

What Is The Coordinate Of The System Of Equations $Y=2x+3$ And $-y+7=-2$

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Understanding the coordinate of a system of equations is fundamental in algebra and analytic geometry. When multiple equations are involved, their solution corresponds to the point(s) where these equations intersect on the coordinate plane. Specifically, in the case of the system of equations:

$$\begin{cases} y = 2x + 3 \end{cases}$$

$$\begin{cases} -y + 7 = -2 \end{cases}$$

it's essential to determine the point $((x, y))$ that satisfies both equations simultaneously. This process involves solving the system to find the exact coordinate(s) where these two lines intersect. In this article, we will explore how to interpret such systems, methods for solving them, and the significance of their solutions in various applications.

Understanding Systems of Equations

Definition of a System of Equations

A system of equations consists of two or more equations with the same set of variables. The goal is to find the values of these variables that satisfy all equations simultaneously. These solutions are often represented as coordinates in the two-dimensional plane.

For example, the system:

$$\begin{cases} y = 2x + 3 \\ -y + 7 = -2 \end{cases}$$

has two equations involving variables (x) and (y) .

Types of Solutions

Depending on the system, solutions can be:

- Unique solution: The lines intersect at exactly one point.
- Infinite solutions: The lines coincide, meaning they are the same line.
- No solution: The lines are parallel and do not intersect.

In our case, the goal is to find the specific coordinate point where the solution occurs.

Analyzing the Given System of Equations

Original Equations

The system provided is:

1. $y = 2x + 3$ — a linear equation in slope-intercept form.
2. $-y + 7 = -2$ — which can be rearranged to standard form.

Rearranging the Second Equation

Let's manipulate the second equation to express it in a more familiar form:

$$\begin{aligned} & \{ \\ & -y + 7 = -2 \\ & \} \end{aligned}$$

Subtract 7 from both sides:

$$\begin{aligned} & \{ \\ & -y = -2 - 7 \\ & \} \\ & \{ \\ & -y = -9 \\ & \} \end{aligned}$$

Multiply through by -1 to solve for y :

$$\begin{aligned} & \{ \\ & y = 9 \\ & \} \end{aligned}$$

This shows that the second equation is actually a horizontal line at $y = 9$.

Finding the Coordinate Solution

Substitute $(y = 9)$ into the first equation

Since the second equation simplifies to $(y = 9)$, and the first equation is $(y = 2x + 3)$, setting $(y = 9)$ yields:

$$\begin{aligned} & \{ \\ 9 &= 2x + 3 \\ & \} \end{aligned}$$

Subtract 3 from both sides:

$$\begin{aligned} & \{ \\ 9 - 3 &= 2x \\ & \} \\ & \{ \\ 6 &= 2x \\ & \} \end{aligned}$$

Divide both sides by 2:

$$\begin{aligned} & \{ \\ x &= 3 \\ & \} \end{aligned}$$

Solution Point: The intersection point, or the coordinate of the system, is:

$$\begin{aligned} & \{ \\ \boxed{(3, 9)} & \\ & \} \end{aligned}$$

This means that the two lines intersect at the point $((3, 9))$.

Interpreting the Solution

Significance of the Intersection Point

The coordinate $((3, 9))$ indicates the exact point where the graph of $(y = 2x + 3)$ intersects with the line $(y = 9)$. This point is the solution to the system, satisfying both equations simultaneously.

Visual Representation

- The line $(y = 2x + 3)$ is a straight line with a slope of 2 and a y-intercept at 3.
 - The line $(y = 9)$ is a horizontal line crossing the y-axis at 9.
 - Their intersection at $((3, 9))$ can be visualized as follows:
- When $(x = 3)$, $(y = 2(3) + 3 = 6 + 3 = 9)$, confirming the point.

Methods for Solving Systems of Equations

Graphical Method

Plot each equation on a coordinate plane:

- Draw the line $(y = 2x + 3)$.
- Draw the line $(y = 9)$.

The point where both lines cross is the solution. In this case, the crossing point is at $((3, 9))$.

Substitution Method

Since one of the equations is already solved for (y) , substitution is straightforward:

- Substitute $(y = 9)$ into the other equation to solve for (x) .

Elimination Method

Useful when the equations are in standard form, but in this scenario, substitution is more direct.

Practical Applications of Systems of Equations and Coordinates

Real-life Examples

- Engineering: Determining the point where two beams intersect.
- Economics: Finding equilibrium points where supply and demand curves meet.
- Navigation: Calculating the intersection point of routes or signal ranges.
- Physics: Locating the point where two forces or fields intersect.

Importance of Accurate Solutions

Knowing the exact coordinate of intersection can influence design, decision-making, and analysis in various fields. Precise solution methods help avoid errors that could lead to flawed conclusions.

Summary and Key Takeaways

- The system of equations $y = 2x + 3$ and $-y + 7 = -2$ simplifies to the intersection point $((3, 9))$.
- The second equation indicates a horizontal line at $(y = 9)$, and the first line passes through this point when $(x = 3)$.
- Solving systems involves methods like substitution, elimination, and graphical analysis.
- Understanding the coordinate of the intersection is vital across scientific, engineering, and mathematical applications.

Conclusion

Determining the coordinate of a system of equations is a fundamental skill in algebra that aids in visualizing and solving real-world problems. In our specific example, the solution $((3, 9))$ exemplifies how algebraic manipulation and understanding of line equations converge to find the exact point of intersection. Mastery of these techniques enables students and professionals alike to analyze complex systems efficiently and accurately.

Additional Tips for Solving Systems of Equations

- Always simplify equations to their most manageable form before solving.
- Verify solutions by substituting back into original equations.
- Use graphing tools or software for visual confirmation, especially with complex systems.
- Practice with different types of systems to build confidence and proficiency.

Keywords: system of equations, coordinate, intersection point, solving equations, algebra, graphing, substitution, elimination, linear equations, coordinate plane

Frequently Asked Questions

What is the solution to the system of equations $y = 2x + 3$ and $-y + 7 = -2$?

The solution is the point where both equations intersect. Solving the system, $x = 1$ and $y = 5$, so the coordinate is $(1, 5)$.

How do I find the intersection point of $y = 2x + 3$ and $-y + 7 = -2$?

Set $y = 2x + 3$ into the second equation: $-(2x + 3) + 7 = -2$, then solve for x and y to find the intersection point.

What is the coordinate of the solution to the system $y = 2x + 3$ and $-y + 7 = -2$?

The coordinate is $(1, 5)$, where both equations are satisfied.

Are the lines represented by $y = 2x + 3$ and $-y + 7 = -2$ parallel or intersecting?

They intersect at the point $(1, 5)$; thus, they are not parallel.

Can the system of equations $y = 2x + 3$ and $-y + 7 = -2$ be solved graphically?

Yes, by graphing both equations, their point of intersection is at $(1, 5)$.

What is the method to find the coordinate of the system of equations $y = 2x + 3$ and $-y + 7 = -2$?

Substitute y from the first into the second equation or use substitution or elimination methods to find x and y .

Is the point $(1, 5)$ a solution to both equations $y = 2x + 3$ and $-y + 7 = -2$?

$$y + 7 = -2?$$

Yes, substituting $x=1$ and $y=5$ into both equations confirms that $(1, 5)$ is the solution.

What is the significance of the coordinate $(1, 5)$ in the system of equations?

It represents the point where the two lines intersect, satisfying both equations simultaneously.

Additional Resources

Understanding the Coordinate of the System of Equations $Y=2x+3$ and $-y+7=-2$

Mathematics, often perceived as a complex field, fundamentally revolves around understanding relationships between quantities. At the core of algebra and coordinate geometry is the study of systems of equations—sets of equations that are analyzed simultaneously to find common solutions. Among the most foundational of these are linear systems, which describe straight lines in a two-dimensional plane. In this article, we delve into the specific system of equations:

$$\begin{aligned} -y &= 2x + 3 \\ -y + 7 &= -2 \end{aligned}$$

Our goal is to determine the coordinate point (or points) where these lines intersect, explore the meaning behind these solutions, and analyze their implications within the broader scope of mathematical problem-solving.

Fundamentals of Systems of Equations

What Is a System of Equations?

A system of equations consists of two or more equations that share common variables. The solutions to such systems are the set of variable values that satisfy all equations simultaneously. For example, in two variables (x and y), solutions are points in the coordinate plane where the graphs of the equations intersect.

Types of solutions:

- Unique solution: The lines intersect at exactly one point. The system is consistent and independent.
- Infinite solutions: The lines coincide, meaning they are the same line.
- No solution: The lines are parallel and do not intersect.

In our case, the system involves two linear equations, which typically intersect at a single point unless they are coincident or parallel.

Graphical Interpretation of Systems

Graphically, each linear equation corresponds to a straight line on the Cartesian plane. The solution to the system is the point where the lines meet, known as the point of intersection. This point is expressed as an ordered pair (x, y). Visualizing the system helps in understanding the relationships and solving for the intersection point efficiently.

Analyzing the Given System of Equations

The system provided is:

1. $y = 2x + 3$
2. $-y + 7 = -2$

Let's analyze and interpret each component.

Equation 1: $y = 2x + 3$

This is a linear equation in slope-intercept form ($y = mx + b$), where:

- m (slope): 2
- b (y-intercept): 3

Graphically, this line crosses the y-axis at (0, 3) and rises two units vertically for every one unit moved horizontally to the right.

Equation 2: $-y + 7 = -2$

This equation can be simplified to a standard form to better understand its characteristics.

Simplification:

- Add y to both sides: $7 = y - 2$
- Add 2 to both sides: $y = 9$

This indicates that the second line is a horizontal line crossing the y-axis at $y = 9$.

Key observations:

- The second line is horizontal at $y = 9$.
- The first line has slope 2 and crosses y at 3 when $x=0$.

Finding the Intersection Point

The key to solving the system lies in identifying the point where both equations are satisfied simultaneously.

Method 1: Graphical Approach

- Plot the line $y = 2x + 3$. It passes through $(0, 3)$ and has a slope of 2.
- Plot the line $y = 9$, which is a horizontal line crossing the y-axis at 9.
- The intersection point is where $y=9$ on the first line:

- Set $y = 9$ in the first equation:

$$9 = 2x + 3$$

- Solve for x :

$$2x = 9 - 3$$

$$2x = 6$$

$$x = 3$$

- Therefore, the lines intersect at $(3, 9)$.

Method 2: Substitution Method

Given that the second equation simplifies to $y=9$, we substitute this value into the first:

$$- y = 2x + 3$$

$$- 9 = 2x + 3$$

Solve for x :

$$- 2x = 9 - 3 = 6$$

$$- x = 3$$

Thus, the solution is $(3, 9)$.

Method 3: Algebraic Elimination

While elimination is more suitable for systems with different forms, in this case, substitution is straightforward because the second equation directly gives y .

Interpreting the Solution: The Coordinate Point

The point of intersection, $(3, 9)$, is the unique solution to this system. This coordinate indicates the exact location in the Cartesian plane where both lines cross.

Significance of the solution:

- The x-coordinate (3) signifies the horizontal position.
- The y-coordinate (9) signifies the vertical position.

Graphically, this is where the line $y=2x+3$ reaches the height $y=9$, and this height coincides with the horizontal line $y=9$. It is the precise point where the two equations' graphs intersect, confirming the consistency and independence of the system.

Broader Implications and Applications

Understanding the coordinate of systems of equations is fundamental in various real-world contexts.

Applications in Business and Economics

- Profit and Cost Analysis: Equations model revenue and expenses; their intersection point indicates the break-even point.
- Supply and Demand: Equations representing supply and demand curves intersect at the equilibrium price and quantity.

Engineering and Physics

- Calculating forces, trajectories, or electrical circuit points involves solving systems of equations.
- Intersection points can determine optimal conditions or critical points in systems.

Navigation and Geography

- Finding the intersection of two paths, such as roads or flight routes, relies on solving systems of equations to determine the exact crossing point.

Educational Significance

- Mastering such concepts enhances problem-solving skills, critical thinking, and mathematical literacy, foundational for STEM fields.

Advanced Considerations and Variations

While the current system is straightforward, more complex systems can involve nonlinear equations, inequalities, or higher dimensions.

Potential complexities include:

- Parallel lines indicating no solution.
- Coincident lines implying infinitely many solutions.
- Systems involving quadratic or exponential functions.

In such cases, techniques such as substitution, elimination, graphing, or matrix methods (e.g., Gaussian elimination) are employed.

Conclusion: The Significance of Coordinates in Systems of Equations

The coordinate of the system of equations $y=2x+3$ and $-y+7=-2$ is (3, 9). This single point embodies the intersection of two linear equations, symbolizing the solution that satisfies both simultaneously. Understanding how to determine such points is crucial in algebra, geometry, and applied mathematics, providing insights into the relationships between variables and the behavior of systems.

By mastering these fundamental concepts, students and professionals alike can analyze complex systems across various domains, making informed decisions based on mathematical reasoning. The intersection point not only solves a specific problem but also exemplifies the power of algebraic techniques in deciphering the interconnected nature of real-world phenomena.

In essence, the coordinate (3, 9) is more than just a pair of numbers—it represents a precise point of intersection, a solution born from logical reasoning and mathematical rigor, and a gateway to understanding the intricate relationships modeled by systems of equations.

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