18. - 9x + 6y = -62x 3y = 8It Says To Solve The Linear System By Graphing. Check Your Solution.

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Solving systems of linear equations is a fundamental skill in algebra that helps in understanding relationships between variables. When a problem states to solve a linear system by graphing, it involves plotting each equation on a coordinate plane and identifying the point(s) where they intersect. The given system appears to be:
- Equation 1: -9x + 6y = -62x
- Equation 2: 3y = 8

In this comprehensive guide, we will walk through the process of solving this system step-by-step, explain how to graph the equations accurately, verify the solution, and understand the underlying concepts to strengthen your algebraic skills.

Understanding the Given System of Equations

Before diving into graphing, it is essential to interpret and simplify the equations for clarity.

Equation 1: -9x + 6y = -62x

At first glance, this equation appears to have variables on both sides, including a term with x on the right side. To facilitate graphing, it is best to manipulate it into slope-intercept form, y = mx + b.

Step 1: Simplify the equation by bringing all x terms to one side.

- Start with: -9x + 6y = -62x

- Add 62x to both sides:

-9x + 62x + 6y = 0

- Simplify:

(62 - 9) x + 6y = 0

53x + 6y = 0

Step 2: Solve for y:

- Subtract 53x from both sides:

6y = -53x

- Divide both sides by 6:

y = (-53/6) x

This is a linear equation in slope-intercept form, with a slope of -53/6 and y-intercept at 0.

Equation 2: 3y = 8

This is a straightforward equation.

- Divide both sides by 3:

y = 8/3

This represents a horizontal line crossing the y-axis at y = 8/3.

Graphing the Equations

Once the equations are simplified, plotting them on the same coordinate plane will help identify their intersection point.

Graphing Equation 1: y = (-53/6) x

- Characteristics:
- Slope (m): -53/6 ≈ -8.83 (a steep negative slope)
- Y-intercept: (0, 0)

- Plotting points:
- When x = 0: y = 0 → point at (0, 0)
- When x = 6: y = (-53/6) 6 = -53 → point at (6, -53)
- When x = -6: y = (-53/6) (-6) = 53 → point at (-6, 53)

- Drawing the line:
- Connect these points with a straight line, extending across the graph.

Graphing Equation 2: y = 8/3 ≈ 2.67

- Characteristics:
- Horizontal line crossing the y-axis at y = 8/3
- No slope (m = 0)

- Plotting points:
- At x = -10: y = 8/3
- At x = 0: y = 8/3
- At x = 10: y = 8/3

- Drawing the line:
- Draw a straight horizontal line through y = 8/3.

Finding the Intersection Point

The solution to the system is the point where the two lines intersect.

- Equation of line 1: y = (-53/6) x
- Equation of line 2: y = 8/3

Set the two equations equal to find x-coordinate:

(-53/6) x = 8/3

To solve for x:

- Multiply both sides by 6 to clear denominators:

-53 x = (8/3) 6

- Simplify RHS:

(8/3) 6 = 8 2 = 16

- Now, solve for x:

-53 x = 16

x = -16 / 53

Next, plug x back into either equation to find y:

y = 8/3

Since y = 8/3 (from the horizontal line), the intersection point is:

(x, y) = (-16/53, 8/3)

This point is the solution to the system.

Checking Your Solution

Verifying the intersection point ensures accuracy.

Substitute x = -16/53 and y = 8/3 into Equation 1

Recall Equation 1 in simplified form: y = (-53/6) x

Plug in x = -16/53:

y = (-53/6) (-16/53)

Simplify:

-53/6 -16/53 = ((-53) -16) / (6 53)

- (-53) -16 = 848 (positive)

- Denominator: 6 53 = 318

So:

y = 848 / 318

Simplify numerator and denominator:

- Both divisible by 2:

848 / 2 = 424

318 / 2 = 159

Thus:

y = 424 / 159 ≈ 2.6667

Compare to y = 8/3 ≈ 2.6667

They match, confirming the point satisfies Equation 1.

Substitute into Equation 2: y = 8/3

Since y = 8/3, the point obviously satisfies Equation 2.

Result: The intersection point (-16/53, 8/3) is the solution to the system.

Implications and Applications of Solving Linear Systems by Graphing

Understanding how to solve systems graphically has many practical applications:

- Real-world problem-solving: For example, finding the point where cost and revenue functions intersect in economics.
- Engineering: Determining equilibrium points in systems.
- Business: Analyzing break-even points.
- Science: Modeling intersecting phenomena.

Graphing provides a visual understanding, which is especially helpful for more complex systems or when verifying algebraic solutions.

Summary and Key Takeaways

- Simplify each equation to slope-intercept form for easy graphing.
- Plot the equations accurately on a coordinate plane.

- Identify the intersection point graphically or algebraically.
- Verify the solution by substitution into original equations.
- Recognize the importance of graphical solutions in various fields.

Additional Tips for Solving Linear Systems by Graphing

- Always simplify equations before graphing.
- Use precise plotting methods or graphing tools for accuracy.
- Remember that the intersection point may be a fraction, so be meticulous with calculations.
- For more complex systems, consider algebraic methods like substitution or elimination, but graphical methods are excellent for visualization.

Conclusion

Solving linear systems by graphing is an essential technique that combines algebraic manipulation with visual interpretation. In the case of the system:

- Equation 1: $y = (-53/6)\,x$
- Equation 2: $y = 8/3$

The intersection point is $((-16/53, 8/3))$. By understanding the process, practicing graphing, and verifying solutions, students and professionals can better analyze relationships between variables in various contexts. Mastery of this method enhances problem-solving skills and provides intuitive insights into the behavior of linear functions.

Keywords: solving linear systems, graphing equations, algebra, slope-intercept form, intersection point, verify solution, linear equations, algebraic methods, coordinate plane, math practice

Frequently Asked Questions

How do I interpret the equations 18 - 9x + 6y = -62x and 3y = 8 when solving by graphing?

These equations can be rewritten in slope-intercept form to graph them easily. For the first, simplify and solve for y; for the second, divide both sides by 3 to get $y = 8/3$. Plot both lines and find their intersection point to solve the system.

What are the steps to graph the equations 18 - 9x + 6y = -62x and 3y = 8?

First, simplify each equation to slope-intercept form ($y = mx + b$). For the first, combine like terms and solve for y. For the second, divide both sides by 3. Then, plot both lines on the same graph and identify their point of intersection.

How can I verify the solution point when solving the system by graphing?

Once you identify the intersection point from the graph, substitute its x and y values into the original equations to check if both are satisfied. If they are, the point is the correct solution.

What common mistakes should I avoid when solving this system by graphing?

Ensure both equations are correctly rewritten in slope-intercept form before graphing. Also, accurately plot points and double-check the intersection. Avoid errors in algebraic manipulation and misreading the graph.

Can I solve this linear system without graphing, and why might graphing be helpful?

Yes, you can solve it algebraically using substitution or elimination. However, graphing provides a visual understanding of the solution and helps verify the solution point, especially for complex or approximate answers.

What does the solution to this system represent in a real-world context?

The solution point represents the specific values of x and y that satisfy both conditions simultaneously, which could correspond to an intersection point like a shared resource, equilibrium point, or crossing in real-life scenarios depending on the context.

After graphing, I found the intersection point to be (x, y). How do I check if it's correct?

Substitute x and y into both original equations to see if both sides are equal. If they are, then the intersection point is the correct solution to the system.

Additional Resources

Solving the Linear System by Graphing: A Step-by-Step Guide

When tackling systems of linear equations, one of the most visual and intuitive methods is solving the linear system by graphing. This approach allows you to see where the lines intersect, representing the solution to the system. In this guide, we'll walk through the process of solving the system given by:

18. - 9x + 6y = -62

and

x 3y = 8

by graphing, checking your solution, and understanding each step involved.

Understanding the System

Before diving into graphing, it's essential to interpret the equations properly.

The equations:

1. -9x + 6y = -62
2. x 3y = 8

(Note: It appears there might be a typo or formatting issue with the second equation. Assuming it is x + 3y = 8, as this is a common form and makes sense in the context. If the original meant something else, please clarify. For this guide, we'll proceed with x + 3y = 8.)

Step 1: Rewrite Equations in Slope-Intercept Form

Why?
Graphing is easiest when equations are in the form y = mx + b.

Equation 1: -9x + 6y = -62

- Isolate y:

```
6y = 9x - 62
y = (9/6)x - 62/6
y = (3/2)x - 31/3
```

- Simplify constants:

```
y = 1.5x - 10.333...
```

Equation 2: x + 3y = 8

- Isolate y:

```
3y = 8 - x
y = (8 - x)/3
y = (8/3) - (1/3)x
```

Step 2: Find the Graphing Points for Each Line

To graph lines, select x-values and compute corresponding y-values.

For Equation 1: y = (3/2)x - 31/3

- Choose x-values, for example, x = 0, 2, and 4.

x	y = (3/2)x - 31/3
0	y = 0 - 31/3 ≈ -10.33
2	y = (3/2)(2) - 31/3 = 3 - 10.33 ≈ -7.33
4	y = (3/2)(4) - 31/3 = 6 - 10.33 ≈ -4.33

For Equation 2: y = (8/3) - (1/3)x

- Choose x-values, for example, x = 0, 3, and 6.

x	y = (8/3) - (1/3)x

0	y = 8/3 ≈ 2.67
3	y = 8/3 - 1 = (8/3) - 1 ≈ 1.67
6	y = 8/3 - 2 = (8/3) - 2 ≈ 0.67

Step 3: Plot the Lines on a Coordinate Plane

Using graph paper or graphing software:

- Plot the points for Equation 1 and connect them with a straight line.
- Plot the points for Equation 2 and connect them similarly.

Tip: Extend the lines across the graph to clearly see their intersection point.

Step 4: Find the Intersection Point

The solution to the system is the point where the two lines intersect.

Visual Inspection (Approximate)

- Based on the plotted points, observe where the lines cross.
- From the calculated points, it appears the lines intersect somewhere near x ≈ 2.5.

Algebraic Verification

To find the exact intersection point, solve the system algebraically:

From Equation 2:

```
y = (8/3) - (1/3)x
```

Substitute into Equation 1:

```
y = (3/2)x - 31/3

=> (8/3) - (1/3)x = (3/2)x - 31/3
```

Multiply through by 6 to clear denominators:

```
6 [(8/3) - (1/3)x] = 6 [(3/2)x - 31/3]
```

Simplify:

```
28 - 2x = 3x - 231
```

Calculate:

```
```

16 - 2x = 3x - 62
```

Bring like terms together:

```
16 + 62 = 3x + 2x
```

Simplify:

```
78 = 5x
```

Solve for x:

```
x = 78/5 = 15.6
```

Now, substitute x back into one of the equations to find y:

Using Equation 2:

```
y = (8/3) - (1/3)(15.6) = 2.67 - 5.2 ≈ -2.53
```

Solution:
x ≈ 15.6, y ≈ -2.53

Step 5: Check Your Solution

Verify by plugging the solution into both original equations.

Equation 1: -9x + 6y = -62

```
-9(15.6) + 6(-2.53) = -62
-140.4 - 15.18 ≈ -155.58 ≠ -62
```

This discrepancy suggests an inconsistency—likely due to the earlier assumption about the second equation or calculation errors.

Clarification & Final Remarks

Addressing the Discrepancy

The inconsistency indicates that the initial assumption that the second equation is x + 3y = 8 might be incorrect. If the original second equation was x 3y = 8, then:

```
x 3y = 8
```
```

```

which simplifies to:

```
3xy = 8
```

or

```
y = 8 / (3x)
```

which is a nonlinear relation, not a linear one, meaning the system isn't purely linear and cannot be solved by graphing as lines.

Correct System

Assuming the second equation is $3y = 8$, then:

```
3y = 8
=> y = 8/3 ≈ 2.67
```

This is a horizontal line, intersecting the first line at the point where $y=8/3$.

Final Solution with Corrected Equations

- From Equation 1:

```
y = (3/2)x - 31/3
```

- From Equation 2:

```
y = 8/3
```

Set equal:

```
(3/2)x - 31/3 = 8/3
```

Multiply through by 6:

```
6(3/2)x - 6(31/3) = 6(8/3)
```

Simplify:

```
9x - 62 = 16
```
```

Solve for x:

```
9x = 78
x = 78/9 = 8.67
```

Now, check y:

```
y = 8/3 ≈ 2.67
```

Verify in Equation 1:

```
-9(8.67) + 6(2.67) ≈ -78 + 16 ≈ -62
```

which matches the original right side, confirming the solution is correct.

Conclusion

Solving the linear system by graphing is an effective visual approach that reinforces understanding of the relationships between equations. Always:

- Rewrite equations in slope-intercept form for easy graphing.
- Plot multiple points for each line to ensure accuracy.
- Find the intersection point visually or algebraically.
- Check your solution by substituting back into original equations.

Remember: Clarify the equations before solving, as small ambiguities can lead to significant differences in the solution process. Whether you're working with perfect lines or more complex systems, graphing remains a vital tool in your algebra toolkit, providing both insight and confirmation.

Happy graphing!

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