Essential Notes on Moments

Turning forces, torque, Nm

Anticlockwise = +ve   Clockwise = -ve

$$Moment = \ perpendicular\ distance \times force = \ |F| \cdot d$$

Forces through the pivot exert no moment/torque.

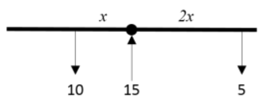
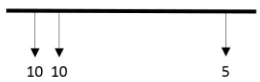
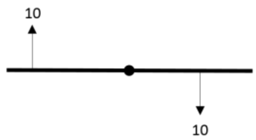
Most problems involve finding resultant (translational) force and resultant moment around one or more points, then using these to determine unknown forces or distances. It is possible to use resultant force and resultant moment to calculate position of resultant moment.

Equilibrium ⇒

resultant moment = 0 (no turning effect) **and** resultant force = 0 (no translational effect)

For a system of three forces to be in equilibrium, *lines of action* of all three forces will meet at a single point.

Resultant of Parallel Forces…

	Sum of forces	Sum of moments	E.g.
Equilibrium	0	0	
Move and turn	Not zero	Not zero	
Turn only (forces are 'a couple')	0	Not zero	

Centre of Mass

$$centre\ of\ mass = \bar{R} = \frac{\sum(mass \times distance)}{\sum distances} = \frac{\sum mr}{\sum r} \approx \frac{\sum moments^*}{\sum distances}$$

*ignoring gravity!

- Uniform rod = centre
- Uniform rectangular lamina = centre
- Uniform circular lamina = centre
- Uniform triangular lamina = on median line, vertex: base = 2:1
- Uniform semi-circular lamina = on line of symmetry where $h = \frac{4r}{3\pi}$

To find centre of mass of composite body, find centre of mass of each composite then find centre of mass of these.