Write An Equation In Slope Intercept Form To Represent The Values In The Table. X Y -2 -13 -1 -7 0 -1

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Understanding how to write an equation in slope-intercept form is fundamental in algebra, especially when interpreting data from a table. This article will guide you through the process of deriving a linear equation given specific data points, focusing on the example table with the points (-2, -13), (-1, -7), and (0, -1). By the end of this guide, you'll be equipped with the skills to find the slope and y-intercept, and write the equation of the line that passes through these points.

Understanding the Slope-Intercept Form of a Linear Equation

Before diving into calculations, it's crucial to understand the structure of the slope-intercept form of a line.

What Is the Slope-Intercept Form?

The slope-intercept form is a way to express the equation of a line:

\[y = mx + b \]

where:
- m is the slope of the line,
- b is the y-intercept (the point where the line crosses the y-axis).

This form is particularly useful because it clearly indicates how the y-values change with x, making it easy to graph and interpret.

Why Use the Slope-Intercept Form?

- It provides a quick way to identify the y-intercept.
- It simplifies plotting the line on a graph.
- It helps in understanding the relationship between x and y.

Analyzing the Data Table

Let's examine the data points provided:

X	Y
-2	-13
-1	-7
0	-1

From these points, our goal is to find the line that passes through all three, or at least determine the equation consistent with these points.

Visualizing the Data

Plotting these points on a coordinate plane can aid in visual understanding:
- At x = -2, y = -13
- At x = -1, y = -7
- At x = 0, y = -1

Noticing the pattern, the points seem to lie on a straight line, which suggests the data is linear.

Calculating the Slope (m)

The first step in writing the equation is to find the slope, which measures how steep the line is.

Formula for Slope

Given two points (x_1, y_1) and (x_2, y_2), the slope m is:

$$ m = \frac{y_2 - y_1}{x_2 - x_1} $$

Applying the Formula to Our Data

Choose any two points; for accuracy, let's use the first and third points:

- Point 1: $(-2, -13)$
- Point 2: $(0, -1)$

Calculating:

$$ m = \frac{-1 - (-13)}{0 - (-2)} = \frac{-1 + 13}{0 + 2} = \frac{12}{2} = 6 $$

Thus, the slope of the line is 6.

Finding the Y-Intercept (b)

With the slope known, the next step is to find the y-intercept b. Recall that b is the value of y when $x=0$.

Using the Slope-Intercept Equation

Since the point (0, -1) has an x-coordinate of 0, it directly gives the y-intercept:

$$ y = mx + b $$
$$ -1 = 6 \times 0 + b $$
$$ b = -1 $$

Alternatively, we can verify the y-intercept using another point and the slope:

Using point $(-1, -7)$:

$$ y = mx + b $$
$$ -7 = 6 \times (-1) + b $$
$$ -7 = -6 + b $$
$$ b = -7 + 6 = -1 $$

Consistent with the previous calculation, confirming $b = -1$.

Writing the Equation in Slope-Intercept Form

Now that we have both the slope and y-intercept:

- Slope $m = 6$
- Y-intercept $b = -1$

The equation of the line is:

$$ y = 6x - 1 $$

Final Equation

$$ \boxed{ y = 6x - 1 } $$

This equation accurately represents the values in the table.

Verifying the Equation

It's essential to verify that the equation works for all given points:

- For $x = -2$:

$$ y = 6(-2) - 1 = -12 - 1 = -13 $$
Matches the table's y value.

- For $x = -1$:

$$ y = 6(-1) - 1 = -6 - 1 = -7 $$
Matches.

- For $x = 0$:

$$ y = 6(0) - 1 = 0 - 1 = -1 $$
Matches.

All points satisfy the equation, confirming its correctness.

Additional Considerations for Writing Equations in Slope-Intercept Form

While this example illustrates a straightforward process, here are some tips and considerations for similar problems:

1. Use Two Points to Find the Slope

- Always verify the linearity of the data.
- Calculate the slope using different pairs to ensure consistency.

2. Find the Y-Intercept

- When $x=0$, the y value directly gives b.
- If $x=0$ isn't in the data, use the slope and an existing point to solve for b.

3. Write the Final Equation

- Substitute the slope and y-intercept into $y = mx + b$.

Note:
In cases where the data points do not lie perfectly on a line, you might need to perform linear regression to find the best-fit line.

Conclusion

Writing an equation in slope-intercept form from a set of data points involves calculating the slope using two points, determining the y-intercept, and then formulating the equation. In our example, the points \((-2, -13)\), \((-1, -7)\), and \((0, -1)\) all align on the line \(y = 6x - 1\). This process not only helps in understanding the relationship between variables but also enhances skills in graphing and data analysis.

Remember, practice with different data sets will improve your ability to quickly derive the linear equations that describe real-world relationships, making you more proficient in algebra and analytical reasoning.

Frequently Asked Questions

What is the slope of the line that passes through the points (-2, -13) and (-1, -7)?

The slope is (-7 - (-13)) / (-1 - (-2)) = (6) / (1) = 6.

How do you find the y-intercept of the line given the points (-2, -13) and (-1, -7)?

Use the slope and one point to solve for b in y = mx + b. For example, with point (-2, -13): -13 = 6(-2) + b, so b = -13 - (-12) = -1.

What is the equation in slope-intercept form for the data points provided?

Using slope m = 6 and y-intercept b = -1, the equation is y = 6x - 1.

How can you verify that the equation y = 6x - 1 fits all the points in the table?

Substitute each x-value into the equation and check if the resulting y matches the table values: for x = -2, y = 6(-2) - 1 = -12 - 1 = -13; for x = -1, y = 6(-1) - 1 = -6 - 1 = -7; for x = 0, y = 6(0) - 1 = -1. All match the table.

Why is it important to determine the slope when writing the equation in slope-intercept form?

The slope indicates the rate of change between x and y, which is essential for accurately formulating the linear equation from data points.

Can the same equation y = 6x - 1 be used to predict y for other x-values in the table?

Yes, because the points lie on the line defined by y = 6x - 1, so it can be used to find y for other x-values on this line.

What is the significance of the slope-intercept form in graphing linear equations?

The slope-intercept form y = mx + b clearly shows the slope (m) and y-intercept (b), making it easy to graph the line and understand its behavior.

Additional Resources

Understanding How to Write an Equation in Slope-Intercept Form from a Table of Values

When working with linear equations, one of the fundamental skills is to be able to derive the equation from a set of data points. This process involves understanding the relationship between the x and y variables and translating that into the slope-intercept form of a line, which is expressed as:

\[y = mx + b \]

where:
- \(m \) is the slope of the line,
- \(b \) is the y-intercept (the point where the line crosses the y-axis).

In this detailed review, we will explore how to write an equation in slope-intercept form based on a given table of values. We will analyze the specific data set provided, understand the concepts involved, and walk through the entire process meticulously.

Analyzing the Given Data Table

The table provided includes three data points:

X	Y
-2	-13
-1	-7
0	-1

This table shows the relationship between the variables x and y. Our goal is to find a linear equation $y = mx + b$ that accurately models these points.

Key Concepts for Deriving the Equation

Before proceeding with calculations, it’s important to understand some fundamental concepts:

The Slope (m)

- The slope indicates the rate of change of y with respect to x.
- It measures how steep the line is.
- Calculated as the change in y divided by the change in x:

$$m = \frac{\Delta y}{\Delta x}$$

- Accurate calculation of the slope is crucial because it defines the entire linear relationship.

The Y-Intercept (b)

- The y-intercept is the value of y when $x = 0$.
- It can be directly read from the table if the point $(0, y)$ exists, or calculated once the slope is known.

Linearity and Consistency of Data

- For the data to be represented by a linear equation, the points must lie on a straight line.
- The consistency of the change in y relative to the change in x across all points confirms linearity.

Step-by-Step Process for Finding the Equation

Let's walk through the process of deriving the equation from the data points.

Step 1: Calculate the Slope (m)

- Use any two points from the table to find m. The most straightforward approach is to use the points with different x values.

- Choosing points $(-2, -13)$ and $(-1, -7)$:

$$
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7 - (-13)}{-1 - (-2)} = \frac{-7 + 13}{-1 + 2} = \frac{6}{1} = 6
$$

- Verify with another pair, say $(-1, -7)$ and $(0, -1)$:

$$
m = \frac{-1 - (-7)}{0 - (-1)} = \frac{-1 + 7}{0 + 1} = \frac{6}{1} = 6
$$

- Since the slope is consistent across different pairs, the line is linear, and the slope $m = 6$.

Step 2: Find the Y-Intercept (b)

- Since the data point $(0, -1)$ directly shows $x = 0$, the y value at this point is the y-intercept.

- Therefore:

$$
b = -1
$$

- Alternatively, if the point with $x = 0$ was missing, we could substitute one of the points into the slope-intercept form $y = mx + b$ to solve for b:

$$
-7 = 6 \times (-1) + b \Rightarrow -7 = -6 + b \Rightarrow b = -7 + 6 = -1
$$

- Confirmed, the y-intercept is -1.

Step 3: Write the Equation

- With $m = 6$ and $b = -1$, the linear equation is:

$$
\boxed{ y = 6x - 1 }
$$

Verifying the Derived Equation

Verification ensures that the equation correctly models all the points in the table.

- Check Point 1 ($x = -2$)

$$
y = 6(-2) - 1 = -12 - 1 = -13
$$
Matches the table value.

- Check Point 2 ($x = -1$)

$$
y = 6(-1) - 1 = -6 - 1 = -7
$$
Matches the table value.

- Check Point 3 ($x = 0$)

$$
y = 6(0) - 1 = 0 - 1 = -1
$$
Matches the table value.

Since all points satisfy the equation, the derived line is correct.

Implications and Applications of the Slope-Intercept Equation

Understanding how to write the equation from a table is essential in many real-world applications, such as:

- Business and Economics: Modeling profit or cost functions based on data.
- Physics: Describing relationships like distance over time.
- Biology: Understanding growth trends.
- Engineering: Analyzing linear systems.

Furthermore, this skill allows for predictions beyond the given data points, facilitating decision-making, planning, and analysis.

Advanced Considerations and Common Pitfalls

While the process appears straightforward, several pitfalls can occur if not careful:

- Assuming Linearity: Not all data points follow a linear pattern. Always verify the consistency of the change in y relative to x.
- Incorrect Slope Calculation: Using points that are too close or too far apart can sometimes lead to rounding errors; always double-check calculations.
- Misreading the Y-Intercept: Ensure that the point with $x = 0$ is correctly identified; if missing, calculate b by substituting any point into the equation.
- Data Errors: Verify data accuracy before proceeding, as incorrect data points will lead to an incorrect equation.

Conclusion: Mastery of the Process

The ability to write an equation in slope-intercept form from a table of data points is a vital skill in algebra. It involves:

- Calculating the slope using two data points,
- Confirming the linearity of the data,
- Finding the y-intercept, either directly from the data or through substitution,
- Constructing the equation $y = mx + b$,
- Verifying the equation against all data points.

In the specific case discussed, the process yielded the equation:

$$\boxed{ y = 6x - 1 }$$

This equation perfectly models the given data set, illustrating the straightforward yet powerful nature of linear modeling. Mastery of this process empowers students and professionals to analyze data efficiently, develop mathematical models, and interpret real-world relationships with confidence.

Remember: Always verify your calculations, confirm the data's linearity, and interpret the results within the context of the problem. Practice with various data sets to strengthen your understanding and application skills in writing equations from tables.

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