Forces can be _____ (which means that they cancel out), or _____ .

2 N ← [ ] → 2 N   4 N ← [ ] → 2 N
                                      → 2 N

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.

3 N ← (a) → 2 N   6 N ← (d) → 1 N
                                   → 1 N

8 N ← (b) → 8 N   4 N ← (e) ↗ 1 N
                                   → 3 N

2 N ← (c)   4 N ← (f) ↗ 2 N
                                   → 3 N
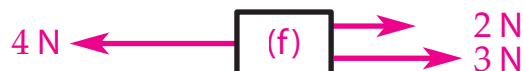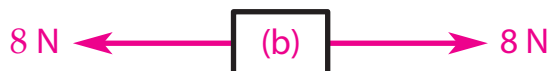
If forces are unbalanced, there is a _____ . To find the resultant force, we find the _____ force to the left and the _____ force to the right. The resultant force is the _____ between these totals. It is the single force which does the same job.

When forces are balanced, the resultant force is _____ .

2 N ← [ ] → 6 N   2 N ← [ ] → 3 N
                         2 N ←

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

   The resultant force is _____   The resultant force is _____
            to the _____ .   to the ___ .

---

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

1 N ← (a) → 3 N   5 N ← (e) → 2 N
                                   → 2 N

2 N ← (b) → 3 N   3 N ← (f) → 2 N
                                   ↘ 1 N

8 N ← (c) → 3 N   5 N ← (g) → 4 N
                                   → 3 N

12 N ← (d) → 12 N   3 N ← (h) → 2 N
                         2 N ←   → 2 N
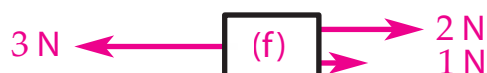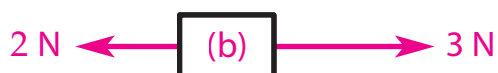
3   Add one extra force to each block in question 2 so that the forces on every block are balanced.

4   The forces on a hovering dragonfly are balanced. Two of the forces are shown. Add two more forces to complete the picture.

1 mN

3 mN
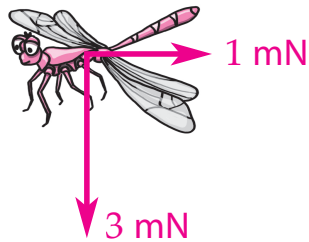
The resultant force tells us how an object's motion will change.
- Resultant force **forward** (in the direction of motion) ⇒ Object _____
- Resultant force **backwards** (against motion) ⇒ Object _____
- Resultant force **sideways** ⇒ Object _____

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.

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

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**, **turns**.

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
     (a) speeding up   (b) at steady speed   (c) slowing down

Drag   Drag   Drag

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?