

Exercise walk-through

1.3

Mass and weight

IGCSE Physics

1.3 Mass and weight

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

- KEY WORDS**
- gravitational field strength
 - mass and weight
 - mass
 - weight
 - matter

Objective

Build the skills to answer exam questions on **mass and weight** – the difference between them, $F_W = mg$, and **gravitational field strength** .

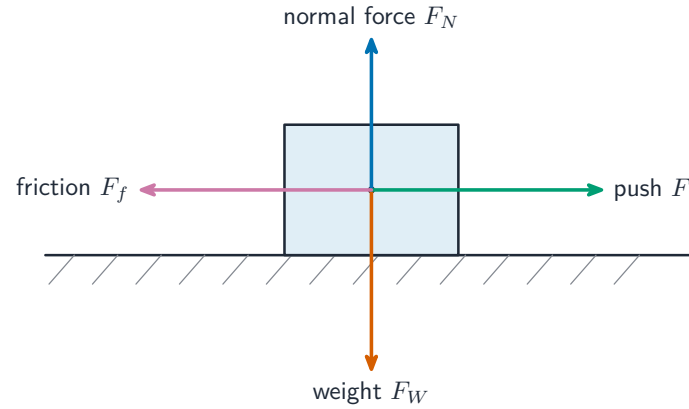
You must be able to:

- distinguish mass (kg, constant) from weight (N, depends on gravity)
- use $F_W = mg$ and $g = \frac{F_W}{m}$

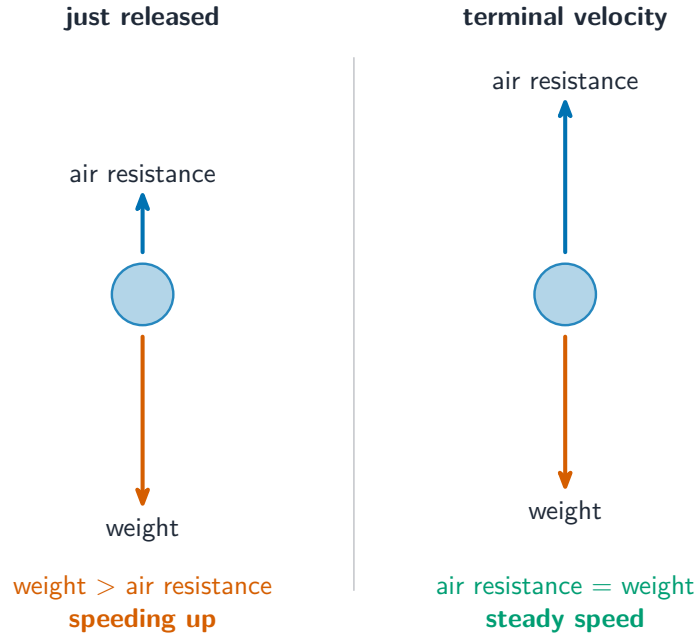
- explain why weight differs on the Moon

1 Key knowledge and worked examples

■ Mass vs weight



Weight is the downward force of gravity on a mass: $F_W = mg$



Weight is the downward force, balanced by drag at terminal velocity

- **mass** = amount of matter (kg), the **same** everywhere.
- **weight** = force of gravity (N); $F_W = mg$; smaller on the Moon (weaker gravity).
- **gravitational field strength** $g = \frac{F_W}{m}$ (≈ 10 N/kg on Earth).

Exercises 2.1·2.2

2.1 Find the weight of a 6.0 kg bag on Earth ($g = 10 \text{ N/kg}$). [2]

2.2 State the unit of weight and the unit of mass. [1]

Exercises 2.1·2.2

2.1 Find the weight of a 6.0 kg bag on Earth ($g = 10 \text{ N/kg}$). [2]

2.1

- $F_W = mg$

$$F_W = mg = (6.0 \text{ kg})(10 \text{ N/kg}) = \mathbf{60 \text{ N}}$$

2.2 State the unit of weight and the unit of mass. [1]

2.2

- weight in newtons (N); mass in kilograms (kg)

Exercise 3.1

3.1 When an astronaut goes to the Moon, their:

[1]

☐

A mass and weight both decrease

B mass stays the same but weight decreases

C mass decreases but weight stays the same

D mass and weight both stay the same

Exercise 3.1

3.1 When an astronaut goes to the Moon, their:

[1]

☐

A mass and weight both decrease

B mass stays the same but weight decreases

C mass decreases but weight stays the same

D mass and weight both stay the same

3.1 B

- mass is unchanged; weight is less because the Moon's gravity is weaker

Exercise 3.2 (a)

3.2 An object has a weight of 48 N on Earth, where $g = 10 \text{ N/kg}$.

(a) Find its mass.

[2]

Exercise 3.2 (a)

3.2 An object has a weight of 48 N on Earth, where $g = 10 \text{ N/kg}$.

(a) Find its mass.

[2]

(a) $m = F_W / g$

$$m = \frac{F_W}{g} = \frac{48 \text{ N}}{10 \text{ N/kg}} = \mathbf{4.8 \text{ kg}}$$

Exercise 3.2 (b)

3.2 An object has a weight of 48 N on Earth, where $g = 10 \text{ N/kg}$.

(b) Find its weight on the Moon, where $g = 1.6 \text{ N/kg}$.

[2]

Exercise 3.2 (b)

3.2 An object has a weight of 48 N on Earth, where $g = 10 \text{ N/kg}$.

(b) Find its weight on the Moon, where $g = 1.6 \text{ N/kg}$. [2]

(b) $F_W = mg$

$$F_W = mg = (4.8 \text{ kg})(1.6 \text{ N/kg}) = \mathbf{7.7 \text{ N}}$$

Exercise 3.3

3.3 Explain why mass does not change when an object is taken to the Moon, but weight does. [2]

Exercise 3.3

3.3 Explain why mass does not change when an object is taken to the Moon, but weight does. [2]

3.3

- mass is the amount of matter, which does not change with location
- weight is the force of gravity, which is smaller on the Moon because its gravitational field strength is weaker