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

CHAPTER 3 BASIC

Pair of Linear Equations in Two Variables

Chapter Practice Booklet · Questions only · Answers in the separate Answer Booklet

6 guided method questions | 32 practice questions | 3 case studies | Basic (430 series) board question index

INSIDE THIS BOOKLET

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STUDENT DETAILS

NAME _____

CLASS & SECTION _____

ROLL NO. _____

BOOKLET STARTED ON _____

CHAPTER TEST SCORE ____ / 20

1

READ THIS FIRST · MATHEMATICS BASIC

Chapter Notes

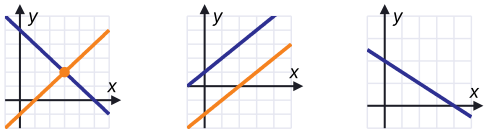
The whole chapter in short-note form: every definition, formula, method and model answer. Revise from here – you should not need the textbook again.

1 Linear equation in two variables

- Form: $ax + by + c = 0$, where a, b, c are real numbers and a, b are not both zero. Example: $2x + y - 6 = 0$.
- A **solution** is a pair (x, y) that makes both sides equal: $(1, 4)$, $(3, 0)$, $(0, 6)$ are solutions of $2x + y = 6$.
- Such an equation has **infinitely many** solutions. Its graph is a **straight line**: every point on the line is a solution, and every solution is a point on the line.

A **pair** of linear equations: $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$. A solution of the pair must satisfy **both** equations: it is a point on both lines.

2 Two lines: three possibilities



Lines intersect	exactly one solution (unique) → **consistent**
Lines are parallel	no solution → **inconsistent**
Lines coincide	infinitely many solutions → **consistent** (dependent)

Consistent = has at least one solution.

3 Consistency from the coefficients

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	intersecting · unique solution · consistent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	parallel · no solution · inconsistent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	coincident · infinitely many · consistent

EXAMPLE

$3x - 2y + 5 = 0$ and $6x - 4y + 9 = 0$: $\frac{3}{6} = \frac{1}{2}$, $\frac{-2}{-4} = \frac{1}{2}$, $\frac{5}{9}$. So $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$: parallel lines, no solution.

Write both equations in the same form (both $= 0$, or both $= c$) before reading c_1 and c_2, and keep the signs.

4 Finding k for a given condition

- **Unique solution:** $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$. The answer has the form "$k \neq \ldots$".
- **No solution:** $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ gives k; then check that $\frac{c_1}{c_2}$ is different.
- **Infinitely many:** all three ratios equal; use two of the equalities.

EXAMPLE

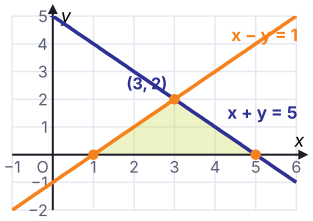
For what k do $2x + ky = 5$ and $4x + 6y = 10$ have infinitely many solutions?
$\frac{2}{4} = \frac{k}{6} = \frac{5}{10} \rightarrow \frac{k}{6} = \frac{1}{2} \rightarrow k = 3$.

EXAMPLE

For what k do $kx + 2y = 3$ and $6x + 4y = 5$ have no solution?
$\frac{k}{6} = \frac{2}{4} \Rightarrow k = 3$; check $\frac{2}{4} \neq \frac{3}{5}$ ✓. So $k = 3$.

5 Graphical method

1. For each equation make a table of 2 or 3 points (easy ones: put $x = 0$, then $y = 0$).
2. Plot the points on the same axes and draw both lines with a ruler. Label each line.
3. Read the point where they meet. That is the solution. Check it in both equations.



Triangle with an axis: vertices = the meeting point + the two points where the lines cut that axis. Here (with the x-axis): $(3, 2)$, $(1, 0)$, $(5, 0)$; area $= \frac{1}{2} \times 4 \times 2 = 4$ sq units.

6 Substitution method

1. From one equation write one variable in terms of the other (choose the one with coefficient 1).
2. Substitute it in the other equation and solve for the remaining variable.
3. Put this value back to get the first variable. Check in both equations.

EXAMPLE

$2x + 3y = 13$, $x - 2y = -4$

$x = 2y - 4 \rightarrow 2(2y - 4) + 3y = 13 \rightarrow 7y = 21 \rightarrow y = 3$, $x = 2$.

Check: $4 + 9 = 13$ ✓, $2 - 6 = -4$ ✓

7 Elimination method

1. Multiply the equations so that one variable has equal (or opposite) coefficients.
2. Subtract (or add) to remove that variable. Solve for the other.
3. Substitute back to find the first variable.

EXAMPLE

$3x + 4y = 10$, $2x - 2y = 2$

Second × 2: $4x - 4y = 4$. Add: $7x = 14 \rightarrow x = 2$; then $4y = 10 - 6 \rightarrow y = 1$.

You get $0 = 0$	infinitely many solutions
You get $0 =$ a non-zero number	no solution
Coefficients swap, like $47x + 31y$ and $31x + 47y$	add and subtract the equations: get $x + y$ and $x - y$

8 Word problems: how to form the equations

Ages	n years ago: $x - n$, $y - n$; n years later: $x + n$, $y + n$
Two-digit number	tens digit x, units y: number $10x + y$; reversed $10y + x$
Fraction	$\frac{x}{y}$; change the numerator/denominator as told, then cross-multiply
Fixed charge + rate	total $= x + ny$ (x fixed, y per unit)
Boat / stream	downstream $u + v$, upstream $u - v$; speed $= \frac{\text{distance}}{\text{time}}$
Interest	$\frac{x \times r}{100}$ for one year on x at $r\%$
Angles	triangle sum 180°; supplementary 180°; complementary 90°

Always write "Let … be x and … be y" first. It carries the mark for forming equations.

9 Model answer: ages (3 marks)

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.

1. Let the mother's present age be x years and the daughter's y years. ½
2. $x - 6 = 4(y - 6) \Rightarrow x - 4y = -18$ ½
3. $x + 6 = 2(y + 6) \Rightarrow x - 2y = 6$ ½
4. Subtract: $2y = 24 \Rightarrow y = 12$ 1
5. $x = 6 + 24 = 30$. Mother 30 years, daughter 12 years. ½

10 Model answer: graph and triangle (5 marks)

Draw the graphs of $x + y = 5$ and $x - y = 1$. Find the vertices of the triangle formed by these lines and the x-axis, and its area.

1. $x + y = 5$: $(0, 5)$, $(5, 0)$, $(2, 3)$ 1
2. $x - y = 1$: $(1, 0)$, $(3, 2)$, $(0, -1)$ 1
3. Lines drawn correctly on the same axes; they meet at $(3, 2)$ 1
4. Vertices: $(3, 2)$, $(5, 0)$, $(1, 0)$ 1
5. Area $= \frac{1}{2} \times$ base $\times$ height $= \frac{1}{2} \times 4 \times 2 = 4$ sq units 1

Use a ruler, write the equation on each line, and mark the meeting point with its coordinates.

11 Checks that save marks

- Put your answer back in **both** equations before you move on.
- In a word problem, the answer must make sense: ages and lengths positive, number of coins a whole number.
- For "no solution" always check the third ratio; if it is also equal, the lines coincide instead.
- A line $x = a$ is parallel to the y-axis; $y = b$ is parallel to the x-axis. So $x = 2$ and $x = 3$ have **no** common point, while $x = 2$ and $y = 3$ meet at $(2, 3)$.

Exam snapshot

What the board asks, and how to prepare

SYLLABUS 2026–27

- Pair of linear equations in two variables; graphical method of solution; consistency and inconsistency.
- Algebraic conditions for the number of solutions.
- Solving by **substitution** and by **elimination**; simple situational problems.

Not asked: cross-multiplication method and equations reducible to linear form (both deleted).

BOARD WEIGHTAGE

20 / 80

Unit II Algebra together. Basic papers give a 1-mark question on the number of solutions (or k) every time, plus a 2- or 3-mark question: solve a pair, draw a graph, or a word problem.

MOST ASKED IN BASIC BOARD PAPERS + SAMPLE PAPER 2026–27 (3 PAPERS CHECKED)

How often	Question type	Marks	Papers
★★★	Number of solutions, or the value of k for a unique solution	1	3 of 3
★★☆	Word problem: fraction, two-digit number, angles	1–3	2 of 3
★☆☆	Solve a pair with fractions in it	2	1 of 3
★☆☆	Solve a pair graphically	3	1 of 3

MISTAKES THAT COST MARKS

- Not checking the answer in both equations.
- Sign slips when you subtract one equation from another. Change every sign of the equation you subtract.
- Writing the ratios for different forms of the equations.
- Taking the two-digit number as $x + y$. It is $10x + y$.
- Plotting points wrongly: $(2, 3)$ means 2 along the x-axis and 3 up.
- Forgetting units (years, ₹, km/h) in the final answer of a word problem.

HOW TO USE THIS BOOKLET

1. **Day 1:** Notes, then Part A (guided methods) – fill every blank.
2. **Day 2:** Part B (NCERT practice). Do every MUST DO question first.
3. **Day 3:** Part C (board pattern), Part D (case studies) and the real board questions in Part E.
4. **Sun 13 Dec: Sunday chapter test – 20 marks in 40 minutes, without the booklet.**
5. Check every answer in the Answer Booklet. Write each mistake on the My Mistakes page.

RULES AT A GLANCE

Unique solution	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ (intersecting)
No solution	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ (parallel)
Infinitely many	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (coincident)
Consistent	unique or infinitely many solutions
Two-digit number	$10x + y$; reversed $10y + x$
Boat	downstream $u + v$, upstream $u - v$

PART A · LEARN THE METHODS

A Guided Practice

Fill in the blanks to learn each board method step by step. Then use the same steps on your own in Part B.

Number of solutions

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

Pair	$\frac{a_1}{a_2}$	$\frac{b_1}{b_2}$	$\frac{c_1}{c_2}$	Lines	Solutions
$x + y - 5 = 0,\ x - y - 1 = 0$	1	-1	5	intersecting	one
$x + 2y - 4 = 0,\ 2x + 4y - 8 = 0$	____	____	____	_____	_____
$3x - y + 2 = 0,\ 6x - 2y + 7 = 0$	____	____	____	_____	_____

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

No solution needs $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$.

$\frac{a_1}{a_2} =$ ____, $\frac{b_1}{b_2} =$ ____. Equate: _____ $\rightarrow k =$ ____

Check: $\frac{c_1}{c_2} =$ ____, which is _____ $\frac{a_1}{a_2}$. So $k =$ ____

Substitution and elimination

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

From the first equation, $y =$ _____.

Substitute in the second: $2x - ($_____$) = 7 \rightarrow$ ____$x - 8 = 7 \rightarrow x =$ ____

Then $y = 8-$ ___ $=$ ___. Check in $2x - y = 7$: _____

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

The coefficients of y are $+2$ and -2, so we _____ the equations: _____$x =$ ____ $\rightarrow x =$ ____

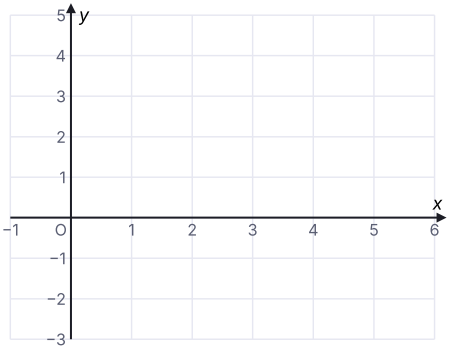
Put in $3x + 2y = 11$: ____ $+2y = 11 \rightarrow y =$ ____

Graph and word problem

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

$x + y = 4$			
x	0	4	2
y			

$x - y = 2$			
x	0	2	4
y			



Solution: $x =$ ____, $y =$ ____

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

Let the larger number be x and the smaller y. Equations: _____ and _____.

Add: ____ $= 32 \rightarrow x =$ ____. Then $y =$ ____.

PART B · NCERT PRACTICE

B NCERT Practice

The same skills as the NCERT examples and exercises, with new numbers. Basic papers are built on NCERT, so finish every question.

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: [3] MUST DO

(i) $3x + 2y - 7 = 0$, $5x - 4y + 1 = 0$ (ii) $4x - 6y + 10 = 0$, $6x - 9y + 15 = 0$ (iii) $2x + 5y - 8 = 0$, $6x + 15y - 11 = 0$

B2. Check whether each pair is consistent or inconsistent: MUST DO [3]

(i) $x + 2y = 5$, $3x + 6y = 15$ (ii) $2x - 3y = 8$, $4x - 6y = 9$ (iii) $3x - y = 2$, $6x + 2y = 10$

B3. The pair of equations $x = 3$ and $y = -2$ represents two lines which are: [1]

(a) parallel (b) intersecting at $(3, -2)$

(c) coincident (d) intersecting at $(-2, 3)$

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

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]

Substitution method

B6. Solve by the substitution method: MUST DO [3]

(i) $x + y = 11,\ x - y = 3$ (ii) $3x - y = 7,\ 2x + 3y = 12$ (iii) $\frac{x}{2} + \frac{y}{3} = 4,\ x - y = 3$

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

Elimination method

B8. Solve by the elimination method: MUST DO [3]

(i) $x + 2y = 9,\ 3x - 2y = 3$ (ii) $4x + 3y = 18,\ 3x - 2y = 5$

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

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. MUST DO [3]

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. MUST DO [3]

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]

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]

C

PART C · BOARD PATTERN (BASIC)

Board Pattern Practice

Question types from real Mathematics Basic papers (430 series) and the 2026–27 Sample Paper. ★★★ = asked in all 3 papers checked · ★★ = 2 papers · ★ = 1 paper.

ASSERTION–REASON: HOW TO ANSWER

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Number of solutions · consistency

★★★ 3 of 3 papers · 1 mark

C1. The pair $2x + 3y = 5$ and $4x + 6y = 10$ has: MUST DO [1]

(a) a unique solution
(b) no solution
(c) infinitely many solutions
(d) exactly two solutions

C2. The lines $x - 2y = 3$ and $3x - 6y = 7$ are: [1]

(a) intersecting **(b)** parallel **(c)** coincident **(d)** perpendicular

C3. Which equation, taken with $2x + y = 7$, gives exactly one solution, namely $(3, 1)$? [1]

(a) $4x + 2y = 14$ **(b)** $2x + y = 5$ **(c)** $x + y = 5$ **(d)** $x - y = 2$

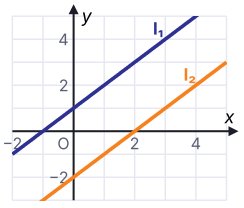
C4. If $kx + 2y = 5$ and $3x + y = 1$ have a unique solution, then: MUST DO [1]

(a) $k = 6$ **(b)** $k \neq 6$ **(c)** $k = \frac{3}{2}$ **(d)** $k \neq \frac{3}{2}$

C5. The value of k for which $x + 2y = 4$ and $3x + ky = 9$ have no solution is: [1]

(a) 2 **(b)** 3 **(c)** 9 **(d)** 6

C6. The graphs of two linear equations are the lines l_1 and l_2 shown. The pair of equations is: [1]



(a) consistent with a unique solution
(b) consistent with infinitely many solutions
(c) inconsistent
(d) dependent

C7. The number of solutions of the pair $x = 4$ and $x = -1$ is: [1]

(a) 0 **(b)** 1 **(c)** 2 **(d)** infinitely many

C8. ASSERTION–REASON [1]

Assertion (A): The pair $2x + 3y = 6$ and $4x + 6y = 12$ is consistent.

Reason (R): If $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, the pair has infinitely many solutions.

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

Values from a given solution

C10. If $x = 2$, $y = -1$ is a solution of $3x + ky = 8$, then k is: [1]

(a) 2 (b) -2 (c) 14 (d) -14

Solve the pair algebraically

★☆☆ 1 of 3 papers · 2 marks

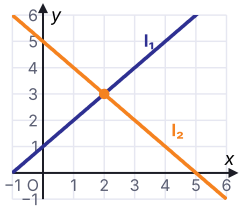
C11. Solve: $5x - 3y = 9$ and $3x + 2y = 13$. MUST DO [2]

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

Graphical method

★☆☆ 1 of 3 papers · 3 marks

C13. The graphs of two equations are shown. The solution of the pair is: [1]



(a) (3, 2) (b) (2, 3) (c) (1, 2) (d) (0, 5)

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

Word problems

★★☆ 2 of 3 papers · 1–3 marks

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. MUST DO [3]

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]

C17. The sum of the numerator and denominator of a fraction is 14. If 1 is added to the denominator, the fraction becomes $\frac{1}{2}$. The fraction is: [1]

(a) $\frac{5}{9}$ (b) $\frac{4}{10}$ (c) $\frac{6}{8}$ (d) $\frac{3}{11}$

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

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]

D

PART D · SECTION E STYLE

Case-Based Questions

Each case carries 4 marks (1 + 1 + 2), as in Section E of the board paper. Underline the numbers in the passage before you start.

D1. Case Study · Canteen Sales [4]

The school canteen sells sandwiches at ₹x each and juice at ₹y a glass. On Monday it sold 40 sandwiches and 30 glasses of juice for ₹1,950. On Tuesday it sold 30 sandwiches and 50 glasses of juice for ₹2,150.

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

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

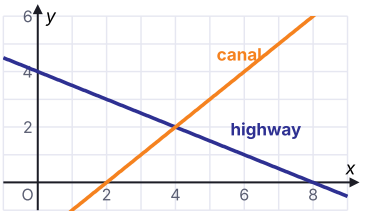
(iii) Find the price of a sandwich and of a glass of juice. [2]

OR

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

D2. Case Study · Town Map [4]

On a town map (1 unit = 1 km), a highway runs along the line $x + 2y = 8$ and a canal along the line $x - y = 2$. The railway line runs along the x-axis. A bridge is built where the highway crosses the canal.



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

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

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

OR

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

D3. Case Study · School Trip [4]

For a school trip, 2 buses and 3 vans together carry 150 students, and 3 buses and 2 vans together carry 175 students. Every bus carries the same number of students, and so does every van.

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

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

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

OR

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

PART E · REAL BOARD QUESTIONS

E Board PYQ Index (Basic)

Real questions from the Mathematics Basic (430 series) papers and the 2026–27 Sample Paper, by type. Open the official paper and solve the listed questions.

Frequency	Question type	Marks	Where asked (year: paper code, question number)	Practise here
★★★	**Number of solutions / value of k**	1	**2026:** 430/1/2 Q7, Q18 · **2025:** 430/1/1 Q20 · **SQP 2026–27:** Q3	A1–A2, B1–B5, C1–C9
★★☆	**Word problems**	1–3	**2025:** 430/1/1 Q28(b) · **SQP 2026–27:** Q4, Q31	A6, B10–B13, C15–C19, D1, D3
★☆☆	**Solve a pair algebraically**	2	**2025:** 430/1/1 Q21	A3–A4, B6–B9, C11–C12
★☆☆	**Solve graphically**	3	**2025:** 430/1/1 Q28(a)	A5, B3–B5, C13–C14, D2

Papers checked (3): 2026 – 430/1/2 (Section A only could be read online) · 2025 – 430/1/1 · CBSE Sample Paper 2026–27 (Mathematics Basic). Sets of one code family share most questions, so they count as one paper. Download the official papers from cbse.gov.in → Previous Year Question Papers → Mathematics Basic.

PART F · YOUR RECORD

F My Mistakes

Write down each mistake from this chapter, including the chapter test.

Every wrong answer is a free lesson. Write it here, find the rule you missed, and redo the question after three days. Bring this page to class before the next test.

Date	Part & Q No.	What went wrong	Correct rule or method	Redone ✓