

Forces Scalars Vectors

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Sort these into scalars and vectors: speed, displacement, mass, force, energy, acceleration. (3 marks)

Step 1 · Scalars (magnitude only)

Speed, mass, energy.

Step 2 · Vectors (magnitude and direction)

Displacement, force, acceleration.

Answer: Scalars: speed, mass, energy. Vectors: displacement, force, acceleration

Check: Ask: does it make sense to say which way? If so, it is a vector.

2. Now try one with the steps

Calculate the weight of a 5.0 kg bag of potatoes on Earth. $g = 9.8 \text{ N/kg}$. (2 marks)

Step 1 · Write the equation

Step 2 · Substitute and calculate

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Describe the difference between a scalar and a vector quantity. [2]

2. Give two examples of scalar quantities and two examples of vector quantities. [2]

3. Describe the difference between contact and non-contact forces, with one example of each. [2]

4. Calculate the weight of a 5.0 kg object on Earth. $g = 9.8 \text{ N/kg}$. [2]

5. Explain the difference between mass and weight. [3]

6. Name the instrument used to measure weight. [1]

7. The mass of an object is doubled. State what happens to its weight. [1]

8. An 80 kg astronaut stands on the Moon, where $g = 1.6 \text{ N/kg}$. Calculate the astronaut's weight. [2]

9. A person has a weight of 735 N on Earth. Calculate their mass. $g = 9.8 \text{ N/kg}$. [2]

10. Describe what is meant by the centre of mass of an object. [1]

11. Explain why velocity is a vector but speed is a scalar. [2]

12. A Mars rover has a mass of 900 kg. Calculate its weight on Mars, where $g = 3.7 \text{ N/kg}$. [2]

13. Explain why an astronaut's weight is less on the Moon than on Earth, even though their mass is the same. [2]

14. A rock weighs 49 N on Earth ($g = 9.8 \text{ N/kg}$). Calculate its weight on Jupiter, where $g = 25 \text{ N/kg}$. [3]

4. Before you hand it in

"My weight is 60 kg."

Your mass is 60 kg. Your weight on Earth is about $60 \times 9.8 = 588 \text{ N}$.

"On the Moon your mass is smaller."

Mass stays the same everywhere; weight changes with the gravitational field strength.

Calling distance a vector

Distance is a scalar; displacement (distance in a stated direction) is a vector.

"Gravity is a contact force because it pulls you onto the ground."

Gravity is a non-contact force; it acts on objects in the air too. The push of the ground on you is the contact force.