Affiliated to CBSE, New Delhi (Affiliation No. 1030642)

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CLASS X · MATHEMATICS BASIC (241) · CBSE BOARD EXAMINATION 2027

CHAPTER 3 BASIC

Pair of Linear Equations in Two Variables

$x + y = 5$

$x - y = 1$

$(3, 2)$

Answer Booklet · Full worked solutions with CBSE-style step marks

Every question of the Basic booklet | Step marks shown line by line | MCQ keys with working

INSIDE THIS BOOKLET

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HOW TO USE THE ANSWERS

1. Solve the question in your notebook **first**. Open this booklet only to check.
2. The orange number beside each line is the **step mark** an examiner gives for that line, as in the CBSE marking scheme.
3. Give yourself marks line by line. A right final answer without the working can lose step marks.
4. Check every solution by putting it back into both equations.
5. Copy every wrong answer to the My Mistakes page of your booklet.

READ THIS FIRST

Marking Guide

Full worked solutions to every question in the chapter booklet, set out the way a CBSE examiner marks them.

HOW MARKS ARE GIVEN IN PAIR OF LINEAR EQUATIONS IN TWO VARIABLES ANSWERS

1. **1-mark MCQ / assertion–reason:** only the correct option scores. The working here is for your understanding.
2. **Solve a pair (2 marks):** one variable found 1 · the other 1. Show the multiplying and adding / substituting.
3. **Condition on k:** the ratios written with the right condition 1 · value of k 1 (with the third ratio checked for "no solution").
4. **Word problem (3 marks):** two correct equations 1–1½ · solving 1 · answer in words with units ½.
5. **Graph (3–5 marks):** a table of points for each line 1 + 1 · both lines drawn and the meeting point read 1 · vertices / area 1 each.
6. Lines with no number are working that earns no separate mark but must be shown.

A

PART A · SOLUTIONS

Guided Practice – Solutions

Worked solutions with step marks for every question in Part A.

Number of solutions

A1. Complete the table. The first row is done for you. [2]

Row 2: $\frac{1}{2}, \frac{2}{4} = \frac{1}{2}, \frac{-4}{-8} = \frac{1}{2}$ → coincident, infinitely many — 1

Row 3: $\frac{3}{6} = \frac{1}{2}, \frac{-1}{-2} = \frac{1}{2}, \frac{2}{7}$ → parallel, no solution — 1

A2. Complete the steps: for what value of k do $2x + ky = 3$ and $4x + 6y = 5$ have no solution? [2]

$\frac{2}{4} = \frac{k}{6} \rightarrow k = 3$ — 1

Check: $\frac{c_1}{c_2} = \frac{3}{5} \neq \frac{1}{2}$ ✓. So $k = 3$ — 1

Substitution and elimination

A3. Complete the steps to solve $x + y = 8$ and $2x - y = 7$ by substitution. [2]

$y = 8 - x \rightarrow 2x - (8 - x) = 7 \rightarrow 3x = 15$ — 1

$x = 5, y = 3$ (check: $10 - 3 = 7$ ✓) — 1

A4. Complete the steps to solve $3x + 2y = 11$ and $2x - 2y = 4$ by elimination. [2]

Add: $5x = 15 \rightarrow x = 3$ — 1

$9 + 2y = 11 \rightarrow y = 1$ — 1

Graph and word problem

A5. Complete the tables, draw both lines on the grid and write the solution of $x + y = 4$ and $x - y = 2$. **[3]**

$x + y = 4$: $(0, 4)$, $(4, 0)$, $(2, 2)$ — 1

$x - y = 2$: $(0, -2)$, $(2, 0)$, $(4, 2)$ — 1

The lines meet at $(3, 1)$: $x = 3$, $y = 1$ — 1

A6. The sum of two numbers is 25 and their difference is 7. Complete the steps to find the numbers. **[2]**

$x + y = 25$, $x - y = 7$ — 1

Add: $2x = 32 \rightarrow x = 16$, $y = 9$ — 1

B

PART B · SOLUTIONS

NCERT Practice – Solutions

Worked solutions with step marks for every question in Part B.

Consistency and graphs

B1. By comparing the ratios $\frac{a_1}{a_2}, \frac{b_1}{b_2}, \frac{c_1}{c_2}$, find whether the lines intersect, are parallel or coincide: **(i)** $3x + 2y - 7 = 0$
$5x - 4y + 1 = 0$ **(ii)** $4x - 6y + 10 = 0$
$6x - 9y + 15 = 0$ **(iii)** $2x + 5y - 8 = 0$
$6x + 15y - 11 = 0$ **[3]**

(i) $\frac{3}{5}$ and $\frac{2}{-4} = -\frac{1}{2}$: not equal $\rightarrow$ the lines **intersect** — 1

(ii) $\frac{4}{6} = \frac{-6}{-9} = \frac{10}{15} = \frac{2}{3} \rightarrow$ the lines **coincide** — 1

(iii) $\frac{2}{6} = \frac{5}{15} = \frac{1}{3}$ but $\frac{-8}{-11} = \frac{8}{11} \rightarrow$ the lines are **parallel** — 1

B2. Check whether each pair is consistent or inconsistent: **(i)** $x + 2y = 5$
$3x + 6y = 15$ **(ii)** $2x - 3y = 8$
$4x - 6y = 9$ **(iii)** $3x - y = 2$
$6x + 2y = 10$ **[3]**

(i) $\frac{1}{3} = \frac{2}{6} = \frac{5}{15}$: coincident lines $\rightarrow$ **consistent** (infinitely many solutions) — 1

(ii) $\frac{2}{4} = \frac{-3}{-6} = \frac{1}{2}$ but $\frac{8}{9} \neq \frac{1}{2}$: parallel $\rightarrow$ **inconsistent** — 1

(iii) $\frac{3}{6} = \frac{1}{2}$ and $\frac{-1}{2}$: not equal $\rightarrow$ unique solution $\rightarrow$ **consistent** — 1

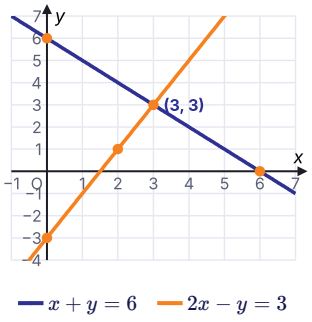
Q	Answer	Working / reason
B3	**(b)** intersecting at $(3, -2)$	$x = 3$ is parallel to the y-axis and $y = -2$ is parallel to the x-axis; they meet at $(3, -2)$.

B4. Solve graphically: $x + y = 6$ and $2x - y = 3$. **[3]**

$x + y = 6$: points $(0,6)$, $(6,0)$, $(2,4)$ 1

$2x - y = 3$: points $(0,-3)$, $(2,1)$, $(3,3)$ 1

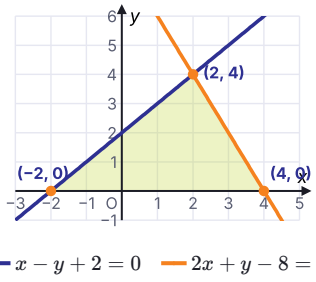
The lines meet at $(3,3)$: $x = 3$, $y = 3$ 1



B5. Draw the graphs of $x - y + 2 = 0$ and $2x + y - 8 = 0$. Find the vertices of the triangle formed by these lines and the x-axis, and shade it. Also find its area. **[4]**

$x - y + 2 = 0$: $(0,2)$, $(-2,0)$, $(2,4)$; $2x + y - 8 = 0$: $(0,8)$, $(4,0)$, $(2,4)$ 1

Both lines drawn on the same axes; they meet at $(2,4)$ 1



Vertices: $(2,4)$, $(-2,0)$, $(4,0)$ 1

Area $= \frac{1}{2} \times 6 \times 4 = 12$ sq units 1

Substitution method

B6. Solve by the substitution method: **(i)** $x + y = 11,\ x - y = 3$ **(ii)** $3x - y = 7,\ 2x + 3y = 12$ **(iii)** $\frac{x}{2} + \frac{y}{3} = 4,\ x - y = 3$ **[3]**

(i) $x = y + 3 \to 2y + 3 = 11 \to y = 4, x = 7$ 1

(ii) $y = 3x - 7 \to 2x + 9x - 21 = 12 \to 11x = 33 \to x = 3, y = 2$ 1

(iii) $3x + 2y = 24$ (×6) and $x = y + 3 \to 5y + 9 = 24 \to y = 3, x = 6$ 1

B7. Solve $3x + 2y = 12$ and $5x - 3y = 1$, and hence find m for which $y = mx + 1$. **[3]**

$y = \dfrac{12 - 3x}{2} \to 5x - \dfrac{3(12 - 3x)}{2} = 1 \to 10x - 36 + 9x = 2$ 1

$19x = 38 \to x = 2, y = 3$ 1

$3 = 2m + 1 \Rightarrow m = 1$ 1

Elimination method

B8. Solve by the elimination method: **(i)** $x + 2y = 9,\ 3x - 2y = 3$ **(ii)** $4x + 3y = 18,\ 3x - 2y = 5$ **[3]**

(i) Add: $4x = 12 \to x = 3$; $3 + 2y = 9 \to y = 3$ — 1

(ii) First ×2: $8x + 6y = 36$; second ×3: $9x - 6y = 15$; add: $17x = 51 \to x = 3$ — 1

$12 + 3y = 18 \to y = 2$ — 1

B9. Use elimination on $2x - y = 5$ and $4x - 2y = 12$. What do you conclude? **[2]**

First ×2: $4x - 2y = 10$. Subtract from the second: $0 = 2$ — 1

This is impossible, so the pair has no solution: the lines are parallel — 1

Word problems

B10. If 1 is added to both the numerator and the denominator of a fraction, it becomes $\frac{4}{5}$. If 5 is subtracted from both, it becomes $\frac{1}{2}$. Find the fraction. **[3]**

Let the fraction be $\frac{x}{y}$. $\frac{x+1}{y+1} = \frac{4}{5} \Rightarrow 5x - 4y = -1$ — 1

$\frac{x-5}{y-5} = \frac{1}{2} \Rightarrow 2x - y = 5$ — ½

$y = 2x - 5 \to 5x - 8x + 20 = -1 \to x = 7, y = 9$ — 1

Fraction $= \frac{7}{9}$ — ½

B11. Six years ago, a mother was four times as old as her daughter. Six years from now, she will be twice as old as her daughter. Find their present ages. **[3]**

Let the ages be x (mother) and y (daughter). $x - 6 = 4(y - 6) \Rightarrow x - 4y = -18$ — 1

$x + 6 = 2(y + 6) \Rightarrow x - 2y = 6$ — ½

Subtract: $2y = 24 \to y = 12, x = 30$ — 1

Mother 30 years, daughter 12 years — ½

B12. The sum of the digits of a two-digit number is 12. The number formed by reversing the digits is 18 more than the original number. Find the number. **[3]**

Let tens digit $= x$, units digit $= y$: $x + y = 12$ — ½

$10y + x = 10x + y + 18 \Rightarrow y - x = 2$ — 1

Add: $2y = 14 \to y = 7, x = 5$ — 1

The number is 57 — ½

B13. A taxi charges a fixed amount plus a charge for every km. The fare for 10 km is ₹180 and for 15 km is ₹255. Find the fixed charge and the charge per km. How much is the fare for 25 km? **[3]**

Let fixed charge $=$ ₹x, rate $=$ ₹y per km: $x + 10y = 180,\ x + 15y = 255$ — 1

Subtract: $5y = 75 \to y = 15, x = 30$ — 1

Fare for 25 km $= 30 + 25 \times 15 =$ ₹405 — 1

C

PART C · SOLUTIONS

Board Pattern Practice – Solutions

Worked solutions with step marks for every question in Part C.

Number of solutions · consistency

Q	Answer	Working / reason
C1	**(c)** infinitely many solutions	$\frac{2}{4}=\frac{3}{6}=\frac{5}{10}=\frac{1}{2}$: coincident lines.
C2	**(b)** parallel	$\frac{1}{3}=\frac{-2}{-6}=\frac{1}{3}$ but $\frac{3}{7}\neq\frac{1}{3}$.
C3	**(d)** x – y = 2	$3-1=2$ ✓ and $\frac{2}{1}\neq\frac{1}{-1}$. (a) coincides, (b) is parallel, (c) is not satisfied by $(3,1)$.
C4	**(b)** k ≠ 6	$\frac{k}{3}\neq\frac{2}{1}\Rightarrow k\neq 6$.
C5	**(d)** 6	$\frac{1}{3}=\frac{2}{k}\Rightarrow k=6$; and $\frac{4}{9}\neq\frac{1}{3}$ ✓
C6	**(c)** inconsistent	The lines are parallel (same steepness, never meet): no solution, so inconsistent.
C7	**(a)** 0	Both lines are parallel to the y-axis, so they never meet.
C8	**(a)**	All ratios are $\frac{1}{2}$, so there are infinitely many solutions and the pair is consistent. R explains A.

C9. Find the value of p for which $px+4y=8$ and $3x+6y=12$ have infinitely many solutions. [2]

$\frac{p}{3}=\frac{4}{6}=\frac{8}{12}=\frac{2}{3}$ — 1

$p=2$ — 1

Values from a given solution

Q	Answer	Working / reason
C10	**(b)** –2	$6-k=8\Rightarrow k=-2$

Solve the pair algebraically

C11. Solve: $5x-3y=9$ and $3x+2y=13$. [2]

First ×2: $10x-6y=18$; second ×3: $9x+6y=39$; add: $19x=57\rightarrow x=3$ — 1

$15-3y=9\rightarrow y=2$ — 1

C12. Solve: $\frac{x}{3}+\frac{y}{4}=4$ and $\frac{x}{2}-\frac{y}{4}=1$. [2]

Add: $\frac{x}{3}+\frac{x}{2}=5\Rightarrow\frac{5x}{6}=5\rightarrow x=6$ — 1

$2+\frac{y}{4}=4\rightarrow y=8$ — 1

Graphical method

Q	Answer	Working / reason

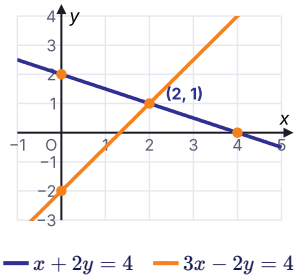
C13 **(b)** $(2, 3)$ — The lines meet at the point 2 along and 3 up: $(2, 3)$.

C14. Solve graphically: $x + 2y = 4$ and $3x - 2y = 4$. **[3]**

$x + 2y = 4$: $(0, 2)$, $(4, 0)$, $(2, 1)$ — 1

$3x - 2y = 4$: $(0, -2)$, $(2, 1)$, $(4, 4)$ — 1

The lines meet at $(2, 1)$: $x = 2$, $y = 1$ — 1



Word problems

C15. Five years ago, a father was seven times as old as his son Ravi. Five years from now, he will be three times as old as Ravi. Find their present ages. **[3]**

Let father $= x$, Ravi $= y$ years. $x - 5 = 7(y - 5) \Rightarrow x - 7y = -30$ — 1

$x + 5 = 3(y + 5) \Rightarrow x - 3y = 10$ — ½

Subtract: $4y = 40 \rightarrow y = 10$, $x = 40$ — 1

Father 40 years, Ravi 10 years — ½

C16. A two-digit number is 4 times the sum of its digits. If 18 is added to the number, its digits are reversed. Find the number. **[3]**

Let tens digit x, units y: $10x + y = 4(x + y) \Rightarrow y = 2x$ — 1

$10x + y + 18 = 10y + x \Rightarrow y - x = 2$ — 1

$2x - x = 2 \rightarrow x = 2$, $y = 4$; the number is 24 — 1

Q	Answer	Working / reason
C17	**(a)** $\frac{5}{9}$	$x + y = 14$ and $2x = y + 1 \rightarrow 3x = 15 \rightarrow \frac{5}{9}$

C18. Two angles are supplementary. The larger is 30° more than twice the smaller. Find the angles. **[2]**

Let them be x (smaller) and y: $x + y = 180$, $y = 2x + 30$ — 1

$3x = 150 \rightarrow x = 50^\circ$, $y = 130^\circ$ — 1

C19. A school bought 3 chairs and 2 tables for ₹4,700, and 5 chairs and 3 tables for ₹7,400. Find the cost of one chair and one table. **[3]**

Let a chair cost ₹x and a table ₹y: $3x + 2y = 4700$, $5x + 3y = 7400$ — 1

First ×3: $9x + 6y = 14100$; second ×2: $10x + 6y = 14800$; subtract: $x = 700$ — 1

$2y = 4700 - 2100 \rightarrow y = 1300$. Chair ₹700, table ₹1,300 — 1

D

PART D · SOLUTIONS

Case-Based Questions – Solutions

Worked solutions with step marks for every question in Part D.

D1. Case Study · Canteen Sales [4]

(i) Write the pair of linear equations for this situation. **[1]**

$40x + 30y = 1950$ and $30x + 50y = 2150$ (i.e. $4x + 3y = 195$, $3x + 5y = 215$) 1

(ii) Is this pair consistent? Give a reason using the ratios. **[1]**

$\frac{40}{30} \neq \frac{30}{50}$: unique solution, so consistent 1

(iii) Find the price of a sandwich and of a glass of juice. **[2]**

$4x + 3y = 195$ ×3 and $3x + 5y = 215$ ×4: $12x + 9y = 585$, $12x + 20y = 860 \rightarrow 11y = 275$, $y = 25$ 1

$4x = 195 - 75 \rightarrow x = 30$. Sandwich ₹30, juice ₹25 1

OR

(iii) On Wednesday the canteen sold 50 sandwiches and 40 glasses of juice. How much did it collect? **[2]**

From the pair: sandwich ₹30, juice ₹25 1

$50 \times 30 + 40 \times 25 = 1500 + 1000 = ₹2,500$ 1

D2. Case Study · Town Map [4]

(i) Do the highway and the canal cross? Give a reason using the ratios. **[1]**

$\frac{1}{1} \neq \frac{2}{-1}$: the lines intersect, so yes 1

(ii) At which point does the highway meet the railway line? **[1]**

Put $y = 0$: $x = 8 \rightarrow (8, 0)$ 1

(iii) Find the coordinates of the bridge. **[2]**

$x = y + 2 \rightarrow y + 2 + 2y = 8 \rightarrow y = 2$ 1

$x = 4$: the bridge is at $(4, 2)$ 1

OR

(iii) The highway, the canal and the railway line enclose a triangular plot. Find its area. **[2]**

Vertices: bridge $(4, 2)$, highway–railway $(8, 0)$, canal–railway $(2, 0)$ 1

Area $= \frac{1}{2} \times 6 \times 2 = 6$ sq km 1

D3. Case Study · School Trip [4]

(i) Write the pair of equations, taking x students per bus and y per van. **[1]**

$2x + 3y = 150$ and $3x + 2y = 175$ 1

(ii) By subtracting the equations, find how many more students a bus carries than a van. **[1]**

Subtract: $x - y = 25$: a bus carries 25 more 1

(iii) Find the number of students a bus and a van can carry. **[2]**

Add: $5x + 5y = 325 \Rightarrow x + y = 65$ 1

With $x - y = 25$: $x = 45$, $y = 20$ 1

OR

(iii) For 245 students the school books 5 buses. How many vans are needed for the rest? **[2]**

A bus carries 45 (from the pair): 5 buses carry 225 1

$245 - 225 = 20$ students left $\rightarrow$ 1 van 1