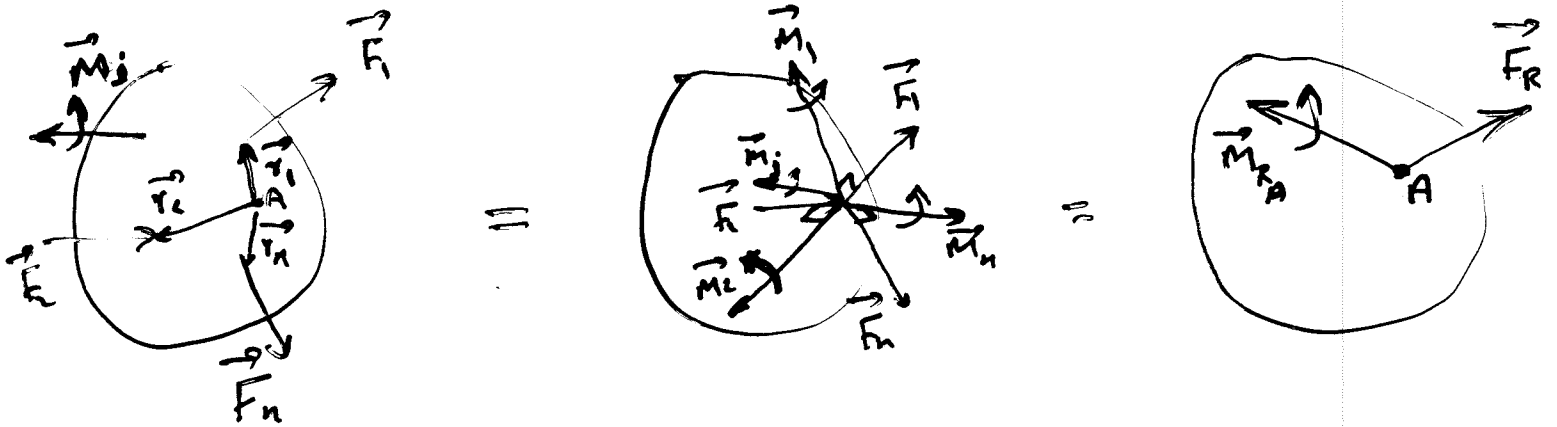
The same procedure can be repeated by moving the force from point B to any other point.

The procedure above can be reversed; that is, if there are a force and a couple which are perpendicular, then they may be replaced by one single equivalent force.



Reduction of a System of Forces/Moments to One Force and One Couple

The procedures discussed above may be repeated many times if there are more than one force.



Note that \vec{F}_R and \vec{M}_{RA} are not perpendicular to each other in general.

$$\vec{F}_R = \sum_{i=1}^n \vec{F}_i$$

$$\vec{M}_{RA} = \sum_{j=1}^m \vec{M}_j + \sum_{i=1}^n \vec{M}_{iA}$$