

Elimination Method — Pair of Linear Equations

CBSE Class 10 Maths · NCERT Chapter 3 · Unit: Algebra (20 of 80 marks)

$a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0 \rightarrow$ **match one coefficient** $\rightarrow$ **add or subtract** $\rightarrow$ **one variable left**

The method in four steps

Step	What you do	Why it works
1. Match	Multiply one or both equations so the coefficients of one variable are numerically equal.	Only equal coefficients can cancel.
2. Eliminate	Add or subtract the two equations.	That variable disappears.
3. Solve	Solve the single equation left.	One equation, one unknown.
4. Back-substitute	Put the value into <i>either</i> original equation, then check in both .	Finds the second variable and proves the pair.

NCERT scope note. Chapter 3 of the rationalised NCERT book gives you the graphical method plus **two** algebraic methods — substitution and elimination. **Cross-multiplication has been removed**, so if a CBSE question names a method, it names one of these two.

Add or subtract? The sign rule

Matched coefficients	Do this	Example
Same sign (+2x and +2x)	Subtract	$(2x + 3y) - (2x - y) = 12 - 4 \Rightarrow 4y = 8$
Opposite signs (+2y and -2y)	Add	$(3x + 2y) + (3x - 2y) = 16 + 8 \Rightarrow 6x = 24$

Memory hook: *same signs subtract, opposite signs add.* Pick the variable with the **smaller LCM** of coefficients — it keeps the numbers small.

What your last line is telling you

After eliminating	What it means	Type of pair
You get a value ($5x = 10$)	Lines meet at one point	Unique solution — consistent
A true statement ($0 = 0$)	Same line twice	Infinitely many — dependent
A false statement ($0 = 9$)	Parallel lines	No solution — inconsistent

What the question is really asking for

Board phrasing	What to set up
"Solve by the method of elimination"	Elimination only — method marks are tied to the named method.
"Solve the pair of linear equations"	Your choice. No coefficient equal to 1 $\Rightarrow$ elimination is faster.
"Two pens and three pencils cost..."	Name the unknowns first, form two equations, then eliminate.
"For what value of k has no solution?"	Eliminate and force the leftover statement to be false.

Key Takeaways

- **Elimination** = make one coefficient match, then add or subtract so that variable cancels.
- **Same signs subtract, opposite signs add** — the single rule the whole method rests on.
- Multiply **every** term when you scale an equation, including the number on the right.
- Faster than substitution when **no coefficient is 1**: it delays fractions to the last step.
- A true leftover ($0 = 0$) means **infinitely many**; a false one ($0 = 9$) means **no solution**.

Worked like the board asks it

Two full solutions, the two special cases, and where marks are actually lost

5 MARKS · WORD PROBLEM (NCERT-STYLE)

The sum of a two-digit number and the number formed by reversing its digits is 66. The two digits differ by 2. Find the number.

Step 1 – name the unknowns. Let the tens digit be x and the units digit be y . The number is $10x + y$; reversed it is $10y + x$.

Step 2 – form the equations. $(10x + y) + (10y + x) = 66 \Rightarrow 11x + 11y = 66 \Rightarrow x + y = 6 \dots (1)$. Digits differ by 2 $\Rightarrow x - y = 2 \dots (2)$ [or $y - x = 2$].

Step 3 – eliminate y . Coefficients of y are $+1$ and -1 : opposite signs, so **add**. $(1) + (2): 2x = 8 \Rightarrow x = 4$.

Step 4 – back-substitute. $4 + y = 6 \Rightarrow y = 2$. The number is **42**.

The other case. With $y - x = 2$, adding gives $2y = 8 \Rightarrow y = 4, x = 2 \Rightarrow 24$. Both are valid, so state both.

Check: $42 + 24 = 66$, and the digits differ by 2.

3 MARKS · MULTIPLY FIRST

Solve by elimination: $9x - 4y = 8$ and $13x + 7y = 101$.

Nothing matches, so scale to eliminate y . LCM of 4 and 7 is 28.

$(1) \times 7 \Rightarrow 63x - 28y = 56$. $(2) \times 4 \Rightarrow 52x + 28y = 404$.

Signs are **opposite** ($-28y$ and $+28y$), so **add**: $115x = 460 \Rightarrow x = 4$.

Back-substitute in (1): $36 - 4y = 8 \Rightarrow 4y = 28 \Rightarrow y = 7$.

Check in (2): $13(4) + 7(7) = 52 + 49 = 101$. Correct.

THE TWO SPECIAL CASES

Pair	Eliminate x	Read it as
$2x + 3y = 6$ $4x + 6y = 12$	$(1) \times 2 \Rightarrow 4x + 6y = 12$; subtract $\Rightarrow 0 = 0$	Same line $\Rightarrow$ infinitely many solutions (dependent)
$2x + 3y = 6$ $4x + 6y = 15$	$(1) \times 2 \Rightarrow 4x + 6y = 12$; subtract $\Rightarrow 0 = 3$	Parallel lines $\Rightarrow$ no solution (inconsistent)

Do not stop at “both variables vanished”. Write the conclusion in words – that sentence carries a mark.

WHERE THE MARKS ACTUALLY GO

- **Adding when you should subtract.** Both variables survive and the work is unusable from that line on.
- **Scaling only the left side.** $2x + 3y = 13$ times 2 is $4x + 6y = 26$, not 13.
- **Sign slip in the subtraction.** In $(2x + 3y) - (2x - y)$, the $-(-y)$ becomes $+y$.
- **Answering half the question.** Finding x and never returning for y loses the final marks – and the check line.

3 MARKS · THE “VALUE OF k ” TWIST

For what value of k does $2x + ky = 1$ and $3x - 5y = 7$ have a unique solution?

Eliminate x . $(1) \times 3 \Rightarrow 6x + 3ky = 3$. $(2) \times 2 \Rightarrow 6x - 10y = 14$.

Same sign on x , so **subtract**: $(3k + 10)y = -11$.

That has a solution for y **only if $3k + 10$ is not zero**, so the pair is unique for **k not equal to $-10/3$** .

And at $k = -10/3$? The line reads $0 = -11$, which is false – so there is **no solution**. Infinitely many is impossible here, because -11 can never be 0.

NOW TRY THIS ONE

Solve $8x + 5y = 9$ and $3x + 2y = 4$ by elimination. *Answer:* scale to $10y$ ($\times 2$ and $\times 5$), subtract $\Rightarrow x = -2$, then $y = 5$. Check: $8(-2) + 5(5) = -16 + 25 = 9$.

Turn this into marks on examfront

- **Chapter 1 free** – start practising today, no payment needed.
- **Mistake identification** – we tag every sign slip and scaling error, so you stop repeating them.
- **Anytime tests** – drill elimination whenever you have twenty spare minutes.
- **Weekly tests** – keep Chapter 3 fresh instead of relearning it in March.
- **Mock tests before the exam** – full papers under real timing, with a marks-lost breakdown.

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