

Quadratic Equations: the two-page summary

Standard form, the two methods CBSE examines, the discriminant, and where the marks actually sit.

$$ax^2 + bx + c = 0 \quad (a \neq 0) \quad \blacktriangleright \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \blacktriangleright \quad D = b^2 - 4ac$$

Two methods, and how to choose between them

Method	Reach for it when	What it costs you
Factorisation split the middle term	a, b and c are small whole numbers and a pair of factors of $a \times c$ adding to b is easy to spot	Nothing, when it works – it is the fastest route. Minutes, when you hunt for factors that are not there.
Quadratic formula $x = \frac{-b \pm \sqrt{D}}{2a}$	Always. In particular when the numbers are awkward, surds appear, or D is not a perfect square	Two or three extra lines of arithmetic, and it never fails.

The 30-second rule: try factors of $a \times c$ for half a minute. If nothing lands, stop and write the formula – that decision is itself a mark-saving skill.

Completing the square is no longer in the chapter. It was removed in the NCERT rationalisation along with its exercise. Older books and older solution sites still print it.

The discriminant decides before you solve

$D = b^2 - 4ac$	Nature of the roots	What the parabola does
D positive	Two distinct real roots	Meets the x-axis at two separate points
D zero	Two equal real roots – never write “one root”	Just touches the x-axis at one point
D negative	No real roots	Never meets the x-axis at all

A “find k so the roots are equal” question is a discriminant question in disguise: set $D = 0$ and solve for k. A “show the roots are real” question wants you to show D is positive or zero – not to solve anything.

Word problems: form, solve, then reject

Every word problem in this chapter runs the same three phases. **Form** the equation from the sentence, **solve** it by whichever method fits, then **check the roots against the story** and say in writing which one you are throwing away. A length, an age, a speed and a number of articles cannot be negative – so a negative root is rejected, and the line that rejects it is worth a mark on its own.

Do not auto-reject. Not every negative root is impossible: a temperature, a profit or a coordinate can be negative. Reject because the *story* forbids it, not because the sign looks wrong.

Where this sits in NCERT and CBSE

The fact	Why it matters to you
Sections and exercises do not line up	§4.2 gives Exercise 4.1, §4.3 gives Exercise 4.2, §4.4 gives Exercise 4.3 – because §4.1 is a bare introduction
Three exercises, thirteen questions	4.1 has 2, 4.2 has 6, 4.3 has 5 – but Ex 4.1 Q2 alone carries four full word problems
Factorisation and the formula	The two methods the exam expects; completing the square and its exercise were removed
Algebra = 20 of 80 marks	The largest of the seven units. CBSE sets marks by unit – chapter-wise percentage tables online are unofficial

Key takeaways

- ✓ Write it as $ax^2 + bx + c = 0$ first. Every method assumes standard form.
- ✓ Factorisation is faster when it works; the formula always works. Give factors 30 seconds, then switch.
- ✓ $D = b^2 - 4ac$ tells you the nature of the roots without solving.
- ✓ $D = 0$ means **two equal real roots**, not one root. CBSE marks that wording.
- ✓ In a word problem, the line that rejects the impossible root is a mark.
- ✓ Show the working. These are descriptive questions – a bare answer loses the method marks.

Five questions that cover the whole chapter

Two methods on one equation, a formula-only case, a discriminant condition, and a word problem that hides a $D = 0$.

NCERT EX 4.2 Q1(ii) · 3 MARKS

Solve $2x^2 + x - 6 = 0$ by factorisation.

Step 1. $a \times c = 2 \times (-6) = -12$. Find two numbers with product -12 and sum $+1$: **4 and -3**.

Step 2. $2x^2 + 4x - 3x - 6 = 0 \rightarrow 2x(x+2) - 3(x+2) = 0 \rightarrow (x+2)(2x-3) = 0$.

Step 3. $x+2 = 0$ or $2x-3 = 0$, so **$x = -2$ or $x = 3/2$** .

Check: sum of roots $-2 + 3/2 = -1/2 = -b/a$ ✓ product $(-2)(3/2) = -3 = c/a$ ✓

THE SAME EQUATION, THE OTHER METHOD

Now solve $2x^2 + x - 6 = 0$ by the formula. $a = 2, b = 1, c = -6$.

$D = b^2 - 4ac = 1 - 4(2)(-6) = 1 + 48 = 49$, and $\sqrt{49} = 7$.

$x = (-1 \pm 7) / 4 \rightarrow x = 6/4 = 3/2$ or $x = -8/4 = -2$.

The lesson: same roots, four extra lines. **D was a perfect square** – that is precisely when factorisation would have worked, and it is the tell to look for before you commit to a method.

WHEN FACTORISATION CANNOT WORK · 3 MARKS

Solve $x^2 - 4x - 8 = 0$. No pair of whole numbers multiplies to -8 and adds to -4 , so stop hunting.

$D = 16 + 32 = 48$, which is positive but **not a perfect square** – so the roots are real, distinct and irrational, and only the formula will reach them.

$\sqrt{48} = 4\sqrt{3}$, so $x = (4 \pm 4\sqrt{3}) / 2 = 2 \pm 2\sqrt{3}$ (≈ 5.46 and ≈ -1.46).

Leave it in surd form. $2 + 2\sqrt{3}$ is the exact answer and CBSE accepts it; the decimal is a bonus, not the answer.

NCERT EX 4.3 · FIND THE VALUE OF k · 2 MARKS

Find k so that $2x^2 + kx + 3 = 0$ has two equal roots.

Equal roots means **$D = 0$** : $k^2 - 4(2)(3) = 0 \rightarrow k^2 - 24 = 0 \rightarrow k^2 = 24$.

$k = \pm\sqrt{24} = \pm 2\sqrt{6}$ ($\approx \pm 4.90$).

Both signs count. Dropping the negative value is the single most common way to lose a mark on this question type – nothing in the question rules k out.

NCERT EX 4.3 · WORD PROBLEM · 5 MARKS

Is it possible to design a rectangular park of perimeter 80 m and area 400 m²? If so, find its length and breadth.

Form. Let the length be x m. Half the perimeter is 40, so the breadth is $(40 - x)$ m. Then $x(40 - x) = 400$, i.e. **$x^2 - 40x + 400 = 0$** .

Decide. $D = 1600 - 1600 = 0$, so the roots are real and equal – the park is possible, and there is exactly one design.

Solve. $x = 40/2 = 20$, so length 20 m and breadth $40 - 20 = 20$ m: a square.

Check against the story: perimeter $2(20 + 20) = 80$ m ✓ area $20 \times 20 = 400$ m² ✓ Both dimensions positive, so nothing to reject.

WHERE THE MARKS GO · NOW TRY THESE

Writing "one root" when $D = 0$	It is two equal roots . One word, one mark.
Answering a discriminant question by solving	If it says <i>nature of the roots</i> , stop at D .
Losing the sign inside $-b$ or under the root	Write $b^2 - 4ac$ on its own line before substituting.
Finding both roots and not rejecting one	The rejection sentence is worth a mark in a word problem.
Now try these: (1) Solve $3x^2 - 2x - 1 = 0$ by factorisation. (2) Solve $2x^2 - 6x + 3 = 0$ – check D first and pick your method. (3) Find k so $kx^2 - 6x + 2 = 0$ has equal roots.	
Answers: (1) $x = 1$ or $-1/3$. (2) $D = 12$, not a perfect square, so the formula: $x = (3 \pm \sqrt{3}) / 2$. (3) $D = 36 - 8k = 0$, so $k = 9/2$.	

Turn this chapter into marks on examfront

Reading the method is the easy half. The instinct for **which** method, and the accuracy to finish it, only come from practice that tells you where you slipped.

- ▶ **Chapter 1 is free** – start today, no payment, no trial countdown.
- ▶ **Mistake identification** – every wrong answer is tagged by type, so you see whether it was method choice, a sign slip or a faulty setup.
- ▶ **Anytime tests** – practise any chapter, at any level, whenever you sit down.
- ▶ **Weekly tests** – a steady check that last week's fixes actually held.
- ▶ **Mock tests before the exam** – full papers under real timing, so exam day is not the first time.

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