

Forces in Equilibrium

Starter

1. **(Review of last lesson)** A balloon of mass 1400 kg is descending vertically with an acceleration of 2 m/s^2 . Find the upward force being exerted on the balloon by the atmosphere.
2. **(Review of last lesson)** A rope with a bucket attached to the end is used to raise water from a well. The mass of the empty bucket is 1.2 kg and it can raise 10 kg of water when full. Taking g as 9.8 m/s^2 find the tension in the rope when:
 - (a) the empty bucket is lowered with an acceleration of 2 m/s^2
 - (b) the full bucket is raised with an acceleration of 0.3 m/s^2 .

Notes

When the **resultant force** acting on an object is **zero**, we say the object is in **equilibrium**.

N.B. This does not mean the object is not moving, just that there is no acceleration. Effectively the forces acting on the body are cancelling each other out.

E.g. 1 In a tug-o'-war competition, two people on each side are pulling on the rope. The two people on the left are pulling with forces of 35 N and 40 N, while the two on the right pull with forces 32 N and D N. Given that the rope is held in equilibrium, find the value of D .

E.g. 2 An object is held in equilibrium by 3 forces: $(3\mathbf{i} + 7\mathbf{j})$ N, $(x\mathbf{i} + y\mathbf{j})$ N and $(-5\mathbf{i} + 2\mathbf{j})$ N. Find the value of x and y .

[Solutions to Starter and E.g.s](#)

Exercise

p500 21E Qu 1ac, 2ac, 3i, 4-8, 11-12

Summary

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