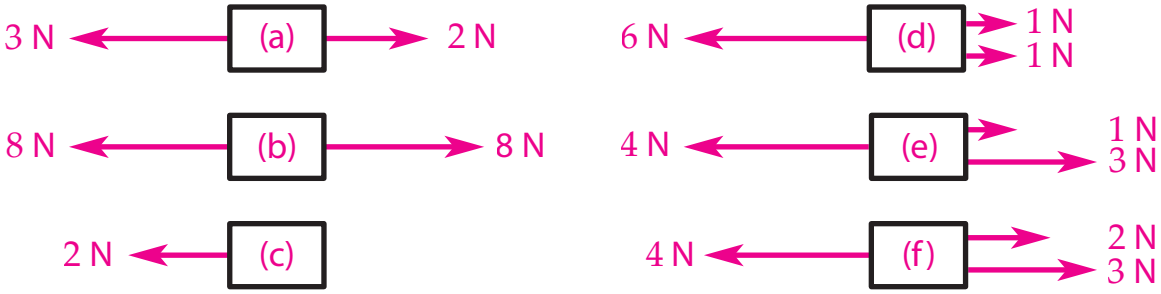
Force and Motion

Forces can be _____ (which means their effects cancel out), or _____.

The forces on these blocks are _____. The ____ force to the left equals the total force to the ____.

1 For each block, decide if the forces are balanced.



If forces are unbalanced, there is a _____. To find the resultant force in a direction, we find the ____ force that way and the ____ force in the opposite direction. The resultant force is the _____ between these totals. It is the single force which has the same effect.

When forces are balanced, the resultant force is ____.

total force to the left _____
total force to the right _____

The resultant force is _____
to the ____.

total force to the left _____
total force to the right _____

The resultant force is _____
to the ___.

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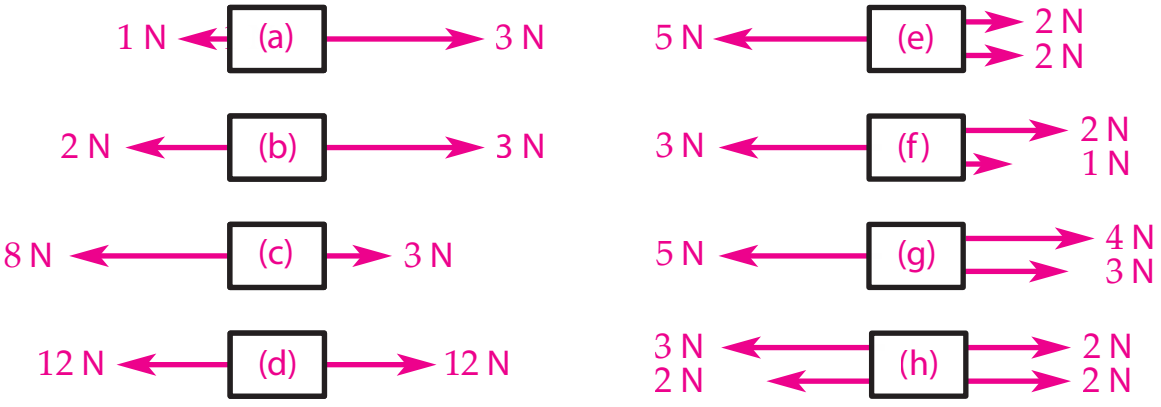
2 What is the resultant force on each block below? For each one give the strength and direction of the resultant force.



3 Add one extra force to each block in question 2 so that the forces on every block are balanced. If the resultant force was already zero, no extra force is needed.

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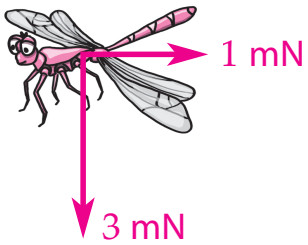
4 The forces on a hovering dragonfly are balanced. Two of the forces (its weight and a force from the wind) are shown. Add two more forces to complete the picture.



The resultant force tells us how an object's motion will change.

- Resultant force **forward** (in the direction of motion) ⇒ Object _____
- Resultant force **backwards** (against motion) ⇒ Object _____
- Resultant force **sideways** ⇒ Object _____

5 A penguin is falling. Draw the direction of the resultant force needed
(a) to make the penguin fall faster, (b) to make the penguin fall slower.

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6 Match the forces with their directions. **Forwards** means **in the direction of motion**, and **backwards** means **against the motion**.

What the force is doing		**Direction**
A motor speeding up a model car.		left
A parachute slowing a skydiver.		backwards
A football being stopped by a goalkeeper.		forwards
A propeller turning a drone to the left.		upwards

If the forces are balanced, there is _____.

- If the object is **still**, it _____
- If the object is _____, it _____ with a _____ speed in a _____.

7 Fill in the table to say what will happen to each object. Choose your answers from **speeds up**, **slows down**, **stays still**, **steady speed in a straight line**, **changes direction**.

Object and motion	**Relevant force(s)**	**What happens**
Cat lying on floor	weight = support force	
Rock moving in deep space	no forces	
Planet in circular orbit	gravity force towards star	
Bus at 50 km/h	engine force = friction	
Driver takes foot off accelerator	engine force < friction	
Egg falling to the floor	weight > drag	
Ball just after being thrown upwards	weight	

8 Complete the force diagrams to show the driving as well as drag forces on a cyclist. Use longer arrows for stronger forces.

(a) speeding up

(b) at steady speed

(c) slowing down

9 A leaf falls off a tree. Choosing from the options below, what happens to it when

speeds up **falls at steady speed** **slows down**

(a) it has just started falling,

(b) it is falling slowly (there is very little drag),

(c) falling at a higher speed where drag and weight are balanced,

(d) it hits the ground?