

Standard Form of a Quadratic Equation

A 2-page CBSE Class 10 summary: the definition, reading a, b and c with their signs, and the simplify-first test.

$$ax^2 + bx + c = 0, a \neq 0 \cdot a, b, c \text{ real} \cdot \text{every term on one side} \cdot \text{descending powers of } x$$

The definition, part by part

Part	What it means	The trap
a, b, c are real	Positive, negative, fractions, even $\sqrt{2}$	Coefficients are not only whole numbers
$a \neq 0$	Keeps the degree at 2	If $a = 0$ it is $bx + c = 0$, which is linear
b = 0 or c = 0 is fine	$x^2 - 16 = 0 \cdot 5x^2 + 2x = 0$	Both are still quadratic equations
Degree 2	At most two roots	Roots = zeroes of $ax^2 + bx + c$

Reading a, b, c — standard form first, signs included

Equation as given	Standard form	a, b, c
$5x - 2x^2 = 7$	$2x^2 - 5x + 7 = 0$	$a = 2, b = -5, c = 7$
$x^2 = 49$	$x^2 - 49 = 0$	$a = 1, b = 0, c = -49$
$3x^2 = -7x$	$3x^2 + 7x = 0$	$a = 3, b = 7, c = 0$
$x(2x - 1) = 3$	$2x^2 - x - 3 = 0$	$a = 2, b = -1, c = -3$

In row 1, stopping at $-2x^2 + 5x - 7 = 0$ gives $a = -2, b = 5, c = -7$ — also correct. Multiplying by -1 flips every sign together; flipping just one is the mark-losing slip.

Is it really quadratic? Simplify first, judge after

Disguise	Example	Simplifies to → verdict
Genuine	$(x - 3)^2 + 2 = 4x - 5$	$x^2 - 10x + 16 = 0 \rightarrow$ quadratic
Looks quadratic, isn't	$x(x + 2) + 6 = (x + 3)(x - 3)$	x^2 cancels: $2x + 15 = 0 \rightarrow$ linear
Looks cubic, is quadratic	$(x + 1)^3 = x^3 + 5$	x^3 cancels: $3x^2 + 3x - 4 = 0 \rightarrow$ quadratic

The routine, every time: expand every bracket → bring all terms to one side → cancel and collect → read the highest surviving power of x → check $a \neq 0$.

Where this sits in NCERT and CBSE

Question	Answer
Where in NCERT?	Chapter 4, Exercise 4.1 (2 questions): Q1 checks eight equations, Q2 represents four situations
How many exercises?	Three: 4.1 standard form · 4.2 factorisation · 4.3 nature of roots. Completing the square was removed.
What does CBSE say?	2026-27, first content line: "Standard form of a quadratic equation $ax^2 + bx + c = 0$, ($a \neq 0$)."
How many marks?	Algebra unit, 20 of 80 theory marks. CBSE sets marks by unit, not chapter.

Key Takeaways

- A quadratic equation is anything that simplifies to $ax^2 + bx + c = 0$ with $a \neq 0$.
- Standard form first, coefficients second** — never read a, b, c off an unarranged equation.
- Every coefficient carries its **sign**: in $2x^2 - 5x + 7 = 0$, b is -5 .
- Only a is restricted**. b and c may be zero.
- Simplify before you judge** — x^2 terms can cancel, and so can x^3 terms.
- Standard form feeds everything later: factorisation, the quadratic formula and $D = b^2 - 4ac$.

Eight equations, one rule: simplify first

NCERT Exercise 4.1 Q1 asks whether each of eight equations is quadratic. Here is how the board expects the working to look.

WORKED IN FULL · Ex 4.1 Q1(viii)

Check whether $x^3 - 4x^2 - x + 1 = (x - 2)^3$ is a quadratic equation.

Step 1 · Expand $(x - 2)^3 = x^3 - 6x^2 + 12x - 8$

Step 2 · One side $x^3 - 4x^2 - x + 1 - x^3 + 6x^2 - 12x + 8 = 0$

Step 3 · Collect The x^3 terms cancel: $2x^2 - 13x + 9 = 0$

Step 4 · Judge Highest power 2 and $a = 2 \neq 0$, so **it is a quadratic equation**, with $a = 2$, $b = -13$, $c = 9$.

Check: put $x = 0$ in both sides of the original: left side 1, right side -8 , difference $9 = c$ ✓. Put $x = 1$: left -3 , right -1 , difference $-2 = 2 - 13 + 9$ ✓.

FIVE MORE FROM THE SAME QUESTION

Ex 4.1 Q1	After simplifying	Quadratic?
(i) $(x + 1)^2 = 2(x - 3)$	$x^2 + 7 = 0$ ($b = 0$)	Yes
(iii) $(x - 2)(x + 1) = (x - 1)(x + 3)$	$3x - 1 = 0$ (x^2 cancels)	No
(iv) $(x - 3)(2x + 1) = x(x + 5)$	$x^2 - 10x - 3 = 0$	Yes
(v) $(2x - 1)(x - 3) = (x + 5)(x - 1)$	$x^2 - 11x + 8 = 0$	Yes
(vii) $(x + 2)^3 = 2x(x^2 - 1)$	$x^3 - 6x^2 - 14x - 8 = 0$	No — stays cubic

Don't assume: (vii) and (viii) both have cubes on both sides. In (viii) the x^3 terms cancel; in (vii) they don't (x^3 against $2x^3$). Only the simplification tells you which.

WHY THE SIGNS MATTER LATER

For $2x^2 - 5x + 7 = 0$, the discriminant is $D = b^2 - 4ac = 25 - 56 = -31$, so there are **no real roots**. Misread c as -7 and $D = 25 + 56 = 81$ — a perfect square that suggests two neat roots that do not exist. **One sign slip in standard form changes the answer to a nature-of-roots question** (Exercise 4.3). And in the quadratic formula, a wrong sign on b alone flips the sign of **both** roots.

WHERE THE MARKS GO

The expansion	Written out, not done in your head — it is the method mark
The cancellation	Say which terms cancel; it is the whole reason for the verdict
The final standard form	$= 0$ on the right, descending powers on the left
The verdict with a reason	"Highest power 2, $a \neq 0$ " — not just "yes"

NOW TRY THESE · Ex 4.1 Q1(ii) and (vi)

(ii) $x^2 - 2x = (-2)(3 - x)$ (vi) $x^2 + 3x + 1 = (x - 2)^2$

Answers: (ii) $x^2 - 4x + 6 = 0$, quadratic, $a = 1$, $b = -4$, $c = 6$. (vi) the x^2 terms cancel, leaving $7x - 3 = 0$ — not quadratic.

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