



## RESULTANT FORCES

## STEM

When multiple **forces** act on an object, they can add together or subtract from each other until there is the equivalent of just one force acting in a single direction. This is the **resultant force**.

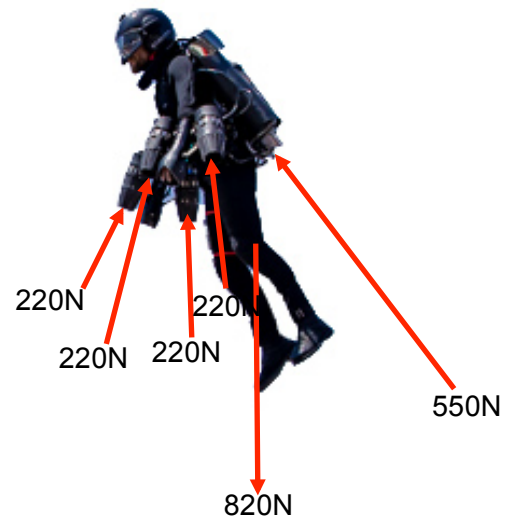
**Free Body Diagrams** show all the forces acting on an object.



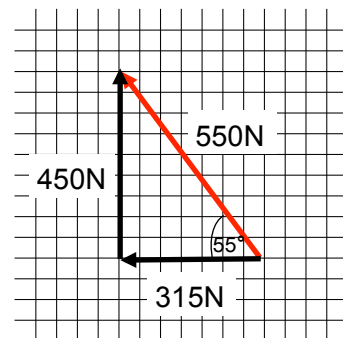
The sizes of the arrows show the relative magnitudes of the forces and the directions show the directions of the forces acting on the object.

An object is in **equilibrium** if the forces on it are **balanced**.

Not all forces act horizontally or vertically - some act at awkward angles.



To make these easier to deal with, they can be split into two **components** at right angles to each other. You can **resolve** a force split into components by drawing it on a scale diagram.



Horizontal component = 315N  
Vertical component = 450N

### Vectors have magnitude and direction

#### Vector quantities

force  
velocity  
displacement  
acceleration  
momentum

#### Scalar quantities

speed  
distance  
mass  
temperature  
time

## Newton's Third Law

When two objects interact, the forces they exert on each other are **equal and opposite**.

In the Gravity Jet Suit, the 5 turbine engines produce hot exhaust gases. As the burning gasses expand and blast out through the nozzle down towards the ground, the pilot is thrust upwards.

The downwards force equals the force pushing the turbines and the pilot upwards.

