

## Moments

### Equilibrium of a lamina under parallel forces

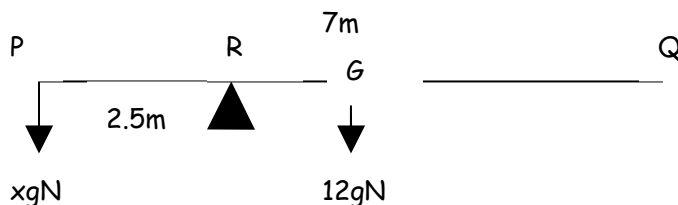
If a system is in equilibrium then the following must hold:

1. The component of the resultant force in any direction must be zero.
2. The algebraic sum of the moments about any point must be zero.

For uniform non light systems the weight acts through the centre of mass. A rod is said to be uniform if it has even weight distribution and therefore the centre of mass acts at the centre of the rod.

### Example 5

A uniform rod PQ of length 7m and mass 12kg is pivoted at the point R where PR is 2.5m. Calculate the mass of the particle that must be attached at P to maintain the rod in a horizontal position.



The moment at P about R must equate to the moment at G about R.

The mass of the rod gives a clockwise moment of:

$$12g \times 1 = 12gNm$$

The mass added at P gives an anticlockwise moment of:

$$xg \times 2.5 = 2.5xNm.$$

Therefore:

$$12gNm = 2.5xNm$$

$$x = 4.8Kg$$