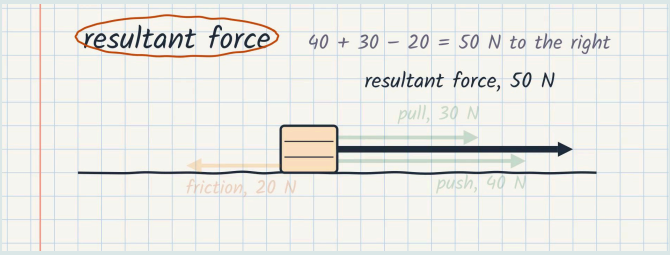
Resultant forces

adding forces, balanced forces, diagrams

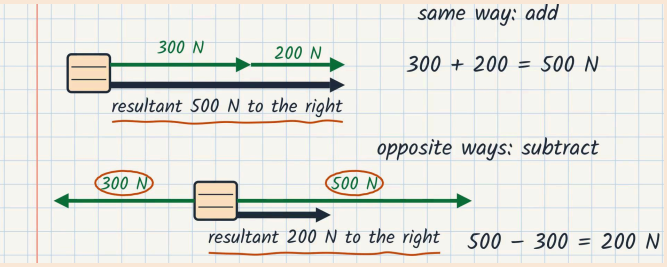
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Summary sheet

1 The resultant force



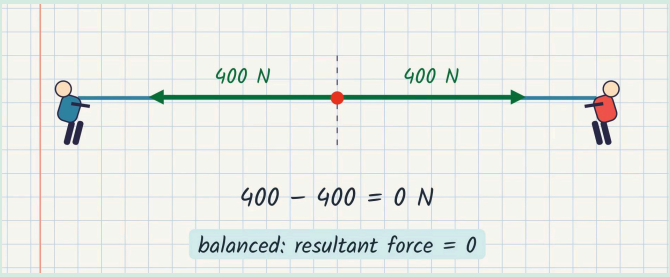
- Most objects have several forces on them. The **resultant force** is the one force that has the **same effect as all of them together**.

2 Forces in a line



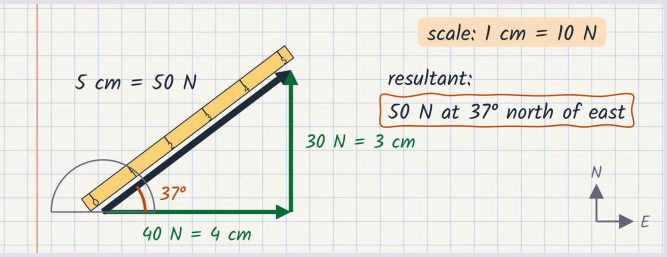
- Same direction: **add**. 300 N + 200 N to the right = **500 N to the right**.
- Opposite directions: **take the smaller from the larger**; the resultant points the way of the larger. 500 N right, 300 N left = **200 N to the right**.

3 Balanced forces



- 400 N each way: 400 − 400 = 0. When the resultant force is **zero**, the forces are **balanced**.
- If one pull drops (400 N vs 300 N), the forces are **unbalanced**: a resultant of 100 N, so things move.

4 Diagrams (Higher)



- **Free body diagram**: one object on its own, every force on it as an arrow (book: weight 5 N down, normal contact force 5 N up).
- **Resolving**: split a force into two parts at right angles. **Scale drawing**: draw the forces tip to tail (e.g. 1 cm = 10 N); the resultant runs from the start of the first to the tip of the second. Measure its length and angle: 40 N + 30 N at right angles = **50 N at 37°**.

Exam tip
A resultant force is a vector: give its size AND its direction. "200 N to the right" scores; "200 N" may not.

Check yourself

- 1 A car: driving force 2000 N forwards, resistive force 800 N backwards. Resultant force?
- 2 What is the resultant force when forces are balanced?

Answers: 1. 1200 N forwards 2. Zero (0 N)