SCIENCE FOUNDATIONS

Net force

Difficulty level: Intermediate

Science Foundations

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Overview of the concept

This is how you work out which way a tug-of-war rope moves, or whether a pushed shopping cart speeds up, slows down, or keeps rolling steadily. A rope moves toward the team pulling harder, because the pushes do not cancel out. A cart rolling at a steady speed has pushes that balance, even though it is still moving. Knowing net force tells you that motion changes only when the pushes do not balance, and which way the change will go.



Rule

Net force = $F_1 + F_2 + \ldots$, the sum of all the forces acting on an object, with opposite directions cancelling.

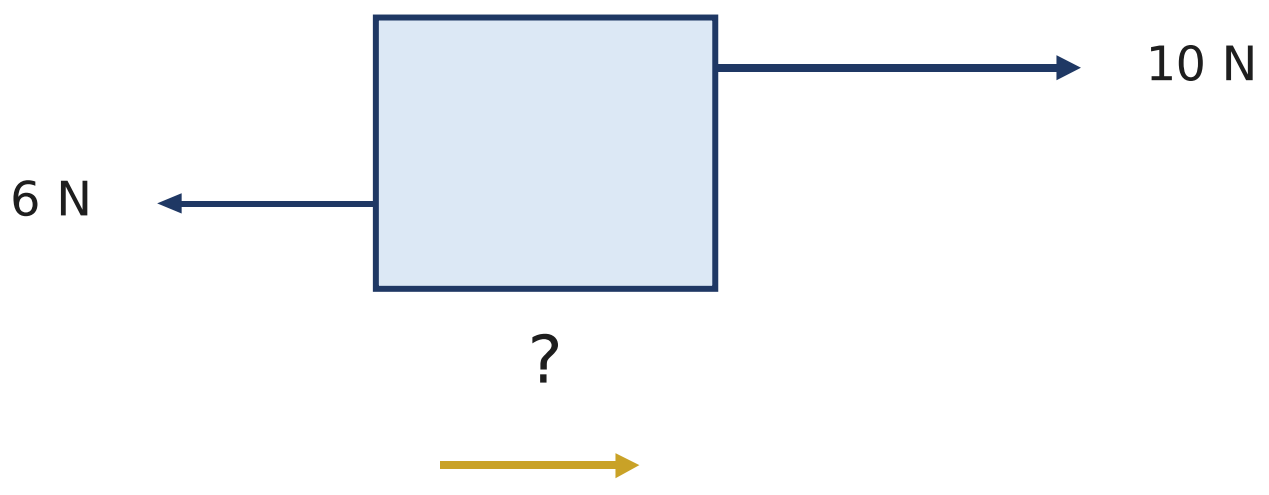
Zero net force means zero acceleration, so a still object stays still and a moving object keeps moving at the same velocity.

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Worked examples

EXAMPLE 1

Q Two pushes on a box: 10 N right and 6 N left. Net force?



SOLUTION

Place both on one line: right positive, left negative.

Add:

10 + (-6) = 4 N

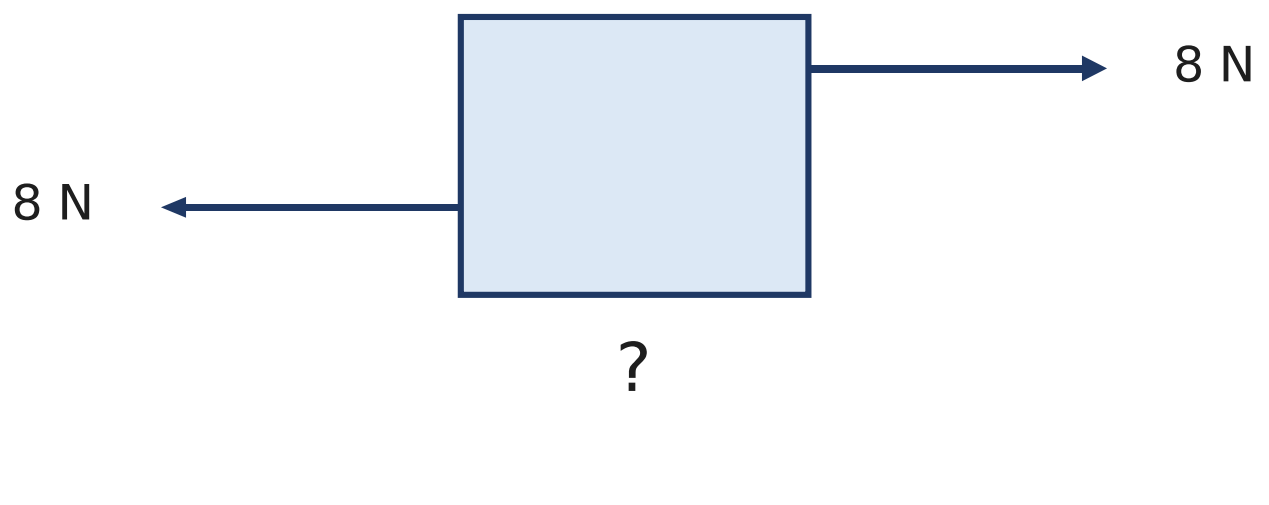
State size and direction.

The result is net force 4 N right.

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EXAMPLE 2

Q Two pushes: 8 N right and 8 N left. Net force?



SOLUTION

Place both on one line: right positive, left negative.

Add:

8 + (-8) = 0 N

State the result: no net force, no acceleration.

The result is net force 0 N.

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Practice questions

1 9 N right, 4 N left: net force?

- **A** 13 N right
- **B** 5 N right
- **C** 5 N left
- **D** 9 N right

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2 6 N east, 6 N west: net force?

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3 10 N right, 5 N right: net force?

- A 5 N right
- B 15 N left
- C 15 N right
- D 10 N right

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4 Net force definition?

- A Sum of all masses
- B Largest single force
- C Average of all forces
- D Vector sum of all forces

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Zero net force means what acceleration?

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6

Forces of 5 N right, 3 N right and 2 N left act on a box. What is the net force?

A 6 N right

B 10 N right

C 4 N right

D 0 N

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7 Net force 0 and moving: what happens?

A Stops at once

B Keeps moving at steady velocity

C Speeds up

D Slows down

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8 Which direction wins in opposite forces?

A The smaller force

B Neither force

C The larger force

D Both forces equally

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9

A box has a net force of 8 N east. What happens to the box?

A It stays still

B It accelerates east

C It moves west at a steady speed

D It stops

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10

Is net force a vector?

A Yes

B No

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ANSWER KEY

1. 5 N right

2. 0 N

3. 15 N right

4. Vector sum of all forces

5. 0

6. 6 N right

7. Keeps moving at steady velocity

8. The larger force

9. It accelerates east

10. Yes

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