ANSWER KEY & MARKING SCHEME · CBSE CLASS 10

Pair of Linear Equations in Two Variables

Mathematics · Chapter 3 · Use this with the Board Paper · Companion to Quick Drill

HOW TO USE

Attempt the Board Paper first (closed-book, full time). Then come here. For 2-mark+ questions, compare your answer to the model. For 3-4 mark questions, also consult the **Topper Templates** below — these show the exact step-by-step structure that scores full marks per CBSE marking-scheme conventions.

MODEL ANSWERS · BOARD PAPER

Section A — MCQs (1 mark each)

Q1. The pair x + 2y = 4 and 2x + 4y = 12 has how many solutions? [1 mark]

Ans: None (parallel lines; first two ratios equal 1/2, c-ratio 1/3 differs).

Q2. For 2x + 3y = 7 and 6x + 9y = 21, the system is: [1 mark]

Ans: Consistent with infinitely many solutions (all three ratios equal 1/3).

Q3. If a pair of lines coincide, the system has: [1 mark]

Ans: Infinitely many solutions.

Q4. Find k so that kx + 2y = 5 and 3x + y = 1 have no solution. [1 mark]

Ans: k = 6 (a-ratio = b-ratio but c-ratio differs).

Q5. Solve: x + y = 5, 2x − y = 4. The value of x is: [1 mark]

Ans: x = 3 (and y = 2).

Q6. Which method has been REMOVED from the 2025-26 NCERT syllabus for solving pairs of linear equations? [1 mark]

Ans: Cross-multiplication method.

Section B — Short Answer I (2 marks each)

Q7. Solve by substitution: x + y = 14 and x − y = 4. [2 marks]

Ans: From eq2: x = 4 + y. Substitute in eq1: (4 + y) + y = 14 ⇒ 2y = 10 ⇒ y = 5; x = 9. Verify 9 + 5 = 14 ✓.

Q8. For what value of k does the pair 2x + 3y = 8, kx + 4y = 10 have a UNIQUE solution? [2 marks]

Ans: Unique ⇔ $a_1/a_2 \neq b_1/b_2$ ⇒ 2/k ≠ 3/4 ⇒ k ≠ 8/3. Any real k except 8/3 gives a unique solution.

Q9. Solve by elimination: 2x + y = 7 and 3x − y = 8. [2 marks]

Ans: Add: 5x = 15 ⇒ x = 3. Then y = 7 − 6 = 1. Verify 3(3) − 1 = 8 ✓.

Q10. The sum of two numbers is 50 and their difference is 10. Find the numbers. [2 marks]

Ans: x + y = 50, x − y = 10 ⇒ x = 30, y = 20.

Section C — Short Answer II (3 marks each)

Q11. Solve by elimination: 3x + 4y = 10 and 2x − 2y = 2. [3 marks]

Ans: Multiply eq2 by 2: 4x − 4y = 4. Add with eq1: 7x = 14 ⇒ x = 2. Back-sub: 4 − 2y = 2 ⇒ y = 1. Verify in eq1: 3(2) + 4(1) = 10 ✓. Solution (2, 1).

Q12. Solve by substitution: 7x − 15y = 2 and x + 2y = 3. [3 marks]

Ans: From eq2: x = 3 − 2y. Substitute: 7(3 − 2y) − 15y = 2 ⇒ 21 − 29y = 2 ⇒ y = 19/29. Then x = 3 − 38/29 = 49/29. Verify: 7(49/29) − 15(19/29) = 58/29 = 2 ✓.

Q13. The sum of the digits of a two-digit number is 9. On reversing the digits, the new number is 27 more than the original. Find the original number. [3 marks]

Ans: Tens digit = x, units = y. x + y = 9. (10y + x) − (10x + y) = 27 ⇒ 9(y − x) = 27 ⇒ y − x = 3. Solve: x = 3, y = 6 ⇒ number = 36. Check: reversed 63; 63 − 36 = 27 ✓.

Section D — Long Answer (7 marks composite)

Q14. (a) A father is three times as old as his son. After 5 years the father will be 2½ times as old. Find their present ages. [4] (b) For what value of k will the pair 2x + 3y = 7 and (k − 1)x + (k + 2)y = 3k have INFINITE solutions? [3] [7 marks]

> **Ans:** (a) Let son = x, father = y. y = 3x and y + 5 = (5/2)(x + 5) ⇒ 3x + 5 = (5/2)(x + 5) ⇒ 6x + 10 = 5x + 25 ⇒ x = 15, y = 45. Verify: in 5 yrs, 50/20 = 2.5 ✓. Son 15 yrs, father 45 yrs. (b) Infinite ⇔ 2/(k−1) = 3/(k+2) = 7/(3k). From first two: 2(k+2) = 3(k−1) ⇒ 2k + 4 = 3k − 3 ⇒ k = 7. Check third: 7/21 = 1/3 and 2/6 = 1/3 ✓. So k = 7.

★ TOPPER ANSWER TEMPLATES — 5 TEMPLATES · MEMORISE THE FORMAT

★ TOPPER TEMPLATE —

Step Pick the simpler equation and isolate one variable [0.5 mark]	From the second equation x + 2y = 3, isolate x: x = 3 − 2y. (Choose the easier one — substitution lives or dies on this choice.)
Step Substitute into the other equation [1 mark]	Replace x in 7x − 15y = 2 by (3 − 2y): 7(3 − 2y) − 15y = 2 ⇒ 21 − 14y − 15y = 2 ⇒ 21 − 29y = 2.
Step Solve the one-variable equation [0.75 mark]	29y = 19 ⇒ y = 19/29.
Step Back-substitute and verify [0.75 mark]	x = 3 − 2(19/29) = 3 − 38/29 = (87 − 38)/29 = 49/29. Check in eq1: 7(49/29) − 15(19/29) = (343 − 285)/29 = 58/29 = 2 ✓.

COMMON LOSS OF MARKS:

- Picking the harder equation to isolate from
- Sign error after distributing the negative
- Skipping the back-substitution verification step

★ TOPPER TEMPLATE —

Step Make coefficients of one variable equal [0.75 mark]	Multiply the second equation by 2 to match the y-magnitude with the first: $4x - 4y = 4$.
Step Add or subtract to eliminate [1 mark]	Add: $(3x + 4y) + (4x - 4y) = 10 + 4 \Rightarrow 7x = 14 \Rightarrow x = 2$.
Step Find the second variable [0.75 mark]	Substitute $x = 2$ in $2x - 2y = 2$: $4 - 2y = 2 \Rightarrow y = 1$.
Step Verify in the untouched original equation [0.5 mark]	$3(2) + 4(1) = 6 + 4 = 10$ ✓. Solution: (2, 1).

COMMON LOSS OF MARKS:

- Multiplying only one equation and forgetting to scale BOTH sides
- Adding when you should subtract (sign mismatch)
- Skipping verification — examiner wants to see the check line

★ TOPPER TEMPLATE —

Step Write in standard form $a_1x + b_1y + c_1 = 0$ [0.5 mark]	Eq1: $kx + 2y - 5 = 0 \Rightarrow a_1=k, b_1=2, c_1=-5$. Eq2: $3x + y - 1 = 0 \Rightarrow a_2=3, b_2=1, c_2=-1$.
Step Apply the no-solution condition [1 mark]	No solution $\Leftrightarrow a_1/a_2 = b_1/b_2 \neq c_1/c_2$. So $k/3 = 2/1 \Rightarrow k = 6$.
Step Verify c-ratio is different [0.5 mark]	Check: $c_1/c_2 = -5/-1 = 5$. Since $2 \neq 5$, the ratios genuinely satisfy 'equal a,b ratios but unequal c-ratio'. So $k = 6$ gives no solution.

COMMON LOSS OF MARKS:

- Forgetting to move constants to LHS before reading c-values (sign mistake)
- Not verifying the third ratio (could accidentally hit infinite-solution case)
- Mis-stating the condition as $a_1/a_2 \neq b_1/b_2$

★ TOPPER TEMPLATE —

Step Define the variables [0.5 mark]	Let the son's present age = x years and the father's present age = y years.
Step Translate both English statements [1.5 marks]	Statement 1: y = 3x. Statement 2 (5 years later, BOTH ages rise by 5): y + 5 = (5/2)(x + 5).
Step Substitute and solve [1 mark]	Replace y by 3x in eq2: 3x + 5 = (5/2)(x + 5). Multiply both sides by 2: 6x + 10 = 5x + 25 ⇒ x = 15.
Step Find the other age and verify [1 mark]	y = 3(15) = 45. Verify: after 5 years, son = 20, father = 50; 50/20 = 2.5 ✓. So son is 15 years, father is 45 years.

COMMON LOSS OF MARKS:

- Forgetting to add 5 to the SON's age in the second statement
- Reading 2½ as 2.5 incorrectly (it's 5/2)
- Not writing the variable definitions — examiner cuts 0.5 mark

★ TOPPER TEMPLATE —

Step Set up the variables and the speed relations [0.75 mark]	Let boat's still-water speed = b km/h and stream speed = s km/h. Downstream speed = b + s; upstream speed = b − s.
Step Use distance = speed × time [1.5 marks]	Downstream: 30 = (b + s)·3 ⇒ b + s = 10. Upstream: 30 = (b − s)·5 ⇒ b − s = 6.
Step Solve the pair by elimination [1 mark]	Add the two equations: 2b = 16 ⇒ b = 8. Subtract: 2s = 4 ⇒ s = 2.
Step State the answer with units and verify [0.75 mark]	Boat's still-water speed = 8 km/h; stream speed = 2 km/h. Verify: downstream 10 km/h × 3 h = 30 km ✓; upstream 6 km/h × 5 h = 30 km ✓.

COMMON LOSS OF MARKS:

- Using b·s instead of b + s for downstream (treating it like a product)
- Skipping units — examiner expects km/h
- Not verifying both distances

MARKING SCHEME — GENERAL NOTES

- Section A: 1 mark for correct option or correct one-line answer; no part marks.
- Section B: Award 1 mark for correct method (writing the standard form, stating the ratio condition, or isolating a variable) and 1 mark for correct final answer with brief verification.
- Section C: 1 mark for setup (defining variables / scaling equations / writing the condition), 1 mark for correct algebraic work without arithmetic slips, 1 mark for final answer with verification.
- Section D: For 4-mark age problem — 0.5 for variable definitions, 1.5 for translating both English sentences to equations, 1 mark for solving the simultaneous pair, 1 mark for stating ages with verification. For 3-mark consistency-k part — 1 mark for stating the infinite-solution condition (all three ratios equal), 1 mark for solving the equation in k, 1 mark for verifying the third ratio.
- Deduct 0.5 mark per sign error (especially when moving c to the LHS). Repeated sign errors cap at 1 mark deduction per question.

- Word problems WITHOUT explicit variable definitions in the first line lose 0.5 mark even if the answer is correct — examiners enforce the format.
- Any solution using cross-multiplication should be accepted on its merit (it is mathematically valid even though dropped from syllabus), but students should not rely on it being asked.