

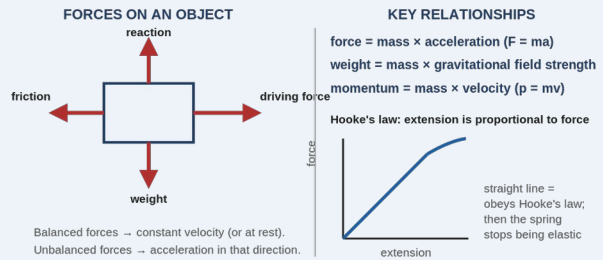
1.2 Forces, Movement, Shape & Momentum

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1. KEY VOCABULARY

TERM	MEANING
Force	A push or a pull, measured in newtons (N).
Weight	The force of gravity on a mass.
Friction	A force that opposes motion.
Resultant force	The single force equal to all the forces combined.
Momentum	Mass × velocity — a measure of motion (kg m/s).
Terminal velocity	The steady top speed when forces balance.

2. FORCES & KEY RELATIONSHIPS



3. BALANCED vs UNBALANCED FORCES

Balanced (resultant = 0): the object stays still or moves at constant velocity.

Unbalanced (resultant ≠ 0): the object accelerates in the direction of the resultant force.

force = mass × acceleration ($F = ma$)

4. TERMINAL VELOCITY

A falling object speeds up; as it does, air resistance grows. When air resistance equals weight, the forces balance — the object falls at a steady terminal velocity (it no longer accelerates).

5. HOOKE'S LAW & MOMENTUM

Hooke's law: extension is proportional to the force — up to the limit of proportionality.

momentum = mass × velocity

In a collision, total momentum is conserved (it stays the same).

6. THE WHY

Why a heavier object does NOT fall faster: more weight also means more inertia — the acceleration due to gravity is the same for all masses (ignoring air resistance).

Why terminal velocity happens: air resistance increases with speed until it exactly balances weight — then there is no resultant force.

7. COMMON EXAM MISTAKES

- ✗ "Mass and weight are the same thing."
- ✓ Mass is in kg; weight is a force in N (weight = mass × g).
- ✗ "At terminal velocity there is no force on the object."
- ✓ Forces still act — they are balanced, so the resultant is zero.
- ✗ "A moving object needs a constant force to keep moving."
- ✓ With balanced forces it keeps moving at constant velocity.

8. SELF-CHECK · cover & quiz

Can you...

1. State the difference between mass and weight?
2. Use $F = ma$ in a calculation?
3. Explain what happens with balanced and unbalanced forces?
4. Explain why a skydiver reaches terminal velocity?
5. State Hooke's law?
6. Calculate momentum, and state that it is conserved?