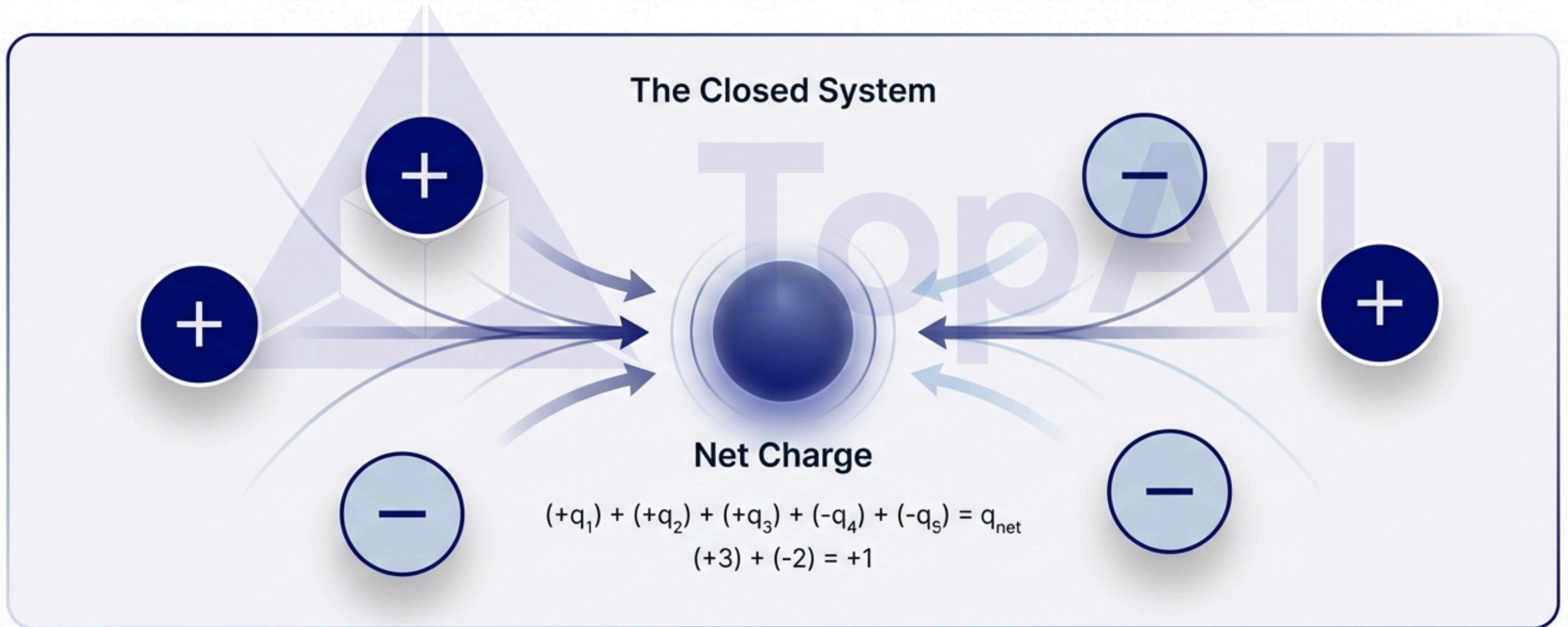


1.4.1 Additivity of Charges

Why calculating net charge is simply an algebraic sum.



Charge is a Scalar Quantity

Mass (m)

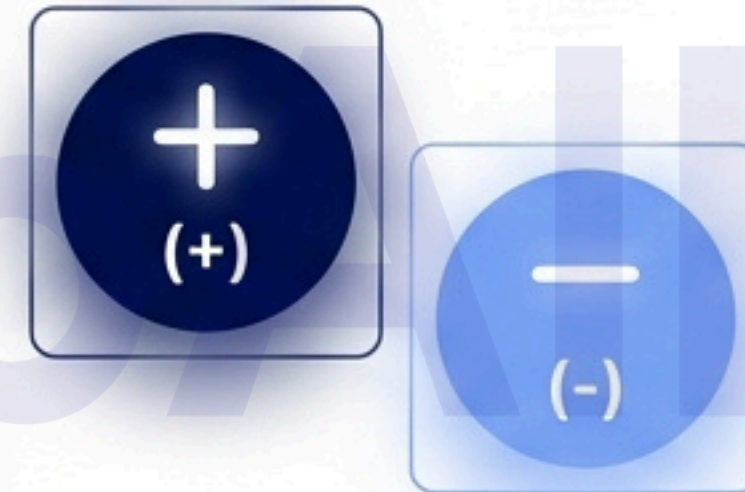


- Always **Positive (+)**.

$$+2 \text{ kg} + 5 \text{ kg} = 7 \text{ kg}$$

THE SIMILARITY:
Both have **magnitude**,
but **NO direction**.

Charge (q)



- Can be **Positive (+)** or **Negative (-)**.

$$+2 \text{ C} - 5 \text{ C} = -3 \text{ C}$$



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Let's Test Them Now.**

$$E=mc^2$$



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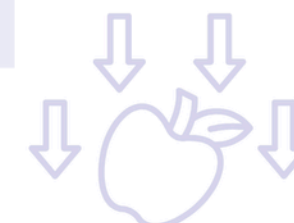
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Algebraic Addition with Signs

Total Charge of a System

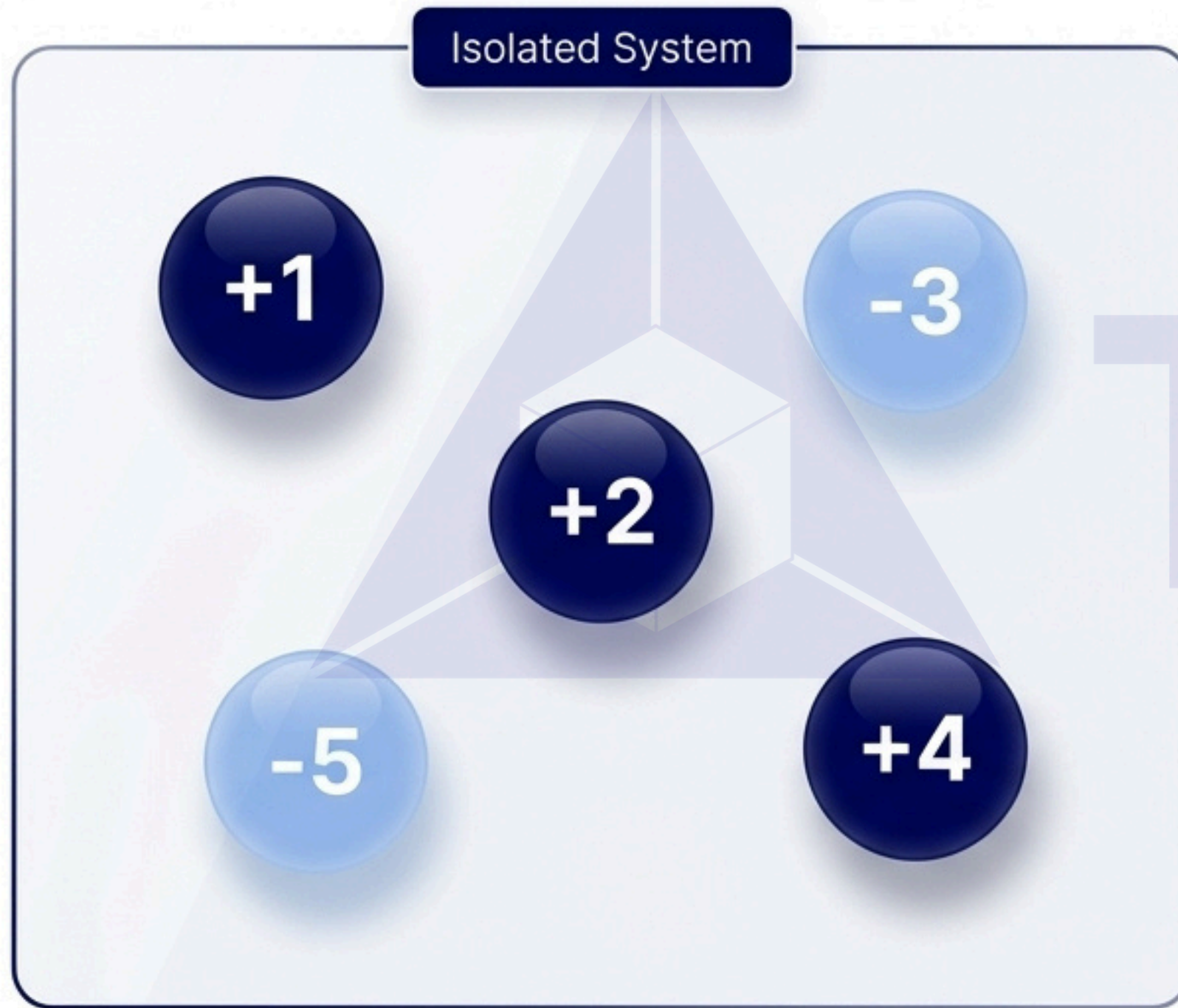
$$Q = q_1 + q_2 + q_3 + \dots + q_n$$

If a system contains n point charges, the total charge is found simply by adding them like real numbers.

EXAM TRAP: Ignoring the Signs

Proper signs must be used while adding the charges in a system. Treating negative charges as positive is a guaranteed way to **lose 5 marks** (-1 negative marking) in competitive exams.

Calculating Net Charge: NCERT Example



Five charges in an arbitrary unit.

Step 1: $Q_{\text{net}} = q_1 + q_2 + q_3 + q_4 + q_5$

Step 2: $Q_{\text{net}} = (+1) + (+2) + (-3) + (+4) + (-5)$

Step 3: $Q_{\text{net}} = (1 + 2 + 4) + (-3 - 5)$

$$Q_{\text{net}} = (+7) + (-8)$$

Step 4: **Final Result: $Q_{\text{net}} = -1$**

Summary & Practice

Key Takeaways

- Charge is a **scalar quantity** (it has magnitude but no direction).
- Total charge of a system is the **algebraic sum** of all individual point charges.
- Unlike mass, charge can be negative. **Proper signs (+ or -)** are strictly required during addition.

Quick Sums

Q1: A system contains three charges: $+2\mu\text{C}$, $-5\mu\text{C}$, and $+4\mu\text{C}$. What is the net charge?

$(+1\mu\text{C})$

Q2: True or False: Mass and charge both add algebraically using positive and negative values.

(False. Mass is always positive; only charge uses negative values).



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