

Any two Forces in the same plane acting on a rigid system (unless they form a couple) are equivalent to a single Resultant force, whose moment round any point in their plane is equal to the algebraic sum of their moments round this point.

37. *Any Forces act in one plane on a rigid system.*

Any Forces
in one plane

Taking any two of these, we find their Resultant, its moment being the sum of the moments of the two round any assumed point in the plane; combining this Resultant with a third to form a new Resultant, whose moment will be the sum of those of the three forces; and this again with a fourth; and so on till we have taken all the forces, we are left at last with a single Resultant only, whose moment is equal to the sum of the moments of all the Forces. In thus proceeding, we must avoid combining with any one of the partial resultants a force which would form with it a couple; and this we can always do by taking instead of this force another one which will not form a couple, for if it did, there would then be two equal and parallel forces, not opposite, and these two could be combined into one which would now no longer form a couple with the Resultant spoken of; we can thus always evade forming a couple until we have combined all the forces but one, and it may happen that this one is equal, parallel, and opposite to the Resultant we have obtained from all the rest, so that we have a couple remaining.

Hence, any set of Forces acting in one plane on a rigid system are either reducible to a couple, or else to a single Resultant Force, whose moment round any point in the plane is equal to the algebraic sum of the moments of the Forces round that point..

are reducible to single Resultant, in general.

38. *To find the conditions of equilibrium when Forces in one plane act on a rigid system which can turn freely about a fixed point in that plane.*

The forces are reducible either to a couple or to a single Resultant Force.

and for equilibrium