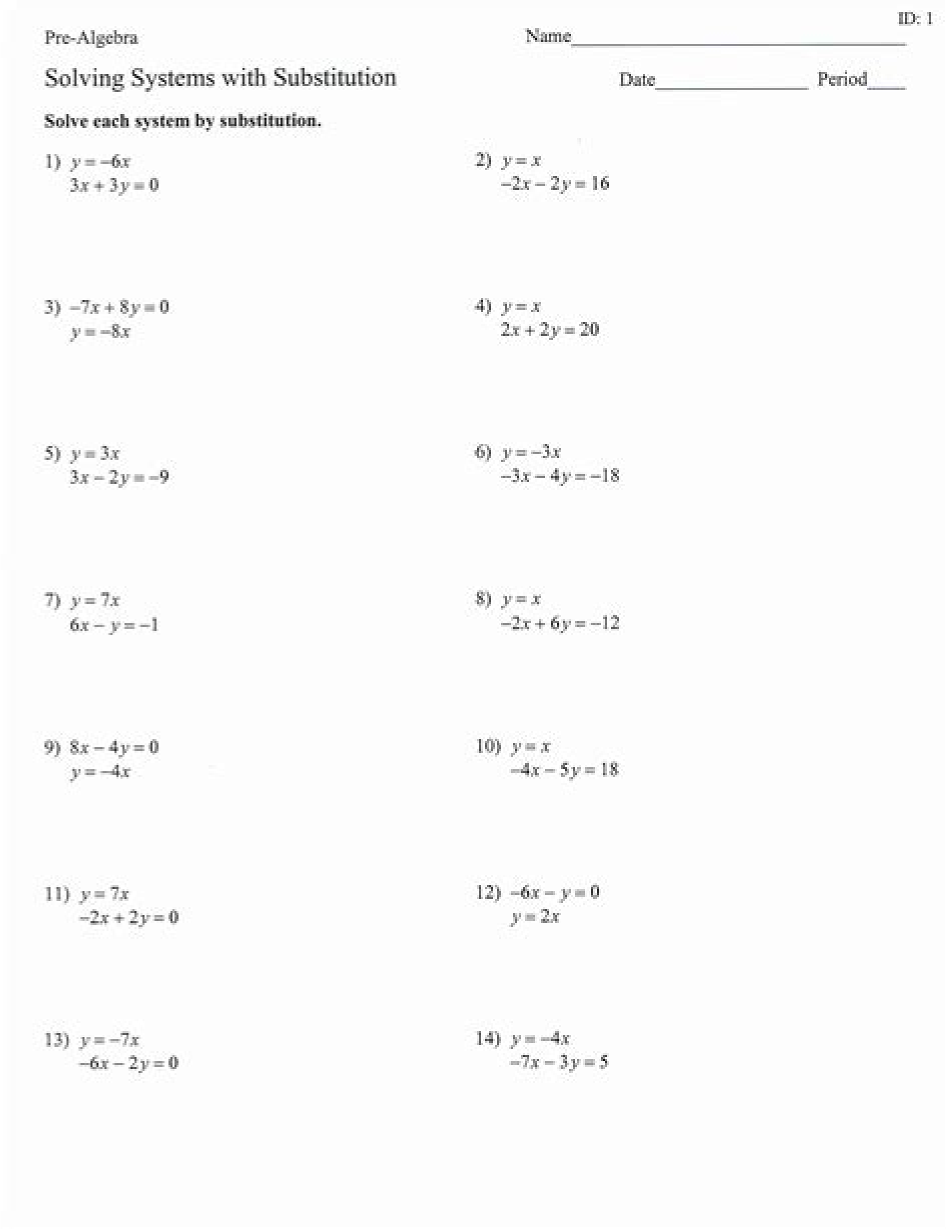
Substitution Method Worksheet With Answers



ID: 1

Pre-Algebra

Name________________________________

Solving Systems with Substitution

Date_______________ Period____

Solve each system by substitution.

1) $y = -6x$
$3x + 3y = 0$

2) $y = x$
$-2x - 2y = 16$

3) $-7x + 8y = 0$
$y = -8x$

4) $y = x$
$2x + 2y = 20$

5) $y = 3x$
$3x - 2y = -9$

6) $y = -3x$
$-3x - 4y = -18$

7) $y = 7x$
$6x - y = -1$

8) $y = x$
$-2x + 6y = -12$

9) $8x - 4y = 0$
$y = -4x$

10) $y = x$
$-4x - 5y = 18$

11) $y = 7x$
$-2x + 2y = 0$

12) $-6x - y = 0$
$y = 2x$

13) $y = -7x$
$-6x - 2y = 0$

14) $y = -4x$
$-7x - 3y = 5$

Substitution Method Worksheet with Answers

The substitution method is a vital technique used in solving systems of equations, particularly linear equations. This method allows one to isolate a variable and substitute it into another equation, making it easier to find the solution. In this article, we will provide a comprehensive worksheet on the substitution method, complete with detailed answers and explanations. This worksheet will serve as an excellent resource for students and educators looking to enhance their understanding of this fundamental algebraic technique.

Understanding the Substitution Method

The substitution method is based on the principle of solving systems of equations by replacing one variable with an equivalent expression derived from another equation. This method is especially useful when one of the equations can be easily manipulated to isolate a variable.

Steps Involved in the Substitution Method

1. Choose an Equation: Begin with a system of equations. Choose one equation to isolate a variable.
2. Solve for One Variable: Rearrange the chosen equation to express one variable in terms of the other.
3. Substitute: Substitute the expression obtained in step 2 into the other equation.
4. Solve the New Equation: Solve the resulting equation for the remaining variable.
5. Back Substitute: Substitute the value found back into the equation from step 2 to find the value of the first variable.
6. Check Your Solution: Always check your solution by substituting both variables back into the original equations.

Examples of the Substitution Method

To illustrate the substitution method, we will present a series of problems along with their solutions. Each example will demonstrate the steps outlined above.

Example 1

Problem:

Solve the system of equations:

1) $y = 2x + 3$

2) $3x + 4y = 18$

Solution:

1. From equation 1, we already have y isolated:

$y = 2x + 3$

2. Substitute y in equation 2:

$3x + 4(2x + 3) = 18$

3. Simplify the equation:

$3x + 8x + 12 = 18$

$11x + 12 = 18$

$11x = 6$

$x = \frac{6}{11}$

4. Back substitute to find y:

$y = 2\left(\frac{6}{11}\right) + 3 = \frac{12}{11} + \frac{33}{11} = \frac{45}{11}$

5. The solution is $x = \frac{6}{11}, y = \frac{45}{11}$.

Example 2

Problem:

Solve the system of equations:

1) $x + y = 7$

2) $2x - y = 4$

Solution:

1. From equation 1, isolate \(y \):

\(y = 7 - x \)

2. Substitute \(y \) in equation 2:

\(2x - (7 - x) = 4 \)

3. Simplify the equation:

\(2x - 7 + x = 4 \)

\(3x - 7 = 4 \)

\(3x = 11 \)

\(x = \frac{11}{3} \)

4. Back substitute to find \(y \):

\(y = 7 - \frac{11}{3} = \frac{21}{3} - \frac{11}{3} = \frac{10}{3} \)

5. The solution is \(x = \frac{11}{3}, y = \frac{10}{3} \).

Example 3

Problem:

Solve the system of equations:

1) \(4x - 5y = 1 \)

2) \(x + 2y = 10 \)

Solution:

1. From equation 2, isolate \(x \):

\(x = 10 - 2y \)

2. Substitute \(x \) in equation 1:

\(4(10 - 2y) - 5y = 1 \)

3. Simplify the equation:

\(40 - 8y - 5y = 1 \)

\(40 - 13y = 1 \)

\(-13y = 1 - 40 \)

\(-13y = -39 \)

\(y = 3 \)

4. Back substitute to find \(x \):

\(x = 10 - 2(3) = 10 - 6 = 4 \)

5. The solution is \(x = 4, y = 3 \).

Substitution Method Worksheet

To practice the substitution method, here is a worksheet with additional problems. Try to solve these on your own before checking the answers provided at the end.

Problems

1. Solve the following system of equations:

1) \(y = 3x - 5 \)

2) \(2x + y = 7 \)

2. Solve the following system of equations:

1) \(x + 3y = 12 \)

2) \(4x - y = 4 \)

3. Solve the following system of equations:

1) \(5x + 2y = 20 \)

2) \(y = x - 1 \)

4. Solve the following system of equations:

1) $3x + 2y = 12$

2) $y = 4 - x$

5. Solve the following system of equations:

1) $6x - 3y = 15$

2) $y = 2x + 1$

Answers to the Worksheet

1. Problem 1:

- Solution: $x = 4, y = 7$

2. Problem 2:

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

3. Problem 3:

- Solution: $x = 3, y = 5$

4. Problem 4:

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

5. Problem 5:

- Solution: $x = 3, y = 7$

Conclusion

The substitution method is a powerful tool for solving systems of equations. By following the structured approach outlined in this article, students can develop a solid understanding of how to manipulate equations to find solutions. The provided worksheet and examples serve as excellent practice opportunities to reinforce learning. With continued practice, the substitution method can become a quick and efficient technique for solving various algebraic problems.

Frequently Asked Questions

What is the substitution method in solving systems of equations?

The substitution method involves solving one of the equations for one variable and then substituting that expression into the other equation to find the values of both variables.

How can I create a substitution method worksheet?

To create a substitution method worksheet, include a variety of systems of equations, provide spaces for students to show their work, and include a section for answers at the end for self-checking.

Where can I find substitution method worksheets with answers?

You can find substitution method worksheets with answers online on educational websites, math resource platforms, or by searching for downloadable PDFs that cater to algebra practice.

What types of equations are best suited for the substitution method?

The substitution method is best suited for systems of linear equations where one equation can be easily manipulated to isolate one variable, making substitution straightforward.

How can I check my answers after using the substitution method?

You can check your answers by plugging the values of the variables back into the original equations to verify that both equations hold true with the substituted values.

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