09.Resultant Force.

- When more than one force is applied, the single force that gives the same result as that of all the contributing forces is known as the **resultant force** of the individual contributing forces.

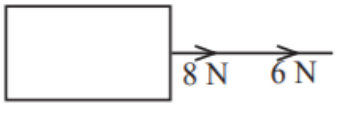
Resultant of two collinear forces.

- **Resultant of two collinear forces acting along the same direction.**

- **When two collinear forces act along the same direction, the resultant of the two forces is equal to the sum of the two individual forces with a direction in the direction of forces.**

Example 1

Two children are pulling a thread connected to a box placed on a table in the same direction. The force applied by one child is 8 N while that of the other child is 6 N. What is the resultant force with which the children are pulling the box?



The resultant force applied by both children = 8 N + 6 N

= 14 N (To the same direction)

Resultant of two collinear forces acting along opposite directions

- **When two collinear forces are exerted on an object in opposite directions, the resultant is given by their difference, with a direction in the direction of larger force.**

Example 1

What is the magnitude and the direction of the resultant of a force of 5 N pulling an object placed on a table in a certain direction and another force of 2 N pulling it in the opposite direction?

$$\text{Resultant force} = (5\ \text{N}) + (-2\text{N})$$
$$= 3\ \text{N}$$

The object will be pulled by a force of 3 N in the direction of the 5 N force.

Resultant of two parallel forces

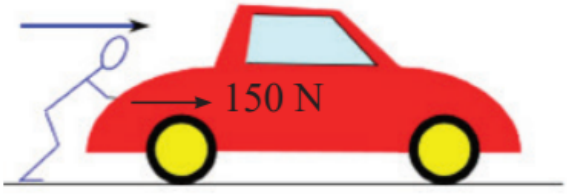


Figure 9.8 – One person trying to push a motor car

One person is trying to push a motor car with a force of 150 N in the direction as shown in Figure 9.8, but it has not moved.

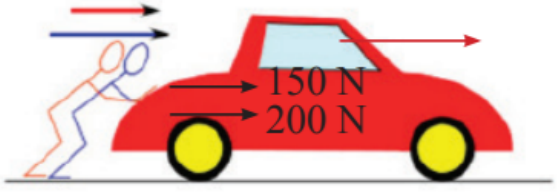
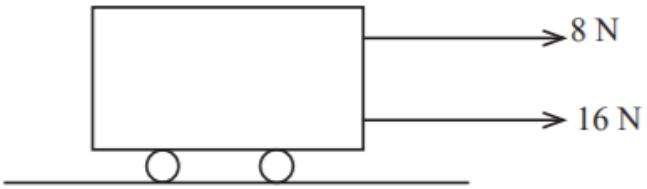


Figure 9.9 – Two persons pushing the car

However, when the assistance of another person pushing the car with a force of 200 N was obtained and the car was pushed by both persons, in the direction shown the car moved. It was because the resultant of the two forces is

- **In order to find the resultant of two parallel forces acting along the same direction, the two forces must be added.**

Example 1



Two strong strings attached to a trolley is pulled by a force of 8 N on one string and a force of 16 N on the other string keeping the two strings parallel. Find the resultant of these two forces.

Resultant of the two forces = 8 N + 16 N
= 24 N

Summary

- The single force acting in place of many forces (the single force that gives the same result as many forces) is known as the resultant force.
- The magnitude of the resultant of two forces acting in the same direction is the sum of the two forces. Direction of the resultant is the direction of an individual forces.
- If the magnitudes of two collinear forces acting in opposite directions are different, then the magnitude of their resultant is equal to the difference between the two forces and acts in the direction of the larger force.
- The resultant of two inclined forces act in a direction which lies between the two forces.