

Worksheet 2.3: Force & Acceleration ($F = m \times a$)

Specification: GCSE Physics (AQA 4.5.6.2 / Edexcel SP12 / OCR Gateway)

PhysicsSheets

Core Equation: $F = m \times a$

Rearranged Forms: $m = \frac{F}{a}$ | $a = \frac{F}{m}$

Units: Force (F) in Newtons (N) | Mass (m) in kilograms (kg) | Acceleration (a) in metres per second squared (m/s^2)

Section A: Formula Recall & Unit Conversions

1. Complete the table below with the correct SI unit and symbol for each variable in the formula $F = m \times a$.

Variable	Unit Name	Unit Symbol
Force (F)	_____	_____
Mass (m)	_____	_____
Acceleration (a)	_____	_____

2. Rearrange the formula $F = m \times a$ to make the following variables the subject:

a) Mass (m): $m =$ _____

b) Acceleration (a): $a =$ _____

3. Perform the following unit conversions. Show your working where appropriate.

a) Convert 500 g to kilograms (kg).

b) Convert 2.5 kN to Newtons (N).

c) Convert 36 km/h to metres per second (m/s).

d) Convert 250 cm/s^2 to metres per second squared (m/s^2).

Section B: Practice Calculations

Remember to show your working, including the equation, substitution, and final answer with units. Avoid premature rounding.

4. A car with a mass of 1200 kg accelerates at 2.5 m/s^2 .

a) Calculate the resultant force acting on the car.

b) A different car experiences a resultant force of 4500 N and has a mass of 1500 kg. Calculate its acceleration.

- c) A rocket engine produces a thrust (force) of 15 kN and causes the rocket to accelerate at 5.0 m/s^2 . Calculate the mass of the rocket in kilograms.

- d) A cyclist and their bicycle have a combined mass of 80 kg. They accelerate from rest to 10 m/s in 4.0 s. Calculate the resultant force acting on the cyclist and bicycle.

Section C: Challenge Context & Multi-step Problems

5. A braking force is applied to a 1.8 tonne lorry travelling at 72 km/h. The lorry comes to a complete stop in 10 seconds.

- a) Calculate the average braking force applied to the lorry. Give your answer to 2 significant figures.

- b) A student is asked to calculate the acceleration of a different object. They are given a force of 50 N and a mass of 20 kg. The student incorrectly calculates the acceleration as 1250 m/s^2 by squaring the mass value because its unit is kg. Explain why this approach is incorrect and describe the correct method.
