Class 10 Maths Chapter 3: Pair of Linear Equations in Two Variables - Notes, Important Questions and MCQs (2026-27)

Free PDF notes from Nextoper.in | Session 2026-27 | Read online:
https://nextoper.in/class-10-maths-chapter-3-pdf-notes/

These Pair of Linear Equations in Two Variables Class 10 notes cover NCERT Class 10 Maths Chapter 3: the graphical method, consistency conditions using coefficient ratios, the substitution and elimination methods, and word problems – with solved examples, 10 MCQs and a free PDF.

Use the table of contents below to jump to the part you need, or read top to bottom for a complete revision of the chapter.

Table of Contents

- Chapter Overview
- Important Topics and Concepts
- Solved Examples
- Choosing the Method
- Consistency Conditions at a Glance
- Important Formulas and Definitions
- Short Answer Questions
- Long Answer Questions
- MCQs with Answers
- Quick Revision Points
- Chapter Summary
- Exam Tips and PYQ Pattern
- Frequently Asked Questions
- Conclusion

Want notes for every chapter? Explore the full Class 10 Maths notes on Nextoper, arranged book-wise and chapter-wise.

Chapter Overview

A pair of linear equations in two variables x and y has the form $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$. Each equation is a straight line; the solution is the point where both lines meet.

You can solve such a pair graphically, or algebraically by substitution or elimination. Before solving, the ratios a_1/a_2, b_1/b_2 and c_1/c_2 tell you whether there is one solution, no solution or infinitely many. (Cross-multiplication and equations reducible to linear form are not in the 2026-27 syllabus.)

Important Topics and Concepts

Graphical Method

- Draw both lines on the same graph using at least two points each.
- Lines intersect at one point → unique solution (consistent).
- Lines are parallel → no solution (inconsistent).
- Lines coincide → infinitely many solutions (dependent and consistent).

Conditions Using Ratios

- $a_1/a_2 \neq b_1/b_2$ → intersecting lines → exactly one solution.
- $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ → parallel lines → no solution.
- $a_1/a_2 = b_1/b_2 = c_1/c_2$ → coincident lines → infinitely many solutions.

Substitution Method

- Step 1: From one equation, express one variable in terms of the other (e.g. y in terms of x).
- Step 2: Substitute into the other equation to get an equation in one variable and solve it.
- Step 3: Substitute back to find the second variable.
- Step 4: Check the answer in both original equations.

Elimination Method

- Step 1: Multiply the equations by suitable non-zero numbers to make the coefficients of one variable equal.
- Step 2: Add or subtract to eliminate that variable.
- Step 3: Solve for the remaining variable and substitute back.
- If both variables vanish and you get a true statement (0 = 0), there are infinitely many solutions; a false statement (0 = 5) means no solution.

Word Problems

- Choose variables clearly (“let the cost of a pen be ₹x”).
- Translate each condition into one equation.
- Solve by the easiest method and answer in words with units.
- Common types: ages, cost of items, fractions, two-digit numbers, speed and boats, rectangle dimensions.

Solved Examples

Board-pattern questions with full working.

- Solve by substitution: $x + y = 14$, $x - y = 4$. From the first, $x = 14 - y$. Then $14 - 2y = 4 \rightarrow y = 5$, $x = 9$.
- Solve by elimination: $3x + 4y = 10$, $2x - 2y = 2$. Multiply the second by 2: $4x - 4y = 4$. Add: $7x = 14 \rightarrow x = 2$; then $y = 1$.
- For what k does $kx + 3y = k - 3$, $12x + ky = k$ have no solution? $k/12 = 3/k \neq (k - 3)/k \rightarrow k^2 = 36$, $k = \pm 6$; $k = -6$ gives $3/-6 \neq -9/-6$ ✓, $k = 6$ makes all ratios equal. So $k = -6$.
- Five years hence, a father will be three times as old as his son. Five years ago he was seven times as old. Find their ages. $x + 5 = 3(y + 5)$ and $x - 5 = 7(y - 5) \rightarrow x - 3y = 10$, $x - 7y = -30 \rightarrow 4y = 40$, $y = 10$, $x = 40$.

Choosing the Method

Pick the fastest method in the exam.

Situation	Best method
One variable has coefficient 1 or −1	Substitution
Coefficients easy to match by multiplying	Elimination
Question asks “solve graphically”	Graphical
Only asks about number of solutions	Compare ratios

Consistency Conditions at a Glance

Ratio condition	Graph	Solutions	Name
$a_1/a_2 \neq b_1/b_2$	Intersecting	Exactly one	Consistent
$a_1/a_2 = b_1/b_2 \neq c_1/c_2$	Parallel	None	Inconsistent
$a_1/a_2 = b_1/b_2 = c_1/c_2$	Coincident	Infinitely many	Dependent (consistent)

Important Formulas and Definitions

Formula / Term	Meaning / Use
Linear equation in two variables	ax + by + c = 0 with a, b not both zero
Solution	A pair (x, y) satisfying both equations
Consistent pair	Has at least one solution
Inconsistent pair	Has no solution
Dependent pair	Has infinitely many solutions (coincident lines)
Substitution method	Solve one equation for a variable and substitute
Elimination method	Equalise coefficients and add/subtract to remove a variable

Short Answer Questions

Q1. Without solving, check whether $5x - 4y + 8 = 0$ and $7x + 6y - 9 = 0$ are consistent.

$a_1/a_2 = 5/7$, $b_1/b_2 = -4/6 = -2/3$. Since $5/7 \neq -2/3$, the lines intersect – consistent with a unique solution.

Q2. Check whether $2x - 3y = 8$ and $4x - 6y = 9$ have a solution.

$2/4 = -3/-6 = 1/2$, but $8/9 \neq 1/2$. Lines are parallel – no solution (inconsistent).

Q3. Solve: $2x + 3y = 11$ and $2x - 4y = -24$.

Subtract: $7y = 35 \rightarrow y = 5$; then $2x = 11 - 15 = -4 \rightarrow x = -2$.

Q4. Find k so that $2x + 3y = 7$ and $(k - 1)x + (k + 2)y = 3k$ has infinitely many solutions.

$2/(k - 1) = 3/(k + 2) = 7/3k$. From the first equality, $2k + 4 = 3k - 3 \rightarrow k = 7$. Check: $3/9 = 7/21$ ✓. So $k = 7$.

$x + y = 27$, $x - y = 3 \rightarrow x = 15$, $y = 12$.

Q6. Half the perimeter of a rectangular garden, whose length is 4 m more than its width, is 36 m. Find its dimensions.

$l + w = 36$, $l - w = 4 \rightarrow l = 20$ m, $w = 16$ m.

Q7. Solve by substitution: $s - t = 3$, $s/3 + t/2 = 6$.

$s = t + 3$. $(t + 3)/3 + t/2 = 6 \rightarrow 2t + 6 + 3t = 36 \rightarrow t = 6$, $s = 9$.

Q8. A fraction becomes 9/11 if 2 is added to both numerator and denominator. If 3 is added to both, it becomes 5/6. Find the fraction.

$11(x + 2) = 9(y + 2) \rightarrow 11x - 9y = -4$; $6(x + 3) = 5(y + 3) \rightarrow 6x - 5y = -3$. Solving: $x = 7$, $y = 9$. Fraction = 7/9.

Long Answer Questions

Q1. Solve graphically: $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Find where the lines meet the x-axis.

For $x - y + 1 = 0$: points (0, 1), (−1, 0), (2, 3).

For $3x + 2y - 12 = 0$: points (4, 0), (0, 6), (2, 3).

Both lines pass through (2, 3), so the solution is $x = 2$, $y = 3$.

The first line meets the x-axis at (−1, 0) and the second at (4, 0).

The triangle formed with the x-axis has vertices (2, 3), (−1, 0), (4, 0).

Q2. A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours it goes 40 km upstream and 55 km downstream. Find the speed of the stream and of the boat in still water.

Let speed in still water = x km/h, stream = y km/h. Let $u = 1/(x - y)$, $v = 1/(x + y)$.

$30u + 44v = 10$ and $40u + 55v = 13$.

Multiply the first by 4 and the second by 3: $120u + 176v = 40$, $120u + 165v = 39 \rightarrow 11v = 1$, $v = 1/11$; then $u = 1/5$.

So $x - y = 5$ and $x + y = 11 \rightarrow x = 8$ km/h, $y = 3$ km/h.

Boat speed 8 km/h; stream speed 3 km/h.

Q3. The cost of 2 kg apples and 1 kg grapes is ₹160. After a month, 4 kg apples and 2 kg grapes cost ₹300. Represent algebraically and graphically and comment.

$2x + y = 160$ and $4x + 2y = 300$ (i.e. $2x + y = 150$).

Ratios: $2/4 = 1/2 = 1/2$ but $160/300 \neq 1/2$.

The lines are parallel, so there is no common solution.

Graphically, (80, 0), (0, 160) lie on the first line and (75, 0), (0, 150) on the second – two parallel lines.

So the data are inconsistent: prices must have changed in the month.

MCQs with Answers

1. The pair x + 2y = 3 and 2x + 4y = 6 has(a) no solution (b) one solution (c) infinitely many solutions (d) two solutionsAnswer: (c) infinitely many solutions – all ratios equal

2. Parallel lines represent a pair that is(a) consistent (b) inconsistent (c) dependent (d) uniqueAnswer: (b) inconsistent

3. The solution of x + y = 5 and x − y = 1 is(a) (3, 2) (b) (2, 3) (c) (4, 1) (d) (1, 4)Answer: (a) (3, 2)

4. For a unique solution, the condition is(a) $a_1/a_2 = b_1/b_2$ (b) $a_1/a_2 \neq b_1/b_2$ (c) $b_1/b_2 = c_1/c_2$ (d) $a_1/a_2 = c_1/c_2$Answer: (b) $a_1/a_2 \neq b_1/b_2$

5. Value of k for which 3x + y = 1 and (2k − 1)x + (k − 1)y = 2k + 1 has no solution is(a) 1 (b) 2 (c) 3 (d) −2Answer: (b) 2 – 3/(2k−1) = 1/(k−1) → k = 2

6. If x = a, y = b is the solution of x − y = 2 and x + y = 4, then a, b are(a) 3, 1 (b) 1, 3 (c) 2, 2 (d) 4, 0Answer: (a) 3, 1

7. Coincident lines have(a) no common point (b) one common point (c) infinitely many common points (d) two common pointsAnswer: (c) infinitely many common points

8. The graph of x = 3 is a line(a) parallel to x-axis (b) parallel to y-axis (c) through origin (d) y = xAnswer: (b) parallel to y-axis

9. Which method is NOT in the 2026-27 syllabus?(a) Substitution (b) Elimination (c) Graphical (d) Cross-multiplicationAnswer: (d) Cross-multiplication

10. A pair of linear equations that has no solution is called(a) dependent (b) consistent (c) inconsistent (d) coincidentAnswer: (c) inconsistent

Quick Revision Points

- Each linear equation = a straight line; solution = intersection point.
- Intersecting → 1 solution; parallel → none; coincident → infinitely many.
- Ratio test: compare a_1/a_2, b_1/b_2, c_1/c_2.
- Substitution: isolate, substitute, solve, back-substitute, check.
- Elimination: equalise coefficients, add/subtract.
- 0 = 0 → infinitely many; 0 = non-zero → no solution.

Chapter Summary

A pair of linear equations in two variables represents two straight lines. They may intersect (one solution), be parallel (no solution) or coincide (infinitely many solutions), which you can predict by comparing the ratios a_1/a_2, b_1/b_2 and c_1/c_2.

Solve such pairs graphically or algebraically by substitution or elimination, and use them to model word problems on ages, costs, fractions, numbers and speeds.

Exam Tips and PYQ Pattern

- Graphical solution is a frequent 3-mark question – plot at least three points per line and label them.
- Ratio-condition questions to find k are common 2-mark questions.
- Always state the method you are using if the question names one.
- Write the final answer in words for word problems.
- Check your solution in both original equations.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the NCERT Class 10 Mathematics textbook and the rationalised CBSE syllabus for 2026-27.

Can I download these notes as a PDF?

Yes. Use the free PDF link at the top of this page – no signup needed.

How do I know if a pair of equations has no solution?

If $a_1/a_2 = b_1/b_2 \neq c_1/c_2$, the lines are parallel and there is no solution.

Is cross-multiplication in the 2026-27 syllabus?

No. Only graphical, substitution and elimination methods are included.

Conclusion

Pair of Linear Equations rewards neat working: test the ratios, pick the fastest method and check your answer. Practise the solved word problems and MCQs here, and save the free PDF for revision.

More Notes: Class 10 Maths Chapter 2: Polynomials notes | Class 10 Maths Chapter 4: Quadratic Equations notes | All Class 10 Maths notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE mathematics educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 10 Maths textbook, Mathematics (Reprint 2026-27), and the CBSE syllabus for the 2026-27 session. Last checked on 16 November 2026.