

NCERT Solutions Class 10 Maths

Chapter 3: Pair of Linear Equations in Two Variables

Exercise 3.3

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Quick Summary: In NCERT Solutions Class 10 Maths Chapter 3 Exercise 3.3, students learn the substitution method for solving pairs of linear equations in two variables. This exercise covers algebraic techniques for finding solutions and determining consistency of equation systems, which are essential for CBSE board exams and building algebraic problem-solving skills.

Key Takeaways:

- Master the substitution method: express one variable in terms of another from equation 1, substitute into equation 2 to get $ax + b = 0$
- Understand consistency conditions: unique solution when $(a_1/a_2) \neq (b_1/b_2)$, infinite solutions when $(a_1/a_2) = (b_1/b_2) = (c_1/c_2)$
- Learn to clear fractions and decimals before applying substitution for easier calculation
- Practice converting word problems into linear equation pairs and solving systematically

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Question 1

QUESTION

Solve the following pair of linear equations by the elimination method and the substitution method:

(i) $x + y = 5$ and $2x - 3y = 4$

(ii) $3x + 4y = 10$ and $2x - 2y = 2$

(iii) $3x - 5y - 4 = 0$ and $9x = 2y + 7$

(iv) $\frac{x}{2} + \frac{2y}{3} = -1$ and $x - \frac{y}{3} = 3$

SOLUTION

Clear decimals or fractions, then use substitution or elimination to remove one variable. Solve the simplified equation, back-substitute, and confirm the ordered pair satisfies both equations.

ANSWER

(i) $x + y = 5$, $2x - 3y = 4$

From $x + y = 5$, express x as $x = 5 - y$. Substitute in $2x - 3y = 4$:

$$2(5 - y) - 3y = 4 \rightarrow 10 - 2y - 3y = 4 \rightarrow 10 - 5y = 4.$$

$$-5y = -6 \rightarrow y = \frac{6}{5}.$$

$$\text{Then } x = 5 - y = 5 - \frac{6}{5} = \frac{25 - 6}{5} = \frac{19}{5}.$$

Solution: $x = \frac{19}{5}$, $y = \frac{6}{5}$.

(ii) $3x + 4y = 10$, $2x - 2y = 2$

From $2x - 2y = 2$, divide by 2:

$$x - y = 1 \rightarrow x = y + 1.$$

Substitute in $3x + 4y = 10$:

$$3(y + 1) + 4y = 10 \rightarrow 3y + 3 + 4y = 10 \rightarrow 7y + 3 = 10.$$

$$7y = 7 \rightarrow y = 1, \quad x = y + 1 = 2.$$

Solution: $x = 2$, $y = 1$.

(iii) $3x - 5y - 4 = 0$ and $9x = 2y + 7$

Rewrite the equations:

$$3x - 5y = 4, \quad 9x - 2y = 7.$$

Multiply the first equation by 2:

$$6x - 10y = 8.$$

Multiply the second equation by 5:

$$45x - 10y = 35.$$

Subtract the first (multiplied) equation from the second:

$$(45x - 10y) - (6x - 10y) = 35 - 8 \Rightarrow 39x = 27.$$

$$x = \frac{27}{39} = \frac{9}{13}.$$

Substitute in $3x - 5y = 4$:

$$3 \cdot \frac{9}{13} - 5y = 4 \Rightarrow \frac{27}{13} - 5y = 4.$$

$$-5y = 4 - \frac{27}{13} = \frac{52 - 27}{13} = \frac{25}{13} \Rightarrow y = -\frac{25}{65} = -\frac{5}{13}.$$

Solution: $x = \frac{9}{13}, y = -\frac{5}{13}$.

(iv) $\frac{x}{2} + \frac{2y}{3} = -1, x - \frac{y}{3} = 3$

Clear denominators by multiplying each equation by 6:

First equation:

$$6\left(\frac{x}{2} + \frac{2y}{3}\right) = 6(-1) \Rightarrow 3x + 4y = -6.$$

Second equation:

$$6\left(x - \frac{y}{3}\right) = 6 \cdot 3 \Rightarrow 6x - 2y = 18.$$

Divide the second equation by 2 to simplify:

$$3x - y = 9.$$

Now solve the pair $3x + 4y = -6$ and $3x - y = 9$ by elimination. Subtract the second from the first:

$$(3x + 4y) - (3x - y) = -6 - 9 \Rightarrow 5y = -15 \Rightarrow y = -3.$$

Substitute in $3x - y = 9$:

$$3x - (-3) = 9 \Rightarrow 3x + 3 = 9 \Rightarrow 3x = 6 \Rightarrow x = 2.$$

Solution: $x = 2, y = -3$.

Question 2

QUESTION

Form the pair of linear equations in the following problems, and find their solutions (if they exist) by the elimination method:

(i) If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $(1)/(2)$ if we only add 1 to the denominator. What is the fraction?

(ii) Five years ago, Nuri was thrice as old as Sonu. Ten years later, Nuri will be twice as old as Sonu. How old are Nuri and Sonu?

(iii) The sum of the digits of a two-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.

(iv) Meena went to a bank to withdraw ₹ 2000. She asked the cashier to give her ₹ 50 and ₹ 100 notes only. Meena got 25 notes in all. Find how many notes of ₹ 50 and ₹ 100 she received.

(v) 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.

SOLUTION

For each scenario, translate the wording into two equations, then eliminate one variable (usually by subtracting the equations). Solve the resulting linear equation, substitute back for the other variable, and report the real-world values.

ANSWER

(i) Fraction

Let the fraction be $(x)/(y)$, where x is the numerator and y is the denominator.

Add 1 to the numerator and subtract 1 from the denominator; the fraction becomes 1:

$$(x + 1)/(y - 1) = 1 \Rightarrow x + 1 = y - 1 \Rightarrow x - y + 2 = 0.$$

If only 1 is added to the denominator, the fraction becomes $(1)/(2)$:

$$(x)/(y + 1) = (1)/(2) \Rightarrow 2x = y + 1 \Rightarrow 2x - y - 1 = 0.$$

Now solve the system

$$x - y + 2 = 0, \quad 2x - y - 1 = 0.$$

Subtract the first from the second:

$$(2x - y - 1) - (x - y + 2) = 0 \Rightarrow x - 3 = 0 \Rightarrow x = 3.$$

Then $x - y + 2 = 0 \Rightarrow 3 - y + 2 = 0 \Rightarrow 5 - y = 0 \Rightarrow y = 5$.

The fraction is $\frac{3}{5}$.

(ii) Ages of Nuri and Sonu

Let the present ages (in years) of Nuri and Sonu be x and y respectively.

Five years ago, their ages were $x - 5$ and $y - 5$. At that time, Nuri was thrice as old as Sonu:

$$x - 5 = 3(y - 5) \Rightarrow x - 5 = 3y - 15 \Rightarrow x - 3y + 10 = 0.$$

Ten years later, their ages will be $x + 10$ and $y + 10$. Then Nuri will be twice as old as Sonu:

$$x + 10 = 2(y + 10) \Rightarrow x + 10 = 2y + 20 \Rightarrow x - 2y - 10 = 0.$$

Solve

$$x - 3y + 10 = 0, \quad x - 2y - 10 = 0.$$

Subtract the second from the first:

$$(x - 3y + 10) - (x - 2y - 10) = 0 \Rightarrow -y + 20 = 0 \Rightarrow y = 20.$$

$$\text{Then } x - 2y - 10 = 0 \Rightarrow x - 40 - 10 = 0 \Rightarrow x = 50.$$

Nuri is 50 years old and Sonu is 20 years old.

(iii) Two-digit number

Let the tens digit be x and the units digit be y . The number is $10x + y$.

The sum of the digits is 9:

$$x + y = 9.$$

The number formed by reversing the digits is $10y + x$. Nine times the original number is twice the reversed number:

$$9(10x + y) = 2(10y + x).$$

Simplify:

$$90x + 9y = 20y + 2x \Rightarrow 90x - 2x + 9y - 20y = 0 \Rightarrow 88x - 11y = 0.$$

Divide by 11:

$$8x - y = 0.$$

Now solve

$$x + y = 9, \quad 8x - y = 0.$$

Add the equations:

$$(x + y) + (8x - y) = 9 + 0 \Rightarrow 9x = 9 \Rightarrow x = 1.$$

$$\text{Then } y = 8x = 8.$$

The number is 18.

(iv) Notes of ₹ 50 and ₹ 100

Let x be the number of ₹ 50 notes and y the number of ₹ 100 notes.

Total money is ₹ 2000:

$$50x + 100y = 2000.$$

Total number of notes is 25:

$$x + y = 25.$$

Divide the money equation by 50:

$$x + 2y = 40.$$

Now solve

$$x + 2y = 40, \quad x + y = 25.$$

Subtract the second from the first:

$$(x + 2y) - (x + y) = 40 - 25 \Rightarrow y = 15.$$

$$\text{Then } x + y = 25 \Rightarrow x + 15 = 25 \Rightarrow x = 10.$$

Meena received 10 notes of ₹ 50 and 15 notes of ₹ 100.

(v) Library charges

Let x be the fixed charge (in ₹) for the first three days and y be the additional charge (in ₹) per extra day.

Saritha kept the book for 7 days, that is 3 days fixed + 4 extra days:

$$x + 4y = 27.$$

Susy kept the book for 5 days, that is 3 days fixed + 2 extra days:

$$x + 2y = 21.$$

Subtract the second from the first:

$$(x + 4y) - (x + 2y) = 27 - 21 \Rightarrow 2y = 6 \Rightarrow y = 3.$$

$$\text{Then } x + 2y = 21 \Rightarrow x + 6 = 21 \Rightarrow x = 15.$$

The fixed charge is ₹ 15 and the charge for each extra day is ₹ 3.

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Key Formulas

Important Formulas for Exercise 3.3

Formula / Concept	Description
General Form of a Pair of Linear Equations	<p>A pair of linear equations in two variables x and y can be represented as:</p> $a_1x + b_1y + c_1 = 0$ $a_2x + b_2y + c_2 = 0$ <p>where $a_1, b_1, c_1, a_2, b_2, c_2$ are real numbers.</p>
Substitution Method Steps	<p>An algebraic method to solve a pair of linear equations. The steps are:</p> <ol style="list-style-type: none"> 1. Solve one of the equations for one variable in terms of the other. 2. Substitute the expression found in step 1 into the other equation. 3. Solve the resulting linear equation in one variable. 4. Substitute the value found in step 3 back into the expression from step 1 to find the value of the other variable.
Condition for a Unique Solution (Consistent System)	<p>If the lines representing the pair of linear equations intersect at a single point, the system is consistent and has a unique solution.</p> <p>Algebraic condition: $(a_1)/(a_2) \neq (b_1)/(b_2)$</p>
Condition for Infinitely Many Solutions (Dependent and Consistent System)	<p>If the lines representing the pair of linear equations are coincident (the same line), the system is dependent and consistent, having infinitely many solutions.</p> <p>Algebraic condition: $(a_1)/(a_2) = (b_1)/(b_2) = (c_1)/(c_2)$</p>
Condition for No Solution (Inconsistent System)	<p>If the lines representing the pair of linear equations are parallel, the system is inconsistent and has no solution.</p> <p>Algebraic condition: $(a_1)/(a_2) = (b_1)/(b_2) \neq (c_1)/(c_2)$</p>
Consistency of a System	<p>A system of linear equations is said to be consistent if it has at least one solution (either a unique solution or infinitely many solutions). An inconsistent system has no solution.</p>

Top FAQs

Q1. How many questions are in NCERT Solutions Class 10 Maths Chapter 3 Pair of Linear Equations in Two Variables Exercise 3.3?

Exercise 3.3 of NCERT Solutions Class 10 Maths Chapter 3 Pair of Linear Equations in Two Variables contains exactly 2 questions. These questions focus on solving linear equations using the substitution method and are important for CBSE board exam 2025-26 preparation.

Q2. Where can I download free PDF of NCERT Solutions for Class 10 Maths Chapter 3 Pair of Linear Equations in Two Variables Exercise 3.3?

You can download the free PDF of NCERT Solutions for Class 10 Maths Chapter 3 Pair of Linear Equations in Two Variables Exercise 3.3 from the official NCERT website or various educational platforms. These step by step solutions are available in PDF format with detailed explanations for all 2 questions, updated for CBSE session 2025-26.

Q3. How many marks does Pair of Linear Equations in Two Variables carry in CBSE Class 10 board exam 2025-26?

Pair of Linear Equations in Two Variables from NCERT Class 10 Maths Chapter 3 carries approximately 6 marks in CBSE Class 10 board exam 2025-26. This chapter is part of Unit II - Algebra and questions can appear in various formats including multiple choice, short answer, and long answer questions.

Q4. Which is the most difficult question in Exercise 3.3 of NCERT Solutions Class 10 Maths Chapter 3 Pair of Linear Equations in Two Variables?

Question 2 of Exercise 3.3 in NCERT Solutions Class 10 Maths Chapter 3 is considered relatively more challenging as it involves forming equations from word problems and solving them using the substitution method. However, with step by step solutions and proper practice, both questions in Exercise 3.3 can be easily mastered for CBSE board exam 2025-26.

Q5. What is Consistency of Linear Equations explained in NCERT Solutions Class 10 Maths Chapter 3 Pair of Linear Equations in Two Variables?

Consistency of Linear Equations in NCERT Class 10 Maths Chapter 3 refers to whether a pair of linear equations has a solution or not. A consistent system has at least one solution (unique or infinitely many), while an inconsistent system has no solution, which is determined through graphical and algebraic methods covered in Exercise 3.3 and other exercises of this chapter.

More Exercises

Visit all exercises from Chapter 3:

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