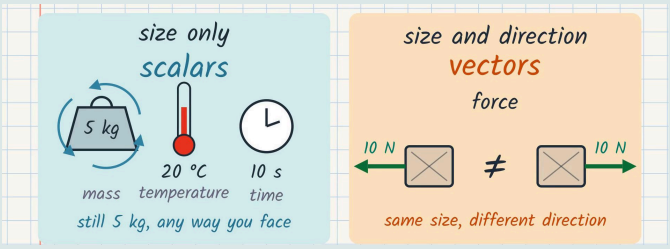
Forces, scalars and vectors

size, direction, and the two kinds of force

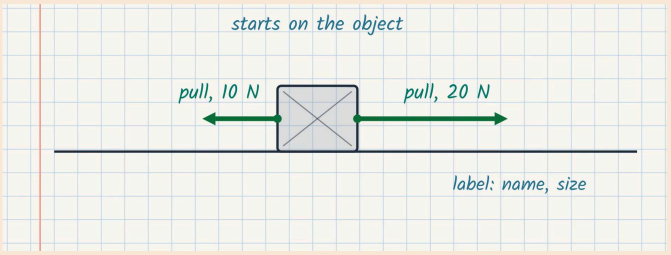
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Summary sheet

1 Scalars and vectors



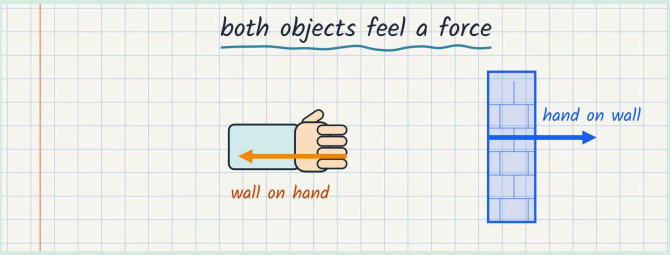
- **Scalars** have size only: mass, temperature, time. 5 kg is 5 kg whichever way you face.
- **Vectors** have size and direction. **Force is a vector**: 10 N to the left is not the same as 10 N to the right.

2 Arrows



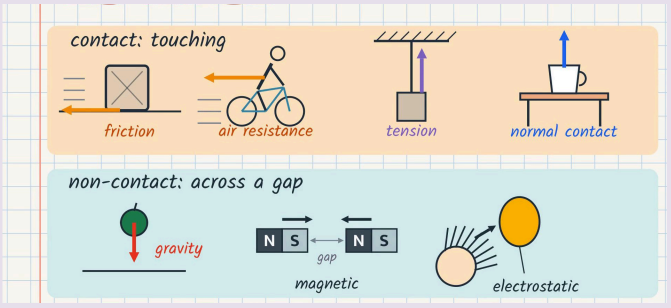
- Draw a vector as an **arrow**: its **length shows the size**, the way it **points shows the direction**. With 1 cm = 5 N, 10 N is 2 cm and 20 N is 4 cm.
- Every force arrow **starts on the object it acts on** and has a label: **name, size**.

3 Forces



- A **force** is a push or a pull on an object. It always comes from an **interaction** with another object.
- **Both objects feel a force**: push a wall and the wall pushes back on your hand. Each force acts on a different object.

4 Contact or not



- **Contact** forces need touching: friction, air resistance, tension, normal contact force.
- **Non-contact** forces act across a gap: gravity, magnetic, electrostatic. Gap test: would it still act across a gap? Yes means non-contact.

Exam tip
Always give a vector's direction as well as its size: 10 N is half an answer; 10 N to the left is the whole answer.

Check yourself

- 1 Is speed a scalar or a vector? And is force?
- 2 Is the force between two magnets a contact or a non-contact force?

Answers: 1. Speed is a scalar. Force is a vector. 2. Non-contact.