Worksheet 4.5: Momentum Calculations ($p = m \times v$)

PhysicsSheets

Specification: GCSE Physics (AQA 4.5.7.1 / Edexcel SP12)

Momentum Equation: $p = m \times v$

Rearranged Forms: $m = \frac{p}{v}$ | $v = \frac{p}{m}$

Units: p (Momentum, kg m/s), m (Mass, kg), v (Velocity, m/s)

Section A: Units, Rearranging & Conversions

1. Complete the table below by stating the correct SI unit and its symbol for each variable in the momentum equation.

Variable	SI Unit Name	SI Unit Symbol
Momentum (p)	_____	_____
Mass (m)	_____	_____
Velocity (v)	_____	_____

2. Rearrange the momentum equation ($p = m \times v$) to make each of the following the subject:

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

b) Velocity (v): $v =$ _____

3. Convert the following values into their standard SI units for use in momentum calculations. Show your working where necessary.

a) 500 g = _____

b) 72 km/h = _____ (Hint: 1 km = 1000 m, 1 h = 3600 s)

c) 25 cm/s = _____

d) 2.5 tonnes = _____ (Hint: 1 tonne = 1000 kg)

Section B: Practice Calculations

Show all your working clearly, including the equation used, substitution, and final answer with correct units.

1. Calculate the momentum of the following objects:

a) A 5 kg bowling ball rolling at 10 m/s.

b) A 200 g tennis ball served at 15 m/s.

c) A 8 kg trolley with a momentum of 120 kg m/s. Calculate its velocity.

d) A car travelling at 90 km/h has a momentum of 500 kg m/s. Calculate its mass.

Section C: Challenge Context & Multi-step Problems

1. A train with a mass of 150 tonnes is travelling at a constant velocity of 108 km/h.

a) Calculate the momentum of the train. Give your answer in standard form to 2 significant figures.

b) Explain why a train, despite its relatively low velocity compared to a bullet, has an extremely high momentum.

2. Consider two objects:

- **Object A:** Mass 2.5 kg, Velocity 8 m/s
- **Object B:** Mass 500 g, Velocity 40 m/s

a) Calculate the momentum of Object A and Object B.

b) A student states that Object B will be much easier to stop than Object A because it has a smaller mass. Evaluate this statement, referring to your calculations in part (a).