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 _____ .

We can add up the forces on each object, counting right as positive and ____ as _____ . In each case, the total is _____ . This total is called the _____ . It is the single force which does the same job.

The forces on the blocks below are _____ , and do not cancel out.

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

Resultant force _____   Resultant force _____

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1   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 ← / 2 N ← (h) → 2 N / → 2 N

2   Add one extra force to each block above so that the forces on every block are balanced.

3   The forces on a hovering dragonfly are balanced. Two of the forces are labelled. Add two forces to complete the picture.

1 mN

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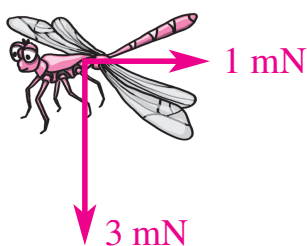
The resultant force tells us how an object's motion will change.
- Resultant force **forward** (in the direction of motion) $\Rightarrow$ Object _____
- Resultant force **backwards** (against motion) $\Rightarrow$ Object _____
- Resultant force **sideways** $\Rightarrow$ Object _____

If the forces are balanced, there is _____.
- If the object is **still**, it _____
- If the object is _____, it _____ with a _____ speed in a _____.

4   Fill in the table to say what will happen to each object. Choose your answers from **speeds up, slows down, stays still, steady speed, 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 dropped on floor	weight $>$ drag	
Ball just after being thrown upwards	weight	

5   Complete the force diagrams to show the driving and drag forces on a cyclist
     (a) speeding up   (b) at steady speed   (c) slowing down

6   A leaf falls off a tree. What happens to it (does it speed up, slow down or fall at steady speed, and why) when

     (a) it has just started falling,

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

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

     (d) it hits the ground?