Physics · Mechanics · Worked solutions

Resultant forces

1. Two forces of 7 N and 9 N act east. State the resultant with its direction.

Add the forces acting in the same direction: 16 N east.

2. A 12 N force acts left and 5 N acts right. Calculate the resultant.

12 − 5 = 7 N left.

3. Two 18 N forces act in opposite directions. Find the resultant and explain your answer.

The forces are equal and opposite. Their vector sum is 0 N.

4. Find the resultant force required to accelerate a 6 kg crate at 2.5 m/s².

F = ma = 6 × 2.5 = 15 N.

5. A 9 N resultant acts on a 3 kg trolley. Find its acceleration.

a = F/m = 9 ÷ 3 = 3 m/s².

Worked solutions · Questions 6–10

6. A driver pushes a crate east with 60 N and friction acts west with 20 N. Find the acceleration if the mass is 10 kg.

Resultant = 60 − 20 = 40 N east. Acceleration = 40 ÷ 10 = 4 m/s² east.

7. A 20 N resultant force produces an acceleration of 0.8 m/s². Calculate the mass.

m = F/a = 20 ÷ 0.8 = 25 kg.

8. A 9 kg trolley accelerates right at 2 m/s² when pushed right by 26 N. Calculate the opposing resistance.

The resultant is 9 × 2 = 18 N right. Resistance = 26 − 18 = 8 N left.

9. A cyclist moves east at steady velocity while driving force is 130 N. Find the total resistance and explain.

Steady velocity means zero acceleration and zero resultant force. The resistance is 130 N west to balance the driving force.

10. A 3 kg box has a 30 N force to the right and a 12 N force to the left. A second leftward force is added so it accelerates left at 2 m/s². Find that added force.

Take right as positive. Required resultant = 3 × (−2) = −6 N. Solve 30 − 12 − F = −6 to get 24 N left.