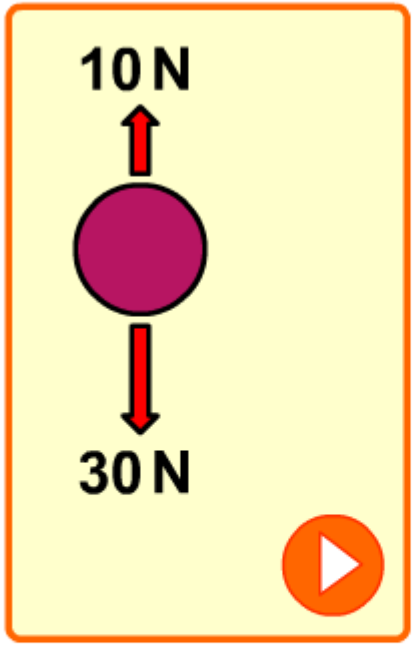
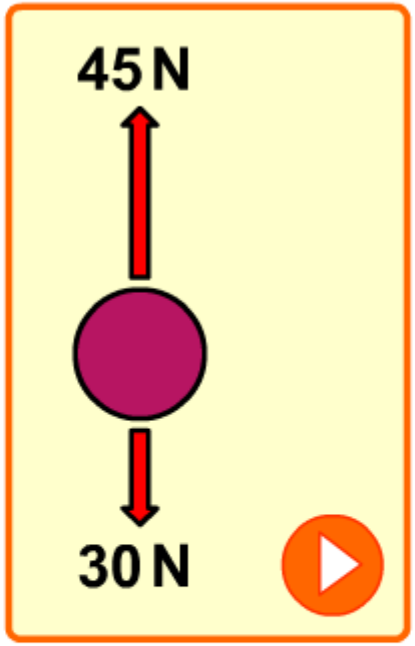
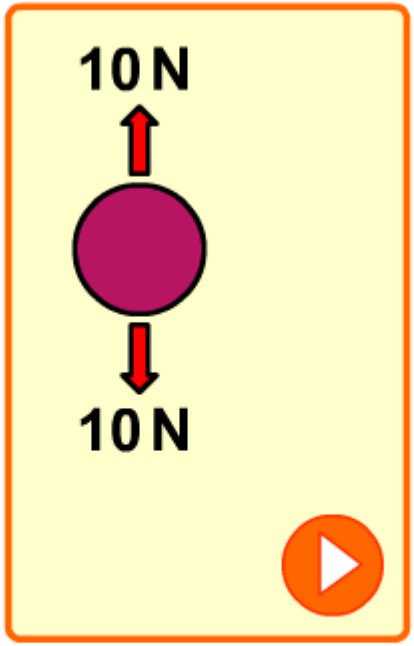
Calculating Resultant Forces

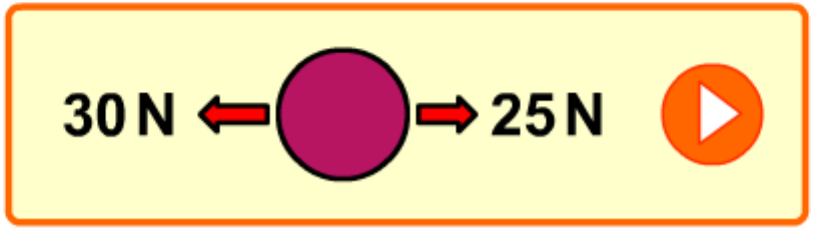
Force pairs

What is the effect of each pair of forces?





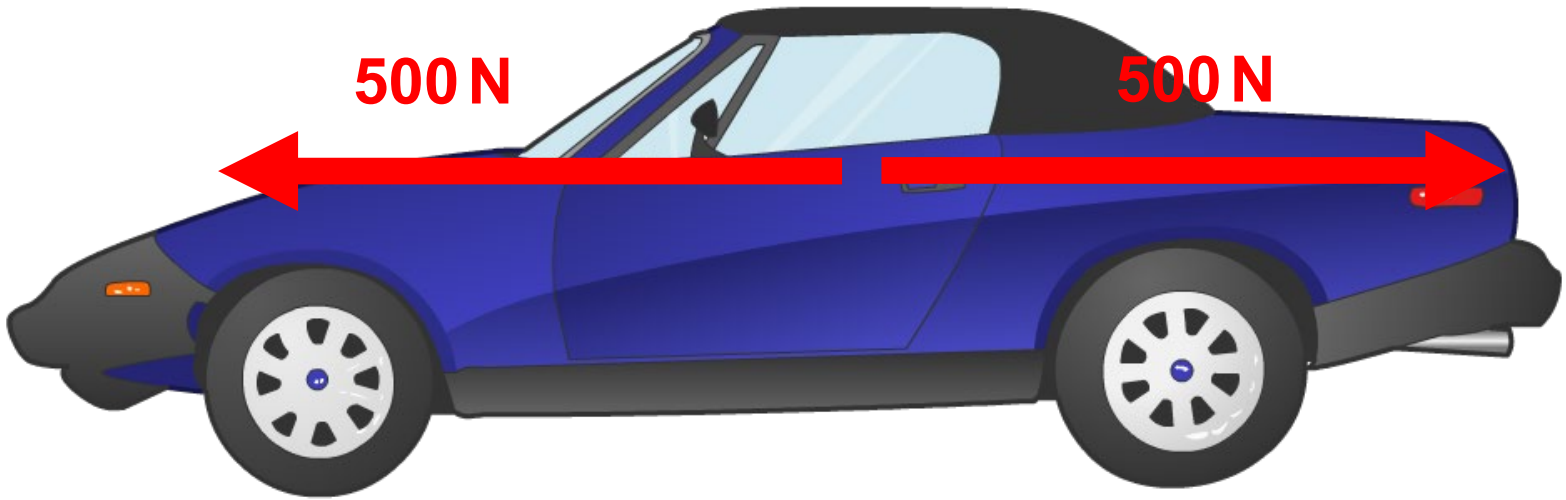




Balanced and unbalanced forces

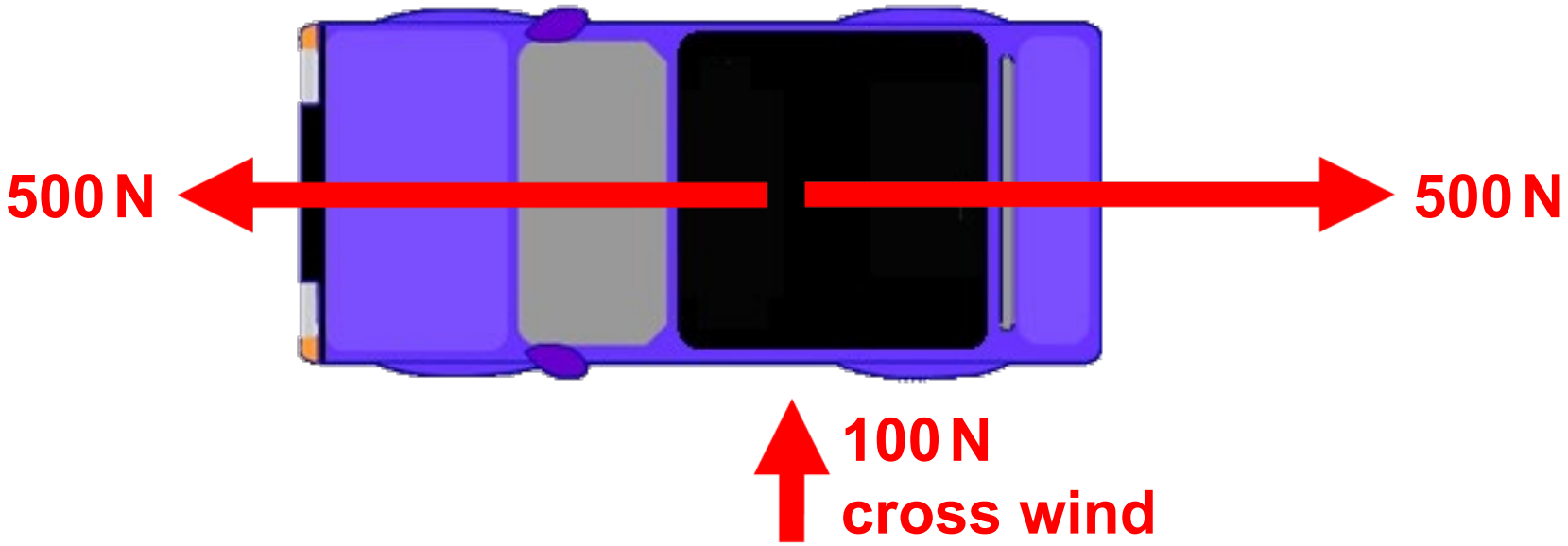
Imagine a car traveling at a constant speed of 50 km/h.

The engine provides sufficient force to balance all the frictional forces that are acting to decrease the speed.



Balanced and unbalanced forces

A crosswind acting on the car produces a sideways force.



The crosswind causes the direction of the car to change – this happens because the sideways forces on the car are not balanced. The car will veer sideways.

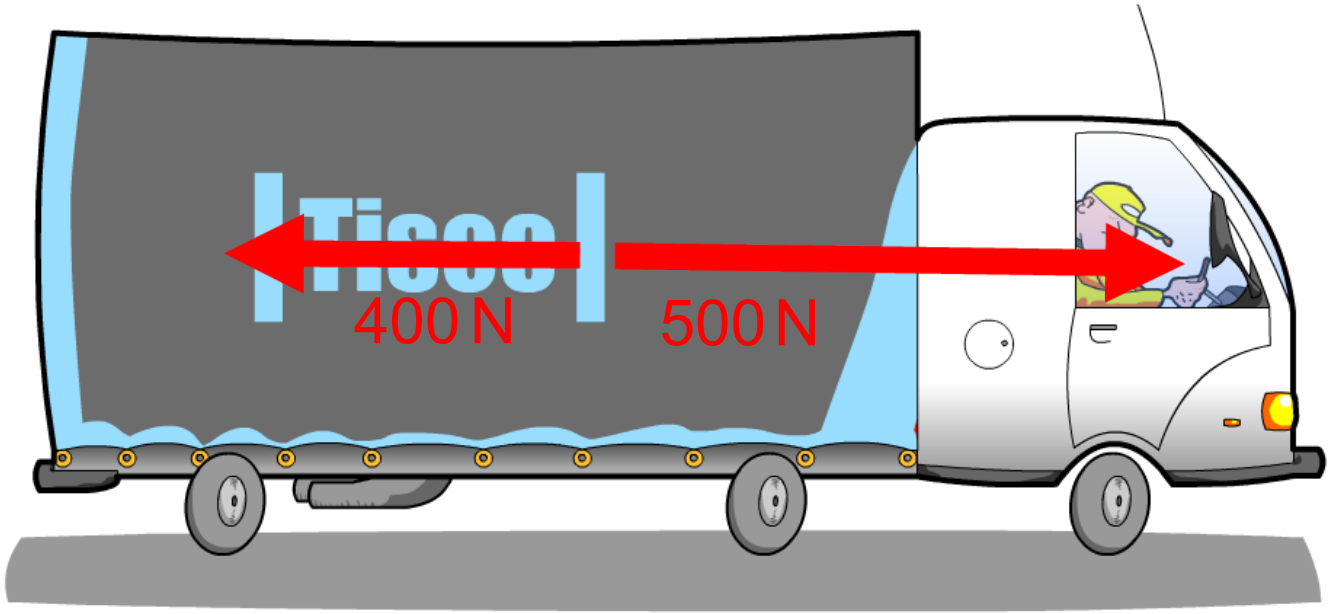
If the car turns right so that the wind is now **behind** the car, what will happen to the speed?

Resultant force

The sum effect of more than one force is called the **resultant force**.

The resultant force is calculated by finding the difference between opposing forces in each direction.
What is the resultant force on this truck?

A resultant force of 100 N is accelerating the truck.



Balanced and unbalanced forces – summary

If the forces on an object are **balanced**:

- and the object is **stationary, it will remain stationary**
- and the object is **moving, it will continue** to move at the same speed and in a straight line.

In other words, the object will continue to do what it is already doing without any change.

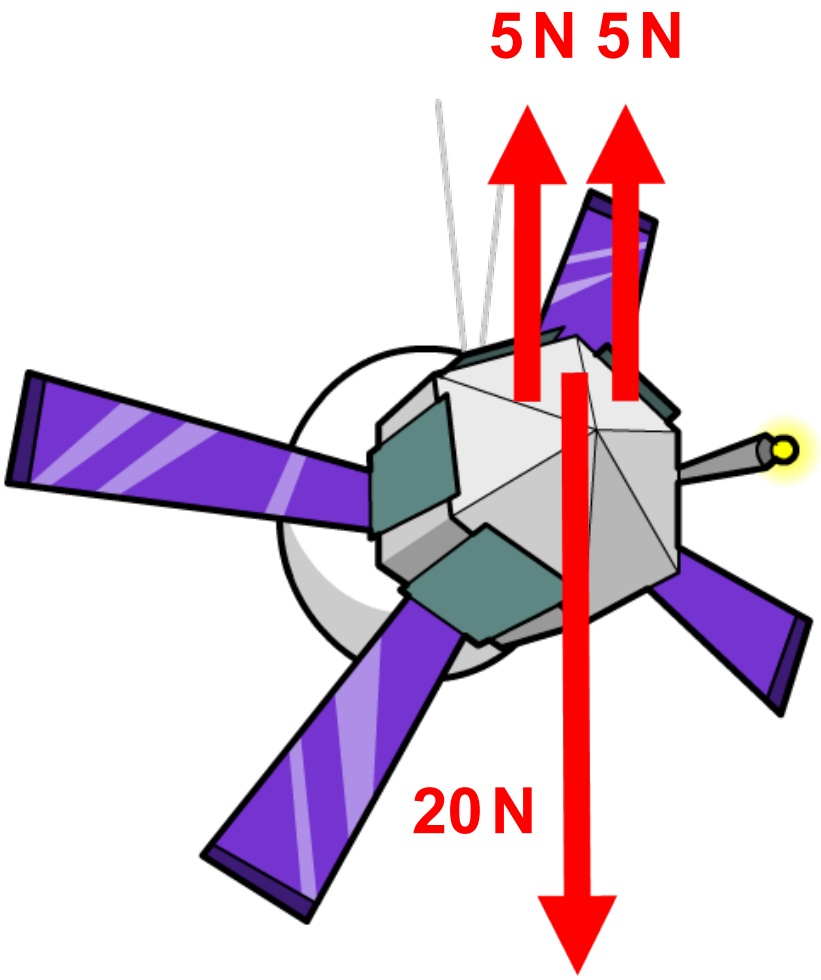
If the forces are **unbalanced**, two things can happen:

- The **speed can change**. This is called **acceleration**.
- The **direction** of motion **can change**.

Resultant forces – question 1

1. What is the resultant force on the satellite?

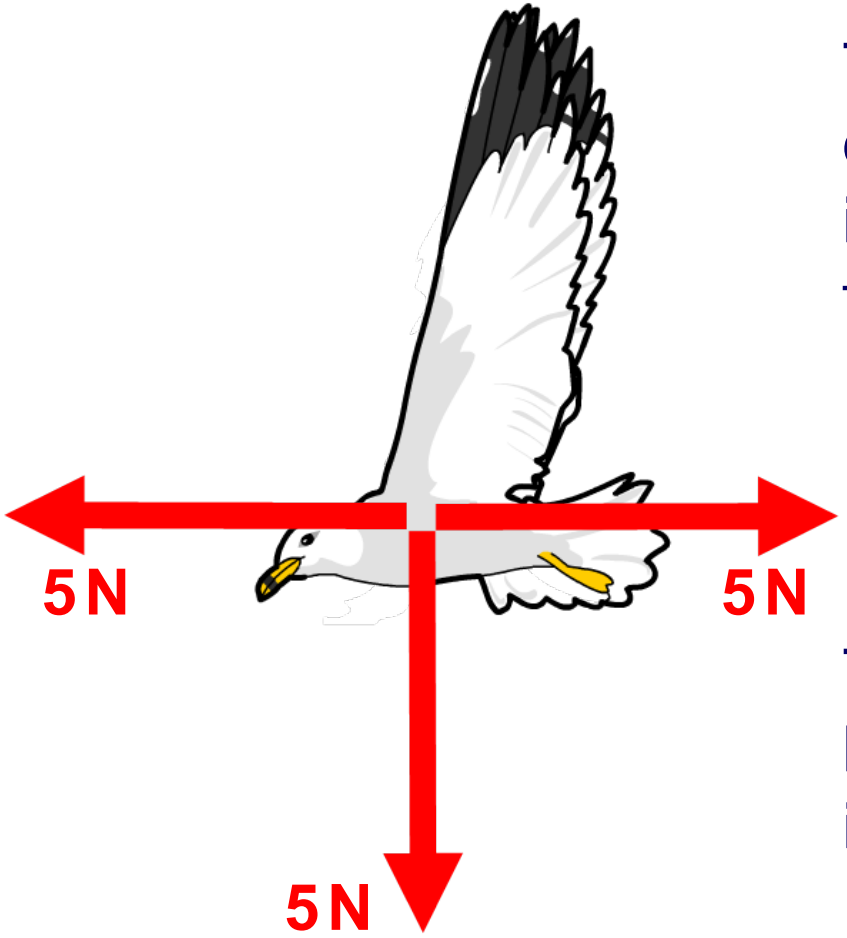
Resultant force = 20 N – 10 N
= **10 N down**



The satellite will accelerate downwards.

Resultant forces – question 2

2. What is the resultant force on the bird?



The forces acting in each direction horizontally are equal in size, so there is no resultant force in this direction.

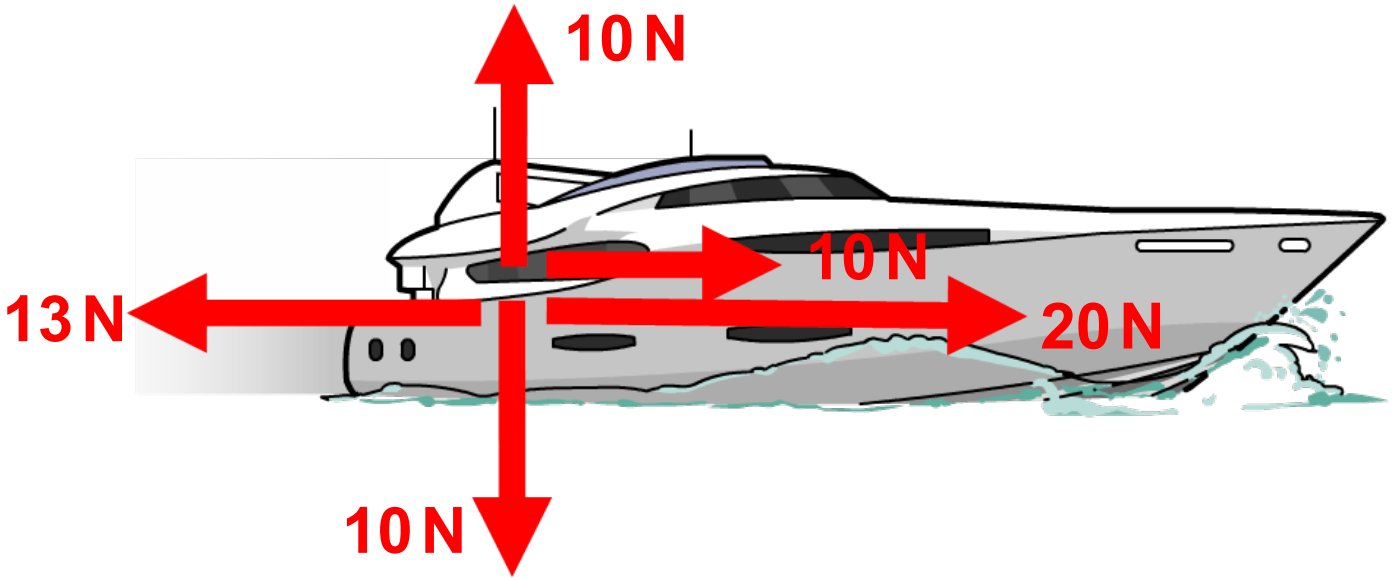
Resultant force = 5 N – 5 N = **0 N**

The vertical forces are not balanced, the bird will accelerate in a downwards direction.

Resultant force = 5 N – 0 N
= **5 N down**

Resultant forces – question 3

3. What is the resultant force on the yacht?



The vertical forces are equal in size and opposite in direction so there is no resultant force in the vertical direction.

The horizontal forces are not balanced, so the yacht will accelerate to the right.

Resultant force = (20 N +10 N) – 13 N

= **17 N right**