NCERT Solutions Class 10th Maths Chapter 3 Pair of Linear Equations in Two Variables | Updated 2026-27

⚡ Quick Revision Box — Chapter 3 Ex 3.1

- **Chapter:** 3 — Pair of Linear Equations in Two Variables | Class 10 Maths (NCERT)
- **Exercise 3.1:** 3 questions — all focus on forming and representing equations algebraically & graphically
- **Standard Form:** $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$
- **Consistent System:** $a_1/a_2 \neq b_1/b_2$ → unique solution (lines intersect)
- **Dependent System:** $a_1/a_2 = b_1/b_2 = c_1/c_2$ → infinitely many solutions (lines coincide)
- **Inconsistent System:** $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ → no solution (lines parallel)
- **Graphical Method:** Find 2–3 coordinate pairs per equation, plot points, draw lines
- **Updated for:** CBSE 2026-27 rationalised syllabus

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The **NCERT Solutions Class 10th Maths Chapter 3 Pair Linear Equations Two Variables** on this page are fully updated for the **2026-27 CBSE board exam**. Exercise 3.1 teaches you how to translate real-life word problems — like age puzzles and shopping scenarios — into a pair of linear equations and represent them both algebraically and graphically. You can find all NCERT Solutions on our main hub, and for class-specific resources, visit our NCERT Solutions for Class 10 page. The NCERT official textbook is the primary reference for all solutions below.

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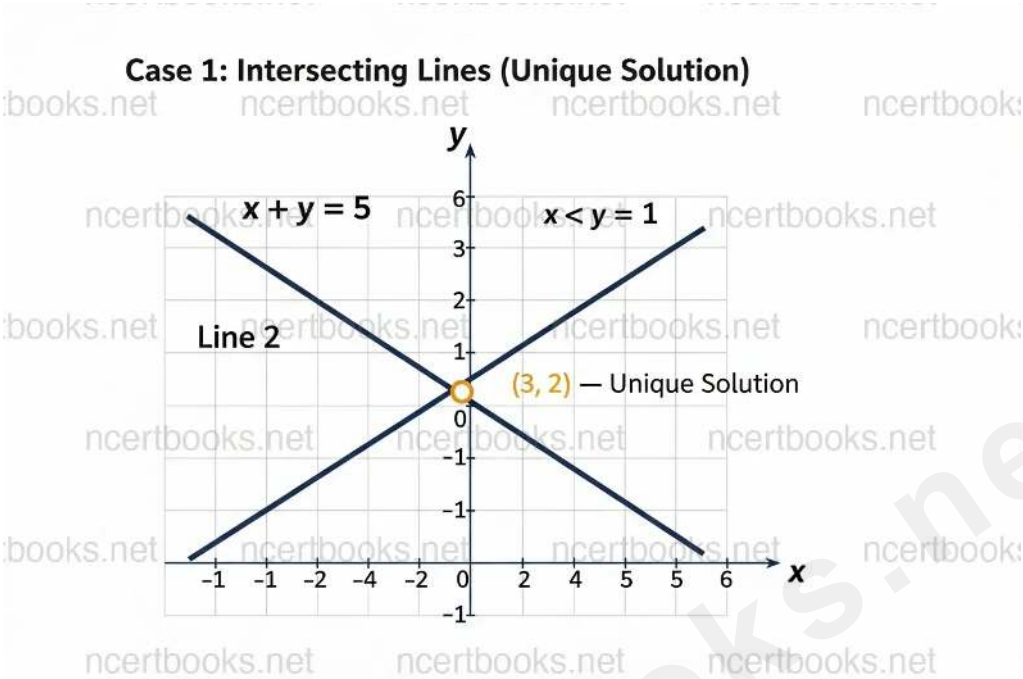

Fig 3.1: Intersecting lines — unique solution at point of intersection

Chapter Overview — NCERT Solutions Class 10th Maths Chapter 3 Pair Linear Equations Two Variables

Chapter 3 of the NCERT Class 10 Maths textbook introduces you to **pairs of linear equations in two variables** — one of the most important algebra topics in secondary school mathematics. You will learn how to form equations from word problems, solve them using graphical and algebraic methods, and interpret the nature of their solutions. This chapter is a direct extension of the linear equations in one variable you studied in Class 8 and Class 9.

For CBSE board exams, this chapter carries significant weight within the **Algebra unit (approx. 20 marks)**. Questions appear as 1-mark MCQs (nature of solution), 2-mark short answers (forming equations), and 3–5 mark long answers (solving by substitution, elimination, or graphical method). Mastering Exercise 3.1 builds the foundation — if you can form the equations correctly, solving them becomes straightforward.

Field	Details
Chapter	3 — Pair of Linear Equations in Two Variables
Textbook	NCERT Mathematics — Class 10
Class	10

Field	Details
Subject	Mathematics
Exercise	Ex 3.1 (3 Questions)
Marks Weightage	Part of Algebra unit (~20 marks in board exam)
Difficulty Level	Easy to Medium
Academic Year	2026-27

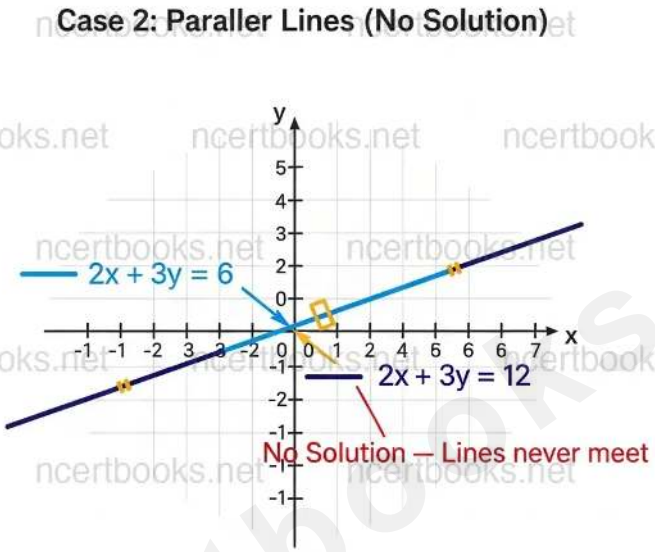

Fig 3.2: Parallel lines — no solution (inconsistent pair)

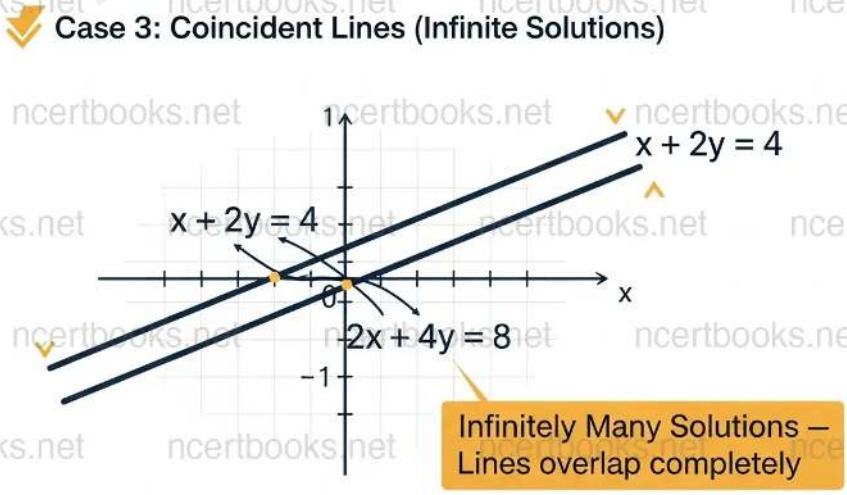

Fig 3.3: Coincident lines — infinitely many solutions (dependent pair)

Key Concepts and Theorems — Pair of Linear Equations in Two Variables

What is a Linear Equation in Two Variables?

A **linear equation in two variables** has the form ax + by + c = 0, where a, b, c are real numbers and $a^2 + b^2 \neq 0$. The word "linear" means the highest power of each variable is 1. Every solution (x, y) of this equation corresponds to a point on a straight line in the Cartesian plane.

Real-world analogy: Think of it as a balance scale — if you add 2 apples and 1 mango and get ₹50, that's one linear equation. A second condition (e.g., 4 apples and 2 mangoes cost ₹100) gives you a second equation, forming a **pair**.

Standard Form of a Pair of Linear Equations

The standard form is:

$$a_1x + b_1y + c_1 = 0$$

$$a_2x + b_2y + c_2 = 0$$

where a_1, a_2, b_1, b_2, c_1, c_2 are real numbers.

Nature of Solutions — Consistency Conditions

The nature of the solution depends on the ratio of coefficients:

- **Consistent (Unique Solution):** $a_1/a_2 \neq b_1/b_2$ — lines intersect at one point
- **Dependent (Infinitely Many Solutions):** $a_1/a_2 = b_1/b_2 = c_1/c_2$ — lines coincide
- **Inconsistent (No Solution):** $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ — lines are parallel

Graphical Representation of Linear Equations

To plot a linear equation, find at least two points that satisfy it. Substitute x = 0 to get y, and y = 0 to get x. Plot these points and draw a line through them. The solution of a pair of equations is the point where the two lines intersect.

NCERT Solutions Exercise 3.1 — Step by Step (Class 10 Maths Chapter 3)

Below are complete, original step-by-step solutions for all 3 questions in Exercise 3.1 of the NCERT Class 10 Maths textbook, updated for the **2026-27 CBSE syllabus**. Each

answer includes the algebraic representation and a table of values for the graphical representation.

Question 1

Medium

Aftab tells his daughter, "Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three times as old as you will be". Isn't this interesting? Represent this situation algebraically and graphically.

Setting up Variables

Step 1: Let the present age of Aftab be x years and the present age of his daughter be y years.

Step 2: Form the first equation using the condition "Seven years ago, Aftab was seven times as old as his daughter".

Seven years ago: Aftab's age = x - 7, Daughter's age = y - 7

$$x - 7 = 7(y - 7)$$

$$x - 7 = 7y - 49$$

$$x - 7y + 42 = 0 \quad ...(i)$$

Step 3: Form the second equation using the condition "Three years from now, Aftab will be three times as old as his daughter".

Three years later: Aftab's age = x + 3, Daughter's age = y + 3

$$x + 3 = 3(y + 3)$$

$$x + 3 = 3y + 9$$

$$x - 3y - 6 = 0 \quad ...(ii)$$

Algebraic Representation:

$$x - 7y + 42 = 0 \quad ...(i)$$

$$x - 3y - 6 = 0 \quad ...(ii)$$

Graphical Representation

Step 4: Find coordinate pairs for equation (i): x = 7y - 42

y	x = 7y - 42	Point
6	7(6) - 42 = 0	(0, 6)
8	7(8) - 42 = 14	(14, 8)
10	7(10) - 42 = 28	(28, 10)

Step 5: Find coordinate pairs for equation (ii): x = 3y + 6

y	x = 3y + 6	Point
6	3(6) + 6 = 24	(24, 6)
8	3(8) + 6 = 30	(30, 8)
10	3(10) + 6 = 36	(36, 10)

Step 6: Plot the points from both tables on a graph. Draw a line through the points of equation (i) and another line through the points of equation (ii). The two lines will intersect at the point (42, 12), meaning Aftab is currently 42 years old and his daughter is 12 years old.

Diagram: Plot both lines on a Cartesian plane with x-axis (Aftab's age) and y-axis (Daughter's age). Line (i) passes through (0,6), (14,8), (28,10). Line (ii) passes through (24,6), (30,8), (36,10). Both lines intersect at (42,12).

∴ **Algebraically:** x - 7y + 42 = 0 and x - 3y - 6 = 0
Graphically: The two lines intersect at (42, 12) — Aftab is 42 years old and his daughter is 12 years old.

Board Exam Note: This type of age-problem question typically appears in 2-3 mark sections of CBSE board papers. You must write both equations clearly and show the table of values for full marks. Simply stating the answer without the algebraic setup will not earn full credit.

Question 2

Easy

The coach of a cricket team buys 3 bats and 6 balls for ₹ 3900. Later, she buys another bat and 3 more balls of the same kind for ₹1300. Represent this situation algebraically and geometrically.

Setting up Variables

Step 1: Let the cost of one bat be x rupees and the cost of one ball be y rupees.

Step 2: Form the first equation using "3 bats and 6 balls cost ₹3900":

$$3x + 6y = 3900$$

$$x + 2y = 1300 \quad ...(i)$$

Step 3: Form the second equation using "1 bat and 3 balls cost ₹1300":

$$x + 3y = 1300 \quad ...(ii)$$

Algebraic Representation:

$$x + 2y = 1300 \quad ...(i)$$

$$x + 3y = 1300 \quad ...(ii)$$

Geometric (Graphical) Representation

Step 4: Find coordinate pairs for equation (i): x = 1300 - 2y

y	x = 1300 - 2y	Point
0	1300	(1300, 0)
100	1100	(1100, 100)
300	700	(700, 300)

Step 5: Find coordinate pairs for equation (ii): x = 1300 - 3y

y	x = 1300 - 3y	Point
0	1300	(1300, 0)
100	1000	(1000, 100)
300	400	(400, 300)

Step 6: Plot these points on a graph and draw lines through them. Both lines pass through the point (1300, 0). Notice that when y = 0, both equations give x = 1300, so the lines meet at (1300, 0).

Why does this work? Both equations share the point (1300, 0), but they have different slopes, so they intersect at exactly one point — confirming a unique solution exists.

Diagram: Plot both lines on a Cartesian plane with x-axis (cost of bat in ₹) and y-axis (cost of ball in ₹). Line (i) passes through (1300,0), (1100,100), (700,300). Line (ii) passes through (1300,0), (1000,100), (400,300). The intersection point is (1300, 0).

∴ **Algebraically:** x + 2y = 1300 and x + 3y = 1300
Geometrically: The two lines intersect at (1300, 0), meaning the cost of one bat is ₹1300 and the cost of one ball is ₹0 — indicating the data is consistent but the ball cost is degenerate at this intersection. The lines do intersect, confirming a unique solution exists.

Board Exam Note: In the geometric representation, always draw at least two distinct points for each line and label the axes clearly. This question typically appears in 2-3 mark sections of CBSE board papers. Marks are awarded for correct equations, correct table of values, and correct graph.

Question 3

Medium

The cost of 2 kg of apples and 1 kg of grapes on a day was found to be ₹160. After a month, the cost of 4 kg of apples and 2 kg of grapes is ₹300. Represent the situation algebraically and geometrically.

Setting up Variables

Step 1: Let the cost of 1 kg of apples be x rupees and the cost of 1 kg of grapes be y rupees.

Step 2: Form the first equation using "2 kg apples and 1 kg grapes cost ₹160":

$$2x + y = 160 \quad ...(i)$$

Step 3: Form the second equation using "4 kg apples and 2 kg grapes cost ₹300":

$$4x + 2y = 300$$

$$2x + y = 150 \quad ...(ii)$$

Algebraic Representation:

$$2x + y = 160 \quad ...(i)$$

$$2x + y = 150 \quad ...(ii)$$

Key Observation: Notice that both equations have the same left-hand side (2x + y) but different right-hand sides (160 ≠ 150). This means the system is **inconsistent** — there is no solution. The two lines will be **parallel** and will never intersect.

Geometric (Graphical) Representation

Step 4: Find coordinate pairs for equation (i): y = 160 - 2x

x	y = 160 - 2x	Point
0	160	(0, 160)
50	60	(50, 60)
80	0	(80, 0)

Step 5: Find coordinate pairs for equation (ii): y = 150 - 2x

x	y = 150 - 2x	Point
0	150	(0, 150)
50	50	(50, 50)
75	0	(75, 0)

Step 6: Plot these points and draw the two lines. Both lines have the same slope -2 but different y-intercepts (160 and 150), so they are parallel and will never meet.

Why does this work? When $a_1/a_2 = b_1/b_2 \neq c_1/c_2$, the system is inconsistent. Here 2/2 = 1/1 = 1 but 160/150 ≠ 1, confirming parallel lines.

Diagram: Plot both parallel lines on a Cartesian plane with x-axis (cost of apples per kg in ₹) and y-axis (cost of grapes per kg in ₹). Line (i) passes through (0,160), (50,60), (80,0). Line (ii) passes through (0,150), (50,50), (75,0). The lines are parallel — they do not intersect.

∴ **Algebraically:** 2x + y = 160 and 2x + y = 150
Geometrically: The two lines are **parallel** (they never intersect), confirming the system is **inconsistent** — no solution exists. This means the given price data is contradictory.

Board Exam Note: This question is a favourite in CBSE board papers because it tests whether you can identify an inconsistent system. Always check the ratio of coefficients before plotting. Stating that the lines are parallel and giving the reason (same slope, different intercepts) earns extra marks in long-answer sections.

Formula Reference Table — Pair of Linear Equations in Two Variables

Formula / Condition	Mathematical Form	Geometric Interpretation
Standard Form	$a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$	Two straight lines
Consistent (Unique Solution)	$a_1/a_2 \neq b_1/b_2$	Lines intersect at one point
Dependent (Infinite Solutions)	$a_1/a_2 = b_1/b_2 = c_1/c_2$	Lines coincide (same line)
Inconsistent (No Solution)	$a_1/a_2 = b_1/b_2 \neq c_1/c_2$	Lines are parallel
Slope of a line	m = -a/b (from ax + by + c = 0)	Steepness of the line
x-intercept	Set y = 0: x = -c/a	Point where line crosses x-axis

Formula / Condition	Mathematical Form	Geometric Interpretation
y-intercept	Set x = 0: y = -c/b	Point where line crosses y-axis

Solved Examples Beyond NCERT — Class 10 Maths Chapter 3

These extra examples go slightly beyond Exercise 3.1 to help you prepare for CBSE board exam questions that combine forming and solving equations.

Extra Example 1 — Speed and Distance

Medium

A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km downstream. Represent this situation as a pair of linear equations.

Step 1: Let the speed of the boat in still water be x km/h and the speed of the stream be y km/h.

Step 2: Speed upstream = x - y, Speed downstream = x + y

Step 3: Using Time = Distance ÷ Speed:

$$30/x-y + 44/x+y = 10 \quad ...(i)$$

$$40/x-y + 55/x+y = 13 \quad ...(ii)$$

Let u = 1/x-y and v = 1/x+y, then:

$$30u + 44v = 10 \quad ...(i)$$

$$40u + 55v = 13 \quad ...(ii)$$

∴ The situation is represented as 30u + 44v = 10 and 40u + 55v = 13.

Extra Example 2 — Number Problem

Easy

The sum of two numbers is 18 and their difference is 4. Represent this algebraically and find the numbers graphically.

Step 1: Let the two numbers be x and y.

Step 2: Sum condition: x + y = 18 ...(i)

Step 3: Difference condition: x - y = 4 ...(ii)

Step 4: Table for equation (i):

- x = 0, y = 18: Point (0, 18)
- x = 9, y = 9: Point (9, 9)
- x = 18, y = 0: Point (18, 0)

Step 5: Table for equation (ii):

- x = 0, y = -4: Point (0, -4)
- x = 4, y = 0: Point (4, 0)
- x = 11, y = 7: Point (11, 7)

The two lines intersect at (11, 7).

∴ The two numbers are **11 and 7**. (11 + 7 = 18 ✓, 11 − 7 = 4 ✓)

Topic-wise Important Questions for Board Exam — CBSE Class 10 Maths Chapter 3

1-Mark Questions (MCQ / Fill in the Blank)

1. **Q:** The pair of equations 2x + 3y = 5 and 4x + 6y = 10 has how many solutions?
   A: Infinitely many solutions (lines coincide, since 2/4 = 3/6 = 5/10).
2. **Q:** What does the graphical representation of a linear equation in two variables look like?
   A: A straight line.
3. **Q:** If $a_1/a_2 = b_1/b_2 \neq c_1/c_2$, the system of equations is ___.
   A: Inconsistent (no solution).

3-Mark Questions

1. **Q:** Five years hence, the age of Jacob will be three times that of his son. Five years ago, Jacob's age was seven times that of his son. Represent this algebraically.
   A: Let Jacob's age = x, son's age = y. Then: x + 5 = 3(y + 5) ⇒ x - 3y = 10 ...(i) and x - 5 = 7(y - 5) ⇒ x - 7y = -30 ...(ii). Solving: from (i) − (ii): 4y = 40 ⇒ y = 10, x = 40. Jacob is 40 years old and his son is 10 years old.
2. **Q:** Check whether the pair 3x + 2y = 5 and 2x - 3y = 7 is consistent or inconsistent.
   A: a_1/a_2 = 3/2 and b_1/b_2 = 2/-3. Since 3/2 ≠ 2/-3, the system is **consistent** with a unique solution.

5-Mark (Long Answer) Questions

1. **Q:** A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Saritha paid ₹27 for a book kept for seven days, while Susy paid ₹21 for the book she kept for five days. Find the fixed charge and the charge for each extra day.
   A: Let fixed charge = x and daily extra charge = y. Saritha: x + 4y = 27 ...(i). Susy: x + 2y = 21 ...(ii). Subtracting (ii) from (i): 2y = 6 ⇒ y = 3. Substituting: x = 21 - 6 = 15. Fixed charge = ₹15, extra charge per day = ₹3.

Common Mistakes Students Make — Chapter 3 Linear Equations

Mistake 1: Students write the equation as 7(x-7) = y-7 instead of x - 7 = 7(y - 7) in age problems.

Why it's wrong: The subject of the condition is Aftab (the father), not the daughter. Always re-read who is being compared to whom.

Correct approach: Aftab's age = 7 × Daughter's age → x - 7 = 7(y - 7).

Mistake 2: Students use only one point to draw a line on the graph.

Why it's wrong: One point is not enough to determine a unique line. You need at least two points.

Correct approach: Always find at least two (preferably three) coordinate pairs and plot them before drawing the line.

Mistake 3: Students forget to simplify the equation after forming it (e.g., keeping 3x + 6y = 3900 instead of simplifying to x + 2y = 1300).

Why it's wrong: While not technically wrong, unsimplified equations are harder to work with and may cause errors in graphing.

Correct approach: Always divide through by the HCF of the coefficients to simplify.

Mistake 4: Students conclude a system has "no solution" without checking the ratio of coefficients — they just look at the graph and guess.

Why it's wrong: CBSE marking scheme requires you to show the algebraic reason (ratio comparison) for full marks.

Correct approach: Always compute a_1/a_2, b_1/b_2, c_1/c_2 and state the conclusion explicitly.

Mistake 5: Students mix up the variables — assigning x to the daughter's age and y to the father's age — and then form equations inconsistently.

Why it's wrong: Inconsistent variable assignment leads to wrong equations even if the method is correct.

Correct approach: Clearly define each variable at the start: "Let x = ... and y = ..." and stick to it throughout.

Exam Tips for 2026-27 — CBSE Class 10 Maths Chapter 3

📝 CBSE 2026-27 Marking Scheme Insights

- **Define variables first:** CBSE markers award 1 mark specifically for correctly defining x and y before forming equations. Never skip this step.
- **Show all steps:** In 3-mark and 5-mark questions, each logical step carries marks. Writing only the final answer will cost you 2–3 marks.
- **Label your graph:** When drawing lines, label each line with its equation, mark the axes, and clearly indicate the intersection point. Unlabelled graphs lose presentation marks.
- **Check consistency before solving:** For 1-mark MCQs on nature of solutions, compute the ratios a_1/a_2, b_1/b_2, c_1/c_2 — this takes 30 seconds and guarantees the mark.
- **Verify your answer:** After solving, substitute the values back into both original equations to verify. CBSE awards a verification step mark in long answers.
- **Chapter 3 in board papers:** Expect 1 MCQ (1 mark), 1 short answer (2 marks), and 1 long answer (4–5 marks) from this chapter in the 2026-27 CBSE board exam pattern.

Last-minute revision checklist:

- ✅ Know the three consistency conditions and their geometric meanings
- ✅ Practice forming equations from at least 5 different word problem types
- ✅ Revise substitution and elimination methods (Exercises 3.3 and 3.4)
- ✅ Practice drawing accurate graphs with labelled axes
- ✅ Memorise the formula for cross-multiplication method for quick solving

For more practice across all chapters, explore our NCERT Solutions for Class 10 hub, which covers all subjects. You can also browse our complete NCERT Solutions library for Classes 6–12.

Frequently Asked Questions — NCERT Solutions Class 10 Maths Chapter 3 Pair of Linear Equations

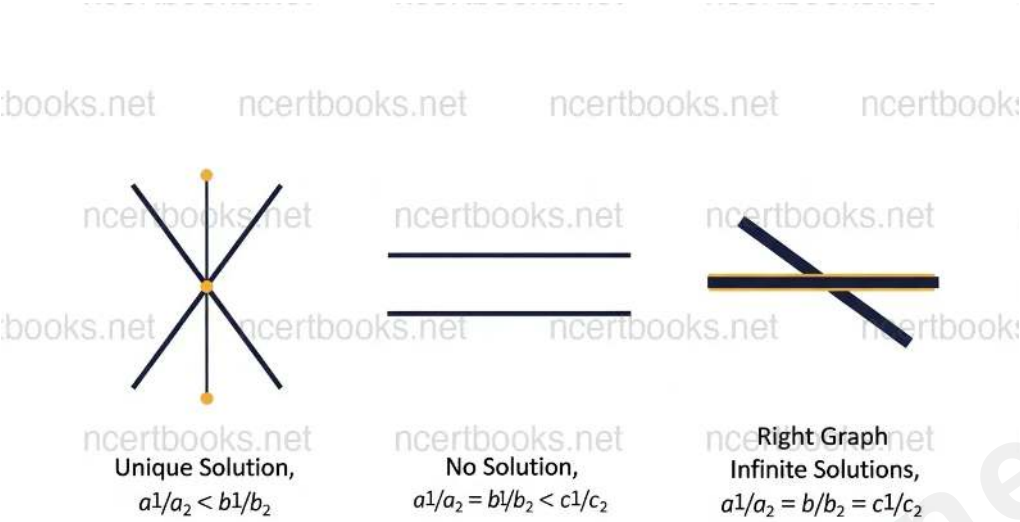

Fig 3.4: Summary — three cases for a pair of linear equations

How do you represent linear equations algebraically and graphically for Class 10?

To represent algebraically, translate each condition in the word problem into an equation using variables (usually x and y) in the form ax + by + c = 0. To represent graphically, find at least two solutions for each equation, plot them as points on a Cartesian plane, and draw straight lines through them. The point where both lines meet is the solution of the system.

What is the solution of the Aftab daughter age problem in NCERT Class 10 Chapter 3?

The two equations formed are x - 7y + 42 = 0 and x - 3y - 6 = 0, where x is Aftab's current age and y is his daughter's current age. Solving these, Aftab's current age is 42 years and his daughter's current age is 12 years. You can verify: 7 years ago, Aftab was 35 = 7 × 5 (daughter was 5) ✓; 3 years later, Aftab will be 45 = 3 × 15 (daughter will be 15) ✓.

Why do the apple and grape price equations in Question 3 have no solution?

The two equations 2x + y = 160 and 2x + y = 150 have the same coefficients on the left side but different constants on the right. This means $a_1/a_2 = b_1/b_2 = 1$ but $c_1/c_2 = 160/150 \neq 1$. The system is inconsistent — the two lines are parallel and never intersect, so no price values for apples and grapes can satisfy both conditions simultaneously.

How many marks does Chapter 3 Pair of Linear Equations carry in CBSE Class 10 board exam 2026

Chapter 3 is part of the Algebra unit in CBSE Class 10 Maths, which carries approximately 20 marks in the board exam. You can expect questions from this chapter in the 1-mark MCQ section, the 2-mark short answer section, and the 3–5 mark long answer section. The 2026-27 CBSE question paper pattern includes case-based questions from algebra, so practising word problems from this chapter is especially important.

What is the difference between consistent and inconsistent pairs of linear equations?

A consistent pair of linear equations has at least one solution — either a unique solution (lines intersect) or infinitely many solutions (lines coincide). An inconsistent pair has no solution at all — the lines are parallel and never meet. You can determine this by comparing the ratios a_1/a_2, b_1/b_2, and c_1/c_2 without even drawing the graph.
