

Title

Linear Equations In One Variable: Introduction And Basic Solving Techniques

Topic

Linear Equations

Country

India

Class/Grade

8th

Curriculum

CBSE

Subject

Mathematics

Book

NCERT Mathematics Textbook

Bloom's Taxonomy Levels

Evaluation, Analysis

Number Of Lessons

3

Duration

45 Minutes

Linear Equations in One Variable: Introduction and Basic Solving Techniques

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Lesson 1

Learning Objectives

- Understand the concept of linear equations in one variable.
- Learn techniques to solve linear equations with linear expressions on one side and numbers on the other side.
- Apply these techniques to solve real-life problems modeled by linear equations.

Success Criteria

- **Understanding Linear Equations:** At least 85% of students can accurately define a linear equation in one variable and identify examples, as demonstrated by their responses in class discussions.
- **Solving Equations:** At least 80% of students can correctly solve linear equations with linear expressions on one side and numbers on the other side, scoring 70% or higher on a related quiz.
- **Application to Real-Life Problems:** At least 75% of students can successfully apply solving techniques to real-life problems, as demonstrated by their performance in group activities and individual exercises.

Materials

- NCERT Mathematics textbook for 8th grade
- Whiteboard and markers

- Projector and slides with examples
- Handouts with practice problems
- Graph paper and rulers

Lesson Outline

Introduction to Linear Equations (10 minutes)

- **Objective:** Introduce the concept of linear equations in one variable.
- **Content:**
 - Define a linear equation in one variable.
 - Explain the standard form of a linear equation: $ax + b = c$.
 - Discuss the importance of linear equations in mathematics and real-life applications.
- **Examples:**
 - $2x + 3 = 7$
 - $5x - 4 = 11$
- **Time:** 10 minutes

Solving Equations with Linear Expressions on One Side (15 minutes)

- **Objective:** Teach techniques to solve linear equations with linear expressions on one side and numbers on the other side.
- **Content:**
 - Explain the steps to isolate the variable:
 1. Add or subtract terms to both sides to move constants to one side.
 2. Divide or multiply both sides by the coefficient of the variable to solve for the variable.
 - Emphasize the importance of maintaining equality by performing the same operation on both sides.
- **Examples:**
 - Solve $2x + 3 = 7$:
 - Subtract 3 from both sides: $2x = 4$



- Divide both sides by 2: $x = 2$
- Solve $5x - 4 = 11$:
 - Add 4 to both sides: $5x = 15$
 - Divide both sides by 5: $x = 3$

- **Time:** 15 minutes

Group Activity: Solving Real-Life Problems (15 minutes)

- **Objective:** Apply solving techniques to real-life problems modeled by linear equations.
- **Content:**
 - Divide students into small groups and provide each group with a handout containing real-life problems.
 - Ask each group to solve the problems and discuss their solutions.
 - Have each group present their findings to the class.
- **Examples:**
 - A person has \$50 and spends \$ x on a book. If they have \$30 left, find the cost of the book.
 - Equation: $50 - x = 30$
 - Solution: $x = 20$
 - A car travels at a speed of 60 km/h. If it covers a distance of 180 km, find the time taken.
 - Equation: $60t = 180$
 - Solution: $t = 3$ hours

- **Time:** 15 minutes

Assessment and Follow-Up (5 minutes)

- **Objective:** Assess students' understanding and provide follow-up activities.
- **Content:**

- Quick quiz with 3-4 problems to solve:
 - $3x + 5 = 14$
 - $4x - 7 = 9$
- Collect and review the quiz to gauge understanding.
- Assign homework problems from the NCERT textbook for additional practice.
- **Time:** 5 minutes

Applications

- **Mathematics:** Building a foundation for more complex algebraic concepts.
- **Science:** Solving equations related to speed, distance, and time.
- **Economics:** Understanding cost and revenue relationships.

Follow-Up

In the next lesson, we will explore solving linear equations having the variable on both sides and delve into more complex applications. We will also discuss additional real-life problems and practice simplifying equations to make them linear.

Lesson 2

Learning Objectives

- Understand techniques to solve linear equations with variables on both sides.
- Develop skills to simplify and solve more complex linear equations.
- Apply these techniques to solve real-life problems involving linear equations with variables on both sides.

Success Criteria

- **Solving Complex Equations:** At least 80% of students can correctly solve linear equations with variables on both sides, scoring 70% or higher on a related quiz.
- **Simplification Skills:** At least 75% of students can successfully simplify and solve complex linear equations, as demonstrated by their performance in class exercises.
- **Application to Real-Life Problems:** At least 70% of students can apply solving techniques to real-life problems, as demonstrated by their performance in group activities and individual exercises.

Materials

- NCERT Mathematics textbook for 8th grade
- Whiteboard and markers
- Projector and slides with examples
- Handouts with practice problems
- Graph paper and rulers

Lesson Outline

Review of Previous Lesson (5 minutes)

- **Objective:** Recap the techniques for solving linear equations with linear expressions on one side.
- **Content:**
 - Quick review of the steps to isolate the variable.
 - Discuss any questions or difficulties from the previous lesson.
- **Time:** 5 minutes

Solving Equations with Variables on Both Sides (15 minutes)

- **Objective:** Teach techniques to solve linear equations with variables on both sides.
- **Content:**
 - Explain the steps to solve such equations:

1. Move all variable terms to one side of the equation.
 2. Move all constant terms to the other side.
 3. Combine like terms and simplify.
 4. Solve for the variable.
- Emphasize the importance of maintaining equality by performing the same operation on both sides.

- **Examples:**

- Solve $3x + 5 = 2x + 9$:
 - Subtract $(2x)$ from both sides: $x + 5 = 9$
 - Subtract 5 from both sides: $x = 4$

- Solve $4x - 7 = 2x + 3$:
 - Subtract $(2x)$ from both sides: $2x - 7 = 3$
 - Add 7 to both sides: $2x = 10$
 - Divide both sides by 2: $x = 5$

- **Time:** 15 minutes

Group Activity: Solving Real-Life Problems (15 minutes)

- **Objective:** Apply solving techniques to real-life problems modeled by linear equations with variables on both sides.
- **Content:**
 - Divide students into small groups and provide each group with a handout containing real-life problems.
 - Ask each group to solve the problems and discuss their solutions.
 - Have each group present their findings to the class.
- **Examples:**
 - Two friends have a total of \$100. If one friend has \$ x and the other has $\$2x - 10$, find the amount each friend has.

- Equation: $x + (2x - 10) = 100$
- Solution: $3x - 10 = 100, 3x = 110, x = 36.67$
- A car rental company charges a base fee of \$50 plus \$0.20 per mile. Another company charges a base fee of \$30 plus \$0.30 per mile. For what distance will the cost be the same?
 - Equation: $50 + 0.20m = 30 + 0.30m$
 - Solution: $20 = 0.10m, m = 200$ miles
- **Time:** 15 minutes

Assessment and Follow-Up (10 minutes)

- **Objective:** Assess students' understanding and provide follow-up activities.
- **Content:**
 - Quick quiz with 3-4 problems to solve:
 - $5x + 3 = 3x + 11$
 - $7x - 4 = 2x + 16$
 - Collect and review the quiz to gauge understanding.
 - Assign homework problems from the NCERT textbook for additional practice.
- **Time:** 10 minutes

Applications

- **Mathematics:** Building a foundation for more complex algebraic concepts.
- **Science:** Solving equations related to speed, distance, and time.
- **Economics:** Understanding cost and revenue relationships.

Follow-Up

In the next lesson, we will explore reducing equations to simpler forms and solving equations that are reducible to the linear form. We will also discuss additional real-life problems and practice simplifying equations to make them linear.

Lesson 3

Learning Objectives

- Understand techniques to reduce complex equations to simpler forms.
- Develop skills to identify and solve equations that are reducible to linear form.
- Apply these techniques to solve real-life problems involving reducible linear equations.

Success Criteria

- **Simplification Skills:** At least 80% of students can correctly reduce complex equations to simpler forms, scoring 70% or higher on a related quiz.
- **Solving Reducible Equations:** At least 75% of students can successfully identify and solve equations that are reducible to linear form, as demonstrated by their performance in class exercises.
- **Application to Real-Life Problems:** At least 70% of students can apply solving techniques to real-life problems, as demonstrated by their performance in group activities and individual exercises.

Materials

- NCERT Mathematics textbook for 8th grade
- Whiteboard and markers
- Projector and slides with examples
- Handouts with practice problems
- Graph paper and rulers

Lesson Outline

Review of Previous Lesson (5 minutes)

- **Objective:** Recap the techniques for solving linear equations with variables on both sides.
- **Content:**
 - Quick review of the steps to solve such equations.
 - Discuss any questions or difficulties from the previous lesson.
- **Time:** 5 minutes

Reducing Equations to Simpler Forms (15 minutes)

- **Objective:** Teach techniques to reduce complex equations to simpler forms.
- **Content:**
 - Explain the steps to simplify complex equations:

1. Combine like terms on both sides of the equation.
 2. Use the distributive property to eliminate parentheses.
 3. Move all variable terms to one side and constant terms to the other side.
 4. Simplify the resulting equation.
- Emphasize the importance of maintaining equality by performing the same operation on both sides.

- **Examples:**

- Simplify and solve $3(x + 2) = 2(x + 5)$:
 - Distribute: $3x + 6 = 2x + 10$
 - Subtract $(2x)$ from both sides: $x + 6 = 10$
 - Subtract 6 from both sides: $x = 4$
- Simplify and solve $4(2x - 3) = 5(x + 1)$:
 - Distribute: $8x - 12 = 5x + 5$
 - Subtract $(5x)$ from both sides: $3x - 12 = 5$
 - Add 12 to both sides: $3x = 17$
 - Divide both sides by 3: $x = \frac{17}{3}$

- **Time:** 15 minutes

Solving Equations Reducible to Linear Form (15 minutes)

- **Objective:** Teach techniques to identify and solve equations that are reducible to linear form.
- **Content:**
 - Explain the steps to identify and solve reducible equations:
 1. Identify the equation that can be transformed into a linear form.

2. Use algebraic manipulation to transform the equation.

3. Solve the resulting linear equation.

- Emphasize the importance of recognizing patterns and using appropriate algebraic techniques.

• **Examples:**

- Solve $\frac{2x + 3}{4} = \frac{x - 1}{2}$:

- Multiply both sides by 4: $2x + 3 = 2(x - 1)$

- Distribute: $2x + 3 = 2x - 2$

- Subtract (2x) from both sides: $3 = -2$ (No solution)

- Solve $\frac{3x - 2}{5} = \frac{2x + 1}{3}$:

- Cross-multiply: $3(3x - 2) = 5(2x + 1)$

- Distribute: $9x - 6 = 10x + 5$

- Subtract (9x) from both sides: $-6 = x + 5$

- Subtract 5 from both sides: $x = -11$

- **Time:** 15 minutes

Group Activity: Solving Real-Life Problems (10 minutes)

- **Objective:** Apply solving techniques to real-life problems modeled by reducible linear equations.

• **Content:**

- Divide students into small groups and provide each group with a handout containing real-life problems.
 - Ask each group to solve the problems and discuss their solutions.
 - Have each group present their findings to the class.

- **Examples:**

- A person invests \$ x in a bank at 5% interest and \$ $2x$ in another bank at 3% interest. If the total interest earned is \$150, find the amount invested in each bank.

- Equation: $0.05x + 0.03(2x) = 150$

- Solution: $0.05x + 0.06x = 150$, $0.11x = 150$, $x = 1363.64$

- A car travels at a speed of 60 km/h for (t) hours and at 80 km/h for $(2t)$ hours. If the total distance covered is 400 km, find the time spent at each speed.

- Equation: $60t + 80(2t) = 400$

- Solution: $60t + 160t = 400$, $220t = 400$, $t = 1.82$ hours

- **Time:** 10 minutes

Assessment and Follow-Up (5 minutes)

- **Objective:** Assess students' understanding and provide follow-up activities.

- **Content:**

- Quick quiz with 3-4 problems to solve:

- $2(x + 3) = 3(x - 2)$

- $\frac{4x - 5}{3} = \frac{2x + 1}{2}$

- Collect and review the quiz to gauge understanding.

- Assign homework problems from the NCERT textbook for additional practice.

- **Time:** 5 minutes

Applications

- **Mathematics:** Building a foundation for more complex algebraic concepts.

- **Science:** Solving equations related to speed, distance, and time.

- **Economics:** Understanding cost and revenue relationships.

Follow-Up

In the next lesson, we will explore more applications of linear equations in real-life scenarios and practice solving a variety of problems. We will also review any difficulties encountered in previous lessons and provide additional support as needed.

