

A short course on

Equilibrium

This video:

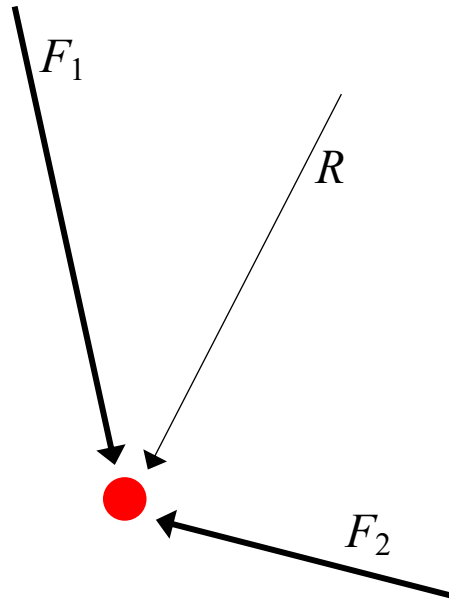
Forces at a Point

Terje's Toolbox is freely available at terje.civil.ubc.ca

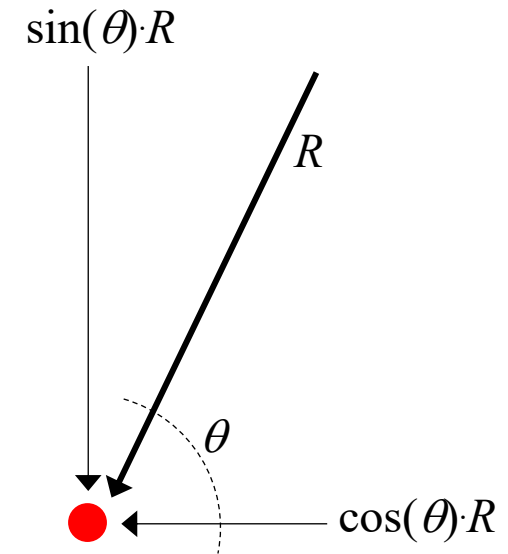
It is created and maintained by Professor Terje Haukaas, Ph.D., P.Eng.,
Department of Civil Engineering, The University of British Columbia (UBC), Vancouver, Canada

Objectives

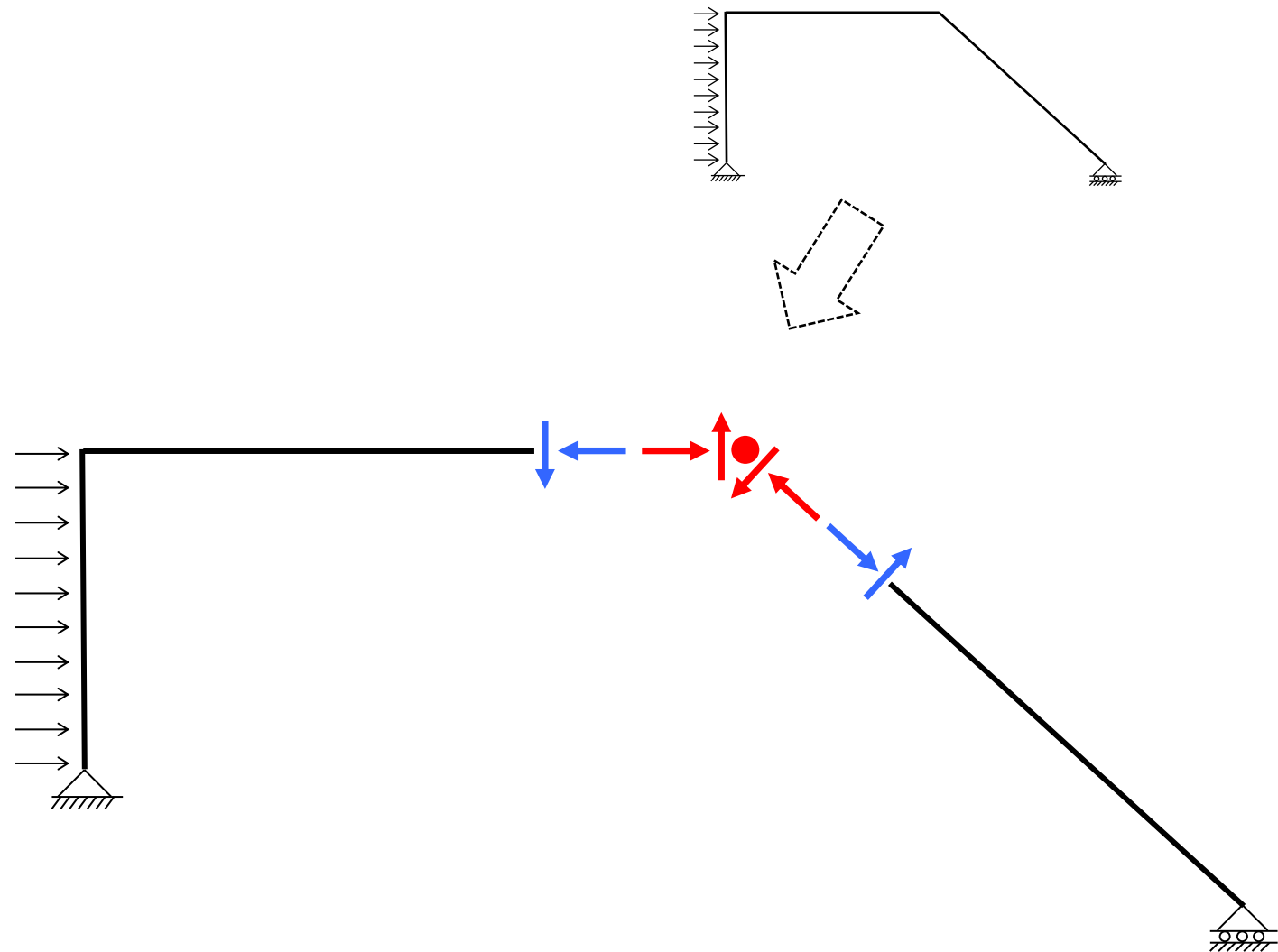
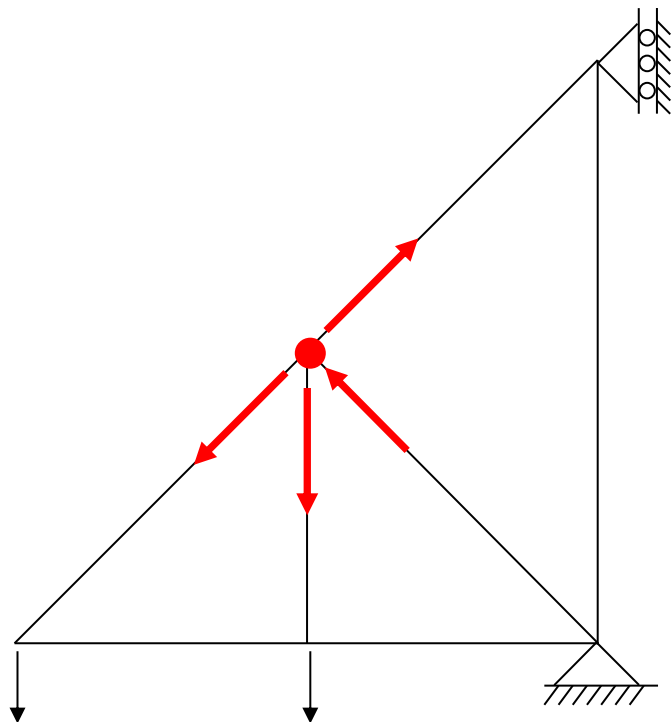
Several forces \rightarrow One resultant



One force \rightarrow Several components

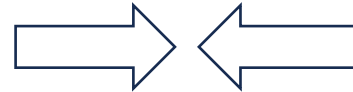


Applications



Equilibrium Equations

$$\sum F_x = 0$$



$$\sum F_y = 0$$



+ a graphical approach that addresses both at once...

How to Impose Equilibrium

Several forces → One resultant

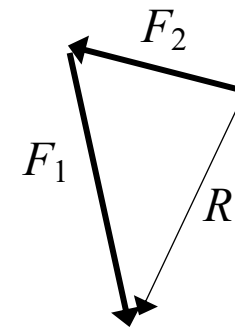
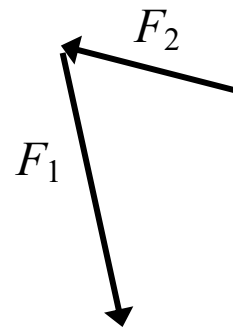
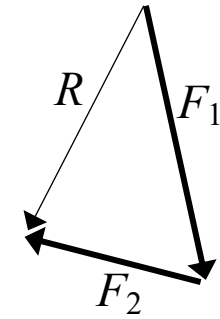
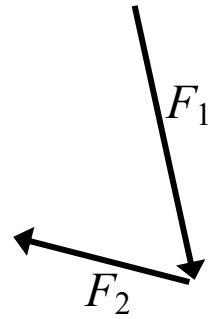
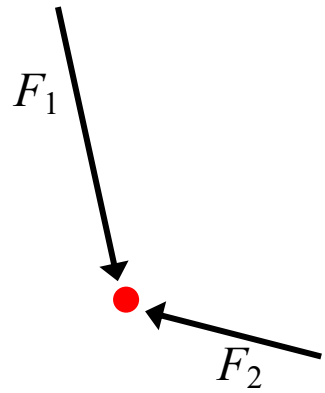
Used by itself, without employing equilibrium, in order to find a force resultant

Used in a “graphical approach” to establish equilibrium, by enforcing that the resultant must be zero

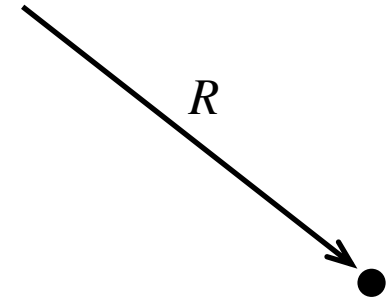
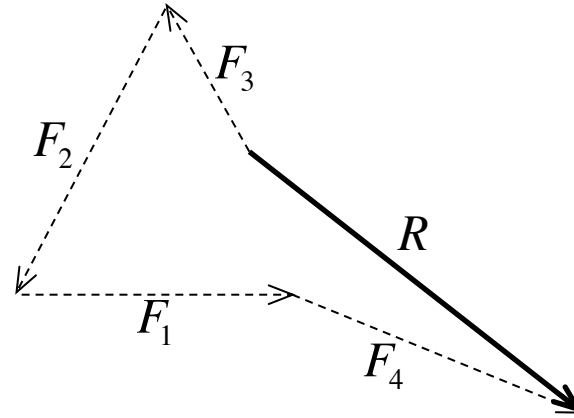
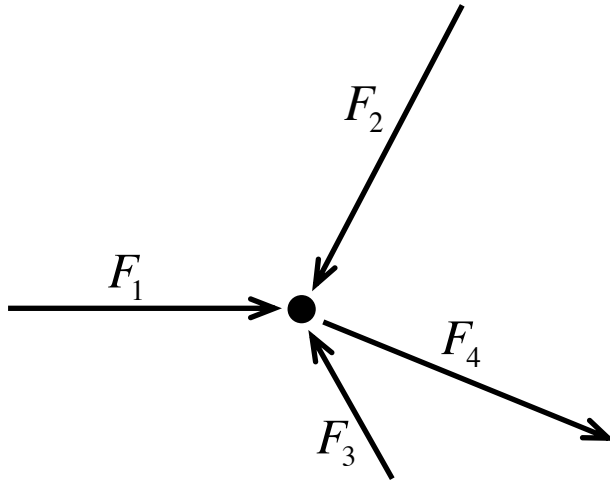
One force → Several components

Used in the “trigonometric approach” to establish equilibrium. Once all horizontal components are determined they are summed and set to zero. Same for the vertical component of all forces acting at a point

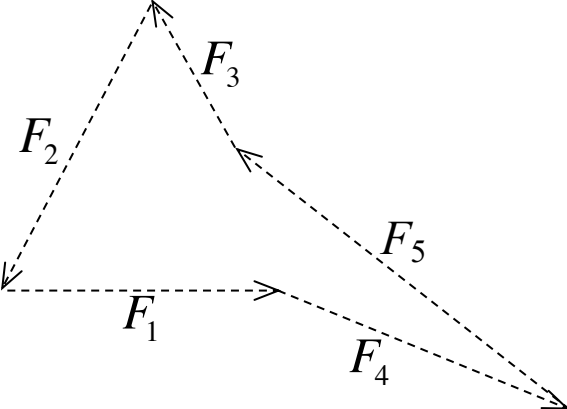
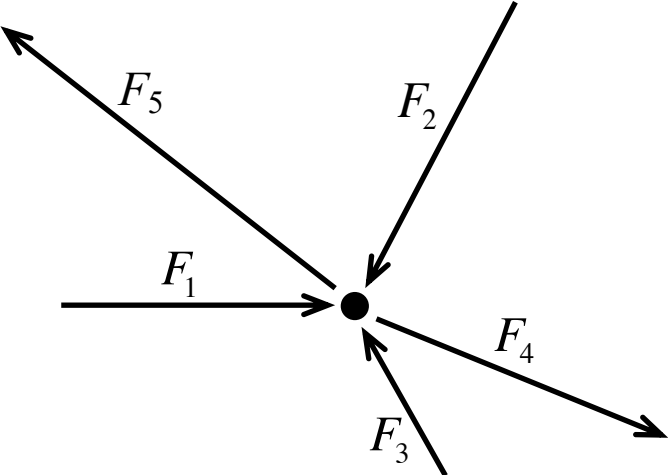
Graphical Approach



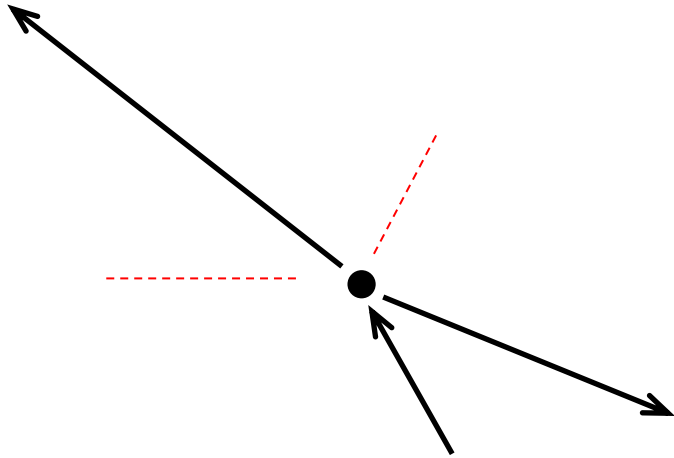
More Forces



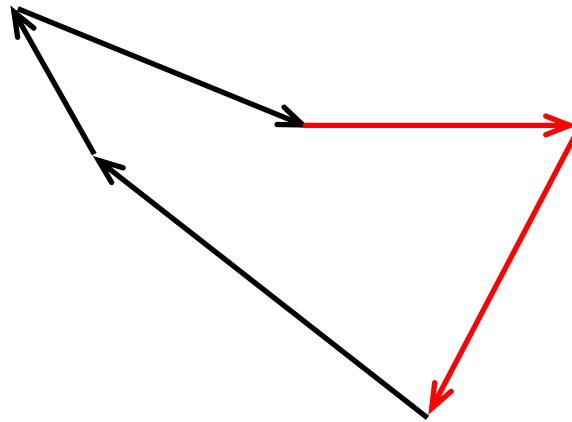
Check Equilibrium



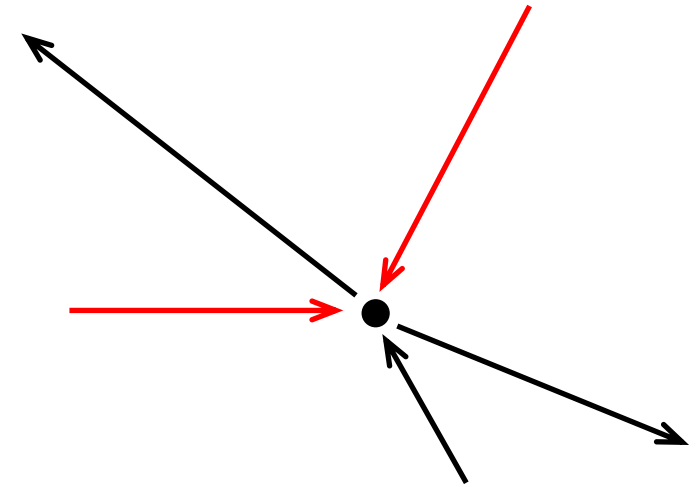
Use Equilibrium



Two unknown forces

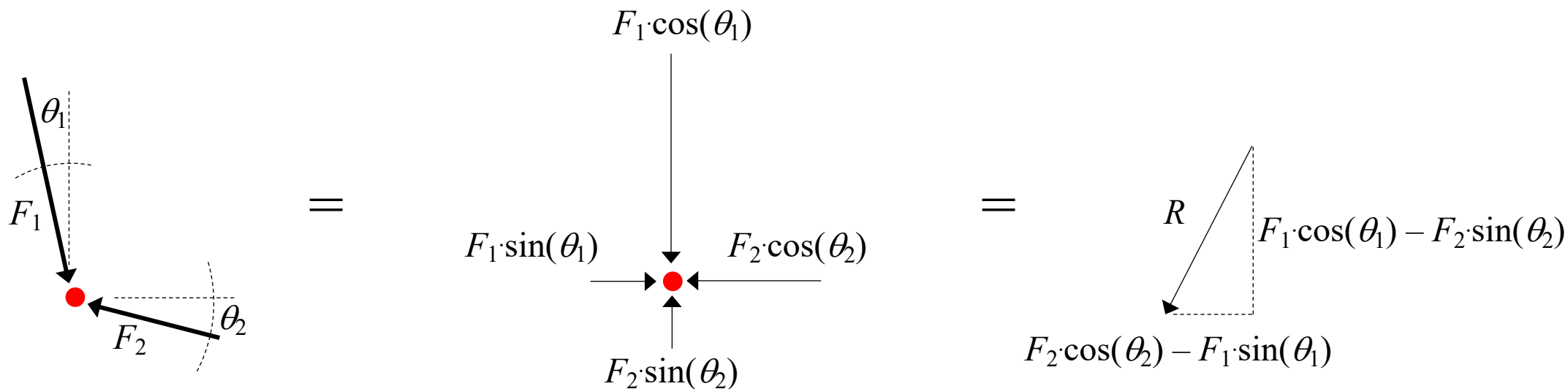


Closed force polygon



Compression?
Tension?

Trigonometry



$$\sum F_x = 0$$

$$\sum F_y = 0$$

More lectures:

Terje's Toolbox:

terje.civil.ubc.ca