Forces

3. Contact Forces

CONCEPT 2

LESSON GUIDE

RESULTANT FORCE ON AN OBJECT

PRECISE LEARNING POINTS

KNOW

I know how to recognise when the resultant force on an object is zero.

APPLY

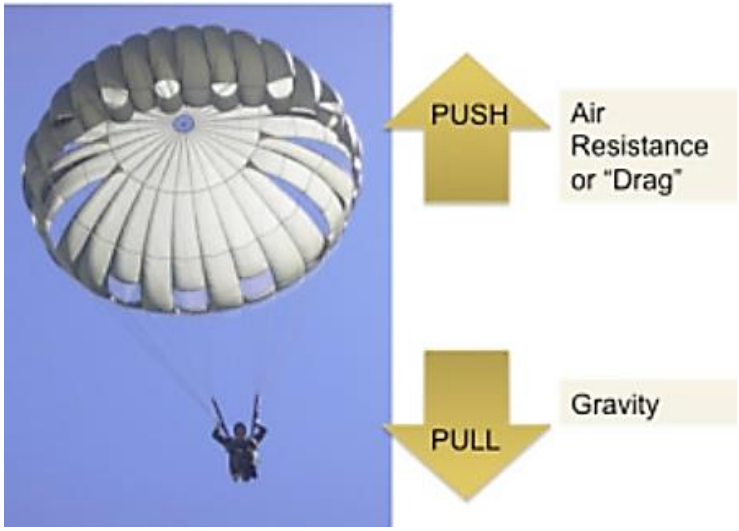
I can apply my knowledge of the resultant force on an object to predict its motion.

EXTEND

I can extend my knowledge of the resultant force on an object to calculate force values.

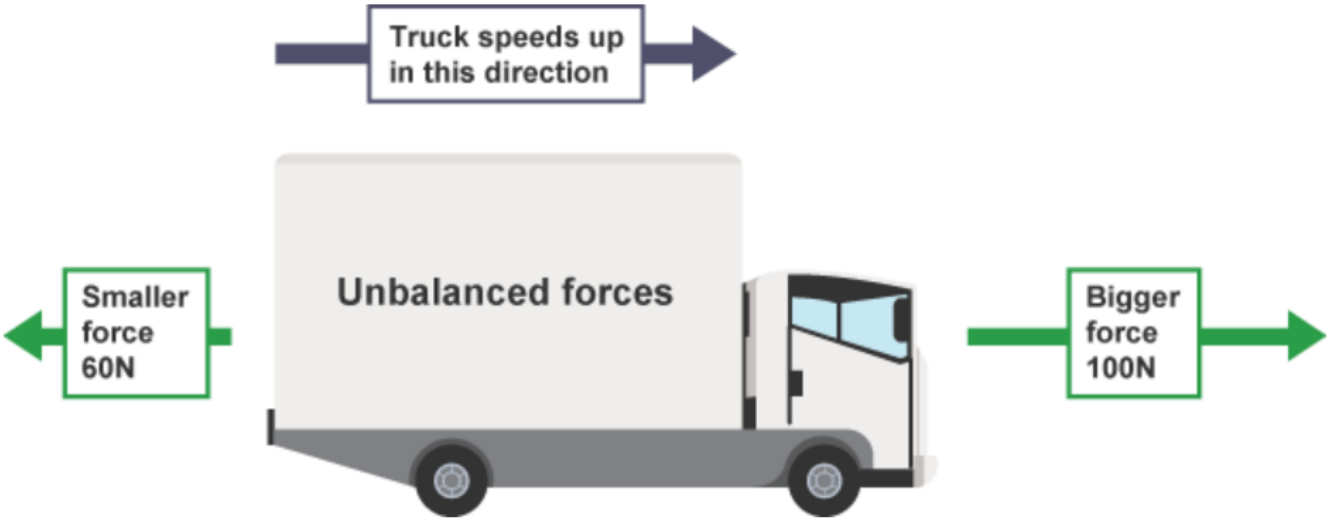
NOTES

Forces are pushes or pulls. They can be balanced or unbalanced. If unbalanced they can change the shape of objects and change the way they are moving. Forces can be grouped into, push, pull or turning forces. An example of a push force could be a person pushing an object such as a pram or trolley. An example of a simple pull force can be seen in a tug of war. And finally, an example of a turning force can be seen when opening a door with a handle or on a see saw. Some examples have both push and pull forces at work, for example a parachutist has the pulling force of gravity to the Earth. The upward push is the force of air resistance, this crucial push force that slows a person's descent and keeps them from smacking into the ground.



When two forces acting on an object are not equal in size, we say that they are unbalanced forces. The overall force acting on the object is called the **resultant force**. If the forces are balanced, the resultant force is zero.
If the forces on an object are unbalanced, this is what happens:

- a stationary object starts to move in the direction of the resultant force
- a moving object changes speed and/or direction in the direction of the resultant force



In this example, we are told the truck is moving forward so to work out the resultant fore we take away the smaller force from the bigger force. 100N – 60N = 40N.

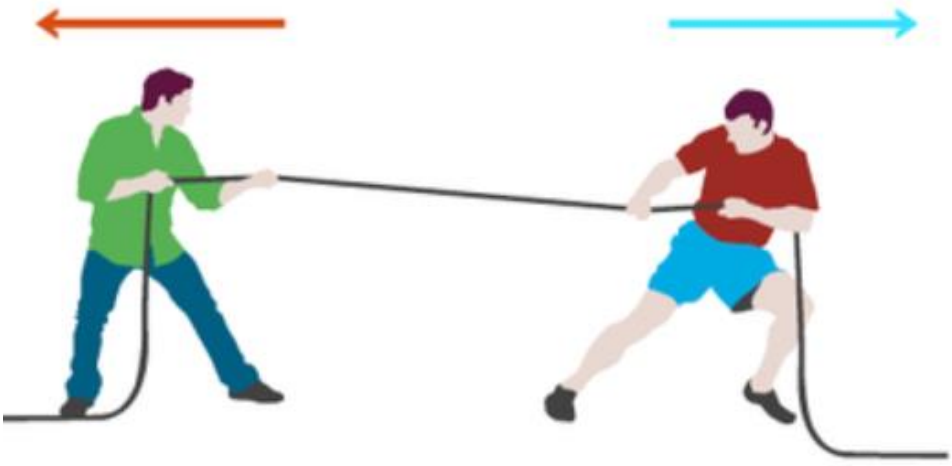
The change in the motion of an object depends upon:

- the size of the resultant force
- the direction of the resultant force

The greater the resultant force, the greater the change in the motion of the object. Whether a moving object speeds up, or slows down, depends on the direction of the resultant force:

- the object speeds up if the resultant force acts in the direction of movement
- the object slows down if the resultant force acts opposite to the direction of movement

If the forces are balanced like in the example below, the object is either stationary or at a constant speed. The size of these forces are either represented by a force reading, such as 100N or the size of the arrow itself. In the tug of war below I can see both arrows are the same size so can assume the forces are balanced and the resultant force is 0.



Another example of this can be seen in this spring experiment. In this experiment, the example to left demonstrates an equilibrium because the forces are balanced. Gravity is pulling downwards on the mass and the spring is pulling upward with the same force. To the right more masses have been added to the spring so now the downward pulling force or gravity is larger and so there must be a resultant force.
It is also possible to achieve equilibrium when an object has multiple different forces acting on it at once. For example, a cyclist travel along a road at a steady speed, the cyclist's legs are the pushing force moving them forward but both air resistance and friction are acting against them. But because they are travelling at a constant speed the total force of the friction and air resistance must be equal to the total pushing force from their legs.