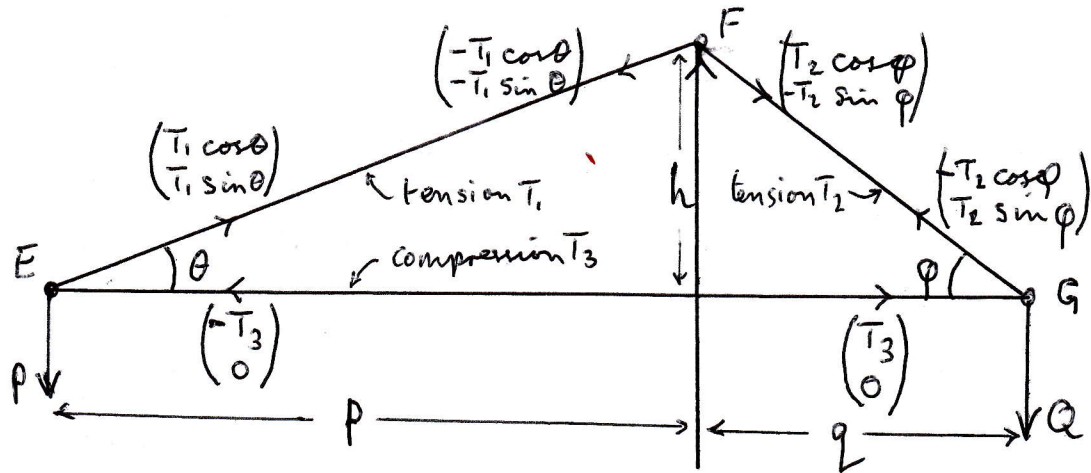
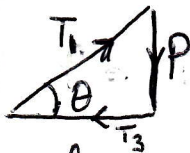


The Law of the See-saw deduced without Torques



The see-saw arm is a pin-jointed triangle. Weights P and Q are hung from E and G . The fulcrum is F . EF and FG are 'ties', under tensions T_1 and T_2 . EG is a strut, under compression T_3 .

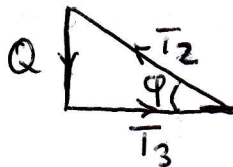
Using force equilibrium at E



$$P = T_3 \tan \theta$$

$$\left[\begin{array}{l} \text{or } P = T_1 \sin \theta \\ T_3 = T_1 \cos \theta \\ \text{so } P = T_3 \tan \theta \end{array} \right]$$

Using force equilibrium at G



$$Q = T_3 \tan \phi$$

$$\left[\begin{array}{l} \text{or } Q = T_2 \sin \phi \\ T_3 = T_2 \cos \phi \\ \text{so } Q = T_3 \tan \phi \end{array} \right]$$

$$\text{So } \frac{P}{Q} = \frac{\tan \theta}{\tan \phi} = \frac{h/p}{h/q} = \frac{q}{p}$$

$$\text{So } Pp = Qq$$