Solving Linear Equations with Addition and Subtraction

Introduction to Linear Equations

Welcome to this worksheet on solving linear equations with addition and subtraction! In this activity, you will learn how to solve linear equations using inverse operations and apply them to real-world problems.

A linear equation is an equation in which the highest power of the variable is 1. For example, 2x + 3 = 7 is a linear equation. The variable is the letter or symbol that represents a value that can change, while the constant is a value that does not change.

Understanding Linear Equations

Identify the variable and constant in the following equations:

1. x + 2 = 5
2. 3x - 1 = 8
3. 2x + 4 = 10

Inverse Operations

Inverse operations are opposite operations that can be used to solve linear equations. For example, the inverse operation of addition is subtraction, and the inverse operation of multiplication is division.

To solve a linear equation using inverse operations, we need to isolate the variable. We can do this by adding, subtracting, multiplying, or dividing both sides of the equation by the same value.

Example 1

Solve the equation x + 2 = 7 using inverse operations.

Subtract 2 from both sides of the equation: x = 7 - 2

x = 5

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Solve the following equations using inverse operations:

1. x + 2 = 7
2. x - 3 = 4
3. 2x + 1 = 9

Real-World Applications

Linear equations can be used to model real-world problems, such as calculating the cost of goods or the distance traveled.

For example, if a book costs $15 and a 10% discount is applied, we can use a linear equation to find the new price of the book.

Example 2

A book costs $15. If a 10% discount is applied, how much will the book cost?

Let x be the new price of the book. We can set up the equation: x = 15 - 0.1(15)

x = 15 - 1.5

x = 13.5

Error Analysis

Error analysis is an important step in solving linear equations. It involves checking your solution to ensure it is valid.

To check our solution, we can plug it back into the original equation and make sure it is true.

Example 3

Check the solution to the equation x + 2 = 7.

We found that x = 5. Plugging this back into the equation, we get: 5 + 2 = 7

7 = 7, so our solution is correct.

Word Problems

Word problems involve using linear equations to solve real-world problems.

For example, if a car rental company charges a base fee of $20 plus an additional $0.25 per mile, we can use a linear equation to find the total cost of renting a car for a day.

Example 4

A car rental company charges a base fee of $20 plus an additional $0.25 per mile. If a customer rents a car for a day and drives 100 miles, how much will they be charged?

Let x be the total cost. We can set up the equation: x = 20 + 0.25(100)

x = 20 + 25

x = 45

Mixed Review

Solve the following equations and problems:

1. 2x + 1 = 9
2. x - 3 = 4
3. A book costs $15. If a 10% discount is applied, how much will the book cost?
4. 3x + 2 = 11
5. A car rental company charges a base fee of $20 plus an additional $0.25 per mile. If a customer rents a car for a day and drives 100 miles, how much will they be charged?

Challenge Problems

Solve the following equations and problems:

1. 2x + 5 = 3x - 2
2. x/2 + 2 = 6
3. A company has $1000 to spend on advertising. If they spend $200 on social media and $300 on print ads, how much money do they have left to spend on television ads?
4. 3x - 2 = 2x + 5
5. A student has $50 to spend on school supplies. If they spend $10 on a notebook and $15 on a pen, how much money do they have left to spend on a calculator?

Review and Reflection

What did you learn about linear equations in this worksheet? What were some challenges you faced while solving the equations? How can you apply what you learned to real-world problems?

Individual Reflection:

1. What did you learn about linear equations in this worksheet?
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Additional Practice

Solve the following equations and problems:

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Conclusion

Congratulations on completing this worksheet on solving linear equations with addition and subtraction! You have learned how to solve linear equations using inverse operations and apply them to real-world problems.

Remember to always check your solutions and apply what you have learned to real-world problems. With practice and patience, you will become proficient in solving linear equations and be able to tackle more complex math problems.

Advanced Concepts

In this section, we will explore advanced concepts related to linear equations, including systems of equations and quadratic equations.

A system of equations is a set of two or more equations that have the same variables. We can solve systems of equations using substitution or elimination methods.

Example 5

Solve the system of equations: 2x + 3y = 7 and x - 2y = -3.

We can use the substitution method to solve this system. First, we solve the second equation for x: x = -3 + 2y.

Then, we substitute this expression for x into the first equation: 2(-3 + 2y) + 3y = 7.

Simplifying the equation, we get: -6 + 4y + 3y = 7.

Combine like terms: 7y = 13.

Divide both sides by 7: y = 13/7.

Now that we have found y, we can find x by substituting y back into one of the original equations: x = -3 + 2(13/7).

Simplifying, we get: x = -3 + 26/7.

x = (-21 + 26)/7.

x = 5/7.

Quadratic Equations

A quadratic equation is an equation in which the highest power of the variable is 2. We can solve quadratic equations using factoring, the quadratic formula, or graphing.

The quadratic formula is: x = (-b ± √(b^2 - 4ac)) / 2a.

Example 6

Solve the quadratic equation: x^2 + 4x + 4 = 0.

We can factor this equation: (x + 2)(x + 2) = 0.

This tells us that x + 2 = 0, so x = -2.

Graphing Linear Equations

We can graph linear equations on a coordinate plane. The x-axis represents the x-variable, and the y-axis represents the y-variable.

To graph a linear equation, we can use the slope-intercept form: y = mx + b. The slope (m) tells us how steep the line is, and the y-intercept (b) tells us where the line crosses the y-axis.

Example 7

Graph the equation: y = 2x - 3.

First, we find the y-intercept by letting x = 0: y = 2(0) - 3.

y = -3.

So, the y-intercept is (0, -3).

Next, we find the slope by looking at the coefficient of x: m = 2.

This means that for every 1 unit we move to the right, we move up 2 units.

Using this information, we can graph the line.

Systems of Inequalities

A system of inequalities is a set of two or more inequalities that have the same variables. We can solve systems of inequalities using graphing or substitution methods.

To solve a system of inequalities, we can graph each inequality on a coordinate plane and find the region where they overlap.

Example 8

Solve the system of inequalities: 2x + 3y > 7 and x - 2y < -3.

We can graph each inequality on a coordinate plane and find the region where they overlap.

Linear Equations in Real-World Applications

Linear equations can be used to model real-world problems, such as calculating the cost of goods or the distance traveled.

For example, if a car rental company charges a base fee of $20 plus an additional $0.25 per mile, we can use a linear equation to find the total cost of renting a car for a day.

Example 9

A car rental company charges a base fee of $20 plus an additional $0.25 per mile. If a customer rents a car for a day and drives 100 miles, how much will they be charged?

Let x be the total cost. We can set up the equation: x = 20 + 0.25(100).

x = 20 + 25.

x = 45.

Conclusion

Congratulations on completing this worksheet on linear equations! You have learned how to solve linear equations using inverse operations, graph linear equations, and apply linear equations to real-world problems.

Remember to always check your solutions and apply what you have learned to real-world problems. With practice and patience, you will become proficient in solving linear equations and be able to tackle more complex math problems.

Review and Reflection

What did you learn about linear equations in this worksheet? What were some challenges you faced while solving the equations? How can you apply what you learned to real-world problems?

Individual Reflection:

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Additional Practice

Solve the following equations and problems:

1. $2x + 3 = 7$
2. $x - 2 = 5$
3. A book costs $15. If a 10% discount is applied, how much will the book cost?
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Error Analysis

Error analysis is an important step in solving linear equations. It involves checking your solution to ensure it is valid.

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Example 10

Check the solution to the equation x + 2 = 7.

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