

Use The Grid To Create A Model To Solve The Percent Problem. 21 Is 70% Of What Number?

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Understanding how to solve percentage problems is a fundamental skill in mathematics that applies to real-world situations, from calculating discounts to determining proportions in data analysis. One effective method to approach these problems is by using visual models, such as grids, which help students and learners conceptualize the relationships between parts and wholes. This article explores how to utilize a grid to create a model that solves the specific percentage problem: "21 is 70% of what number?" We'll walk through the reasoning process, provide step-by-step instructions, and demonstrate how this visual approach enhances comprehension and problem-solving skills.

Why Use A Grid To Solve Percent Problems?

Using a grid as a visual model offers several advantages:

- Clarifies the relationship between parts and whole: The grid helps to visualize how a part (the 21) relates to the whole (the unknown number).
- Supports conceptual understanding: Rather than memorizing formulas, learners see the proportion and develop a deeper grasp of percentage concepts.
- Facilitates accurate calculations: Visual models reduce errors by providing a clear representation of the problem.
- Engages learners: Interactive and visual techniques tend to increase engagement and retention.

Understanding the Percent Problem

Before diving into the grid method, it's essential to understand what the problem asks:

> "21 is 70% of what number?"

This question is asking us to find the total number (the whole) of which 21 is a part, specifically 70% of it.

In mathematical terms, this can be expressed as:

$$\text{Part} = \text{Percent} \times \text{Whole}$$

Where:

- Part = 21
- Percent = 70% (which is 0.70 in decimal form)
- Whole = ? (the number we want to find)

Rearranged, the formula to find the whole is:

$$\text{Whole} = \frac{\text{Part}}{\text{Percent}}$$

But instead of jumping directly to the formula, employing a grid model helps visualize the problem.

Creating a Grid Model for the Problem

The grid model involves dividing a rectangle into equal parts to represent percentages and parts of a whole. Here's how to set it up for this problem:

Step 1: Draw the Grid

- Draw a rectangle that will represent the total number (the whole).
- Divide this rectangle into 100 equal parts horizontally, each representing 1% of the total.
- Shade or mark 70 of these parts to represent 70%.

Step 2: Represent the Part (21) on the Grid

- Since 70% corresponds to 21, find the value of one percent:

$$\text{Value per 1\%} = \frac{\text{Part}}{\text{Percent}} = \frac{21}{70} = 0.3$$

- This means each 1% corresponds to 0.3 units.
- To find the total number (whole), multiply the value per 1% by 100:

$$\text{Whole} = 0.3 \times 100 = 30$$

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- Alternatively, in the grid, since 70 parts equal 21, then:

$$\text{Total parts} = \frac{100}{70} \times 21 = \frac{10}{7} \times 21 = 30$$

Step 3: Visualize the Calculation

- Adjust the grid to show 30 total parts, with 21 shaded representing 70%.
- The unshaded parts (9) represent the remaining percentage (30%).

Step-by-Step Solution Using the Grid Model

1. Identify the known values:

- Part (shaded area): 21
- Percentage: 70%

2. Set up the proportion:

$$\frac{\text{Part}}{\text{Whole}} = \frac{\text{Percent}}{100}$$

3. Solve for the whole:

$$\text{Whole} = \frac{\text{Part} \times 100}{\text{Percent}}$$

Substitute known values:

$$\text{Whole} = \frac{21 \times 100}{70} = \frac{2100}{70} = 30$$

4. Conclusion:

The total number is 30.

Therefore, 21 is 70% of 30.

Additional Tips for Using Grid Models in Percent Problems

- Always convert percentages to decimal form when performing calculations, but visual models help in understanding the relationship.
- Divide the grid into 100 equal parts for clarity, aligning with the percentage scale.
- Use color-coding to distinguish between parts representing the percentage and the remaining parts.
- Practice with different problems to become comfortable with the visual approach.

Real-World Applications of Percent Problems and Grid Models

Understanding how to solve percentage problems with visual models like grids has practical applications:

- Financial calculations: Determining discounts, interest rates, or tax amounts.
- Data analysis: Understanding proportions in surveys or statistical data.
- Cooking and recipes: Adjusting ingredient quantities based on percentages.
- Education and teaching: Helping students grasp concepts of parts of a whole.

Conclusion

Using the grid to create a model simplifies complex percentage problems, making them accessible and understandable. For the specific problem "21 is 70% of what number?", constructing a visual grid reveals the solution step by step. This approach not only provides an accurate answer—30—but also deepens conceptual understanding of percentages, parts, and wholes. Whether you're a student, teacher, or someone looking to strengthen your math skills, mastering the grid method enhances problem-solving confidence and mathematical reasoning.

Remember, visual models like grids serve as powerful tools in mathematics, transforming abstract concepts into tangible, comprehensible representations. Practice with different percentage problems using this method to build fluency and develop a strong foundation in proportional reasoning.

Frequently Asked Questions

How can I use a grid to find the number that 70% of is equal to?

You can set up a grid where one column represents the percentage (70%) and the other the total number. By representing parts and wholes visually, you can find the total number by dividing the part by the percentage (as a decimal).

What steps should I follow to create a model using a grid for solving '70% of what number?'?

First, draw a grid with two columns: one for the percentage and one for the total number. Fill in the part you know (the specific amount) and set up the percentage as a fraction or decimal. Then, solve for the total number by dividing the part by the decimal form of the percentage.

Can you give an example of using a grid to find the number when 70% of it is 35?

Yes. Draw a grid with 70% represented as 0.7 and the part as 35. To find the total number, divide 35 by 0.7, which equals 50. So, 70% of 50 is 35.

Why is using a grid helpful for solving percent problems like '21 is 70% of what number?'?

Using a grid helps visualize the relationship between parts and the whole, making it easier to set up equations and understand how to find the total number based on the given percentage and part.

How do I interpret the grid model to understand the percentage problem better?

The grid breaks down the percentage and the total number into visual parts, allowing you to see how the part relates to the whole. This visual aid clarifies the calculation process and improves understanding of percentage relationships.

Additional Resources

Use The Grid To Create A Model To Solve The Percent Problem. 21 Is 70% Of What Number?

Understanding percentages is fundamental in mathematics, with applications

spanning finance, statistics, and everyday decision-making. One common problem involves determining the whole number when given a part and a percentage—such as finding the number of which 70% equals 21. While straightforward for some, this problem can become more intuitive and manageable when approached with a visual model. Using a grid as a modeling tool provides clarity and structure, making the solution more accessible, especially for learners developing foundational skills.

In this article, we will explore how to use a grid to create a model that helps solve the problem: "21 is 70% of what number?" We will delve into the theoretical basis of percentages, demonstrate how to construct and interpret the grid model, and provide step-by-step instructions that can be adapted for similar problems.

Understanding the Percent Problem: Theoretical Foundations

Before constructing a model, it's crucial to understand what the problem asks. The phrase "21 is 70% of what number?" translates mathematically into an equation:

$$\text{Part} = \text{Percent} \times \text{Whole}$$

where:

- Part = 21
- Percent = 70% (which is 0.70 in decimal form)
- Whole = the unknown number we seek

Rearranged, the problem becomes:

$$\text{Whole} = \text{Part} \div \text{Percent}$$

or

$$\text{Whole} = 21 \div 0.70$$

This straightforward calculation yields:

$$\text{Whole} = 30$$

However, relying solely on the formula might obscure the conceptual understanding of the problem. Using a visual model like a grid helps illustrate how parts relate to the whole, making the ratio and the percentage connection more tangible.

Constructing the Grid Model

A grid provides a visual framework to represent the relationship between the part, the whole, and the percentage. The key idea is to partition the grid into sections that correspond to the percentage and then identify the total.

Step 1: Decide on the Grid Dimensions

- Choose a manageable size for the grid, such as a 10-by-10 square, totaling 100 units. This makes the percentage calculations straightforward because percentages are based on 100 units.

Step 2: Represent the Part (21)

- Since 21 is the known part, and we know the total is 100 units, we can shade or mark the units representing the 21 part within the grid.

Step 3: Visualize the Percentage

- Recognize that 70% of any whole is 70 out of 100 units.
- Therefore, the grid can be divided into:
 - 70 units representing 70%
 - 30 units representing the remaining percentage

Step 4: Map the Known Part onto the Grid

- Shade 21 units within the grid to represent the part. To relate this to the percentage, see how 21 relates to 70 units (since 70% is 70 units in this model).

Step 5: Find the Whole

- Since 21 units correspond to 70% in our model, the total number of units (the whole) can be found by setting up a proportion:

$$\begin{aligned} & \backslash[\\ & \frac{21}{x} = \frac{70}{100} \\ & \backslash] \end{aligned}$$

This proportion reflects that 21 is to the total (x) as 70 is to 100.

- Cross-multiplied, it becomes:

$$\begin{aligned} & \backslash[\\ & 21 \times 100 = 70 \times x \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash[\\ & 2100 = 70x \\ & \backslash] \end{aligned}$$

$$\begin{aligned} & \backslash[\\ & x = \frac{2100}{70} = 30 \\ & \backslash] \end{aligned}$$

Thus, the whole number is 30, matching the earlier calculation.

Step-by-Step Guide to Using the Grid Model

To make this approach accessible for learners, here are detailed instructions:

1. Draw a 10-by-10 Grid

- Use graph paper or draw manually.
- Label each cell from 1 to 100 for clarity.

2. Shade 21 Cells to Represent the Part

- Select 21 cells to shade or color. These represent the part that is 70% of the whole.

3. Determine the Corresponding Percentage

- Recognize that in this grid, 70 shaded cells would represent 70%.

4. Analyze the Relationship Between the Shaded Cells and the Whole

- Since 21 cells are shaded, and that corresponds to 70%, the total grid (100 cells) corresponds to 100%.

5. Set Up a Proportion

- Use the following proportion based on the visual:

$$\begin{aligned} & \backslash[\\ & \frac{\text{Shaded Part}}{\text{Total Cells}} = \frac{\text{Percentage}}{100} \\ & \backslash] \end{aligned}$$

Substituting known values:

$$\begin{aligned} & \backslash[\\ & \frac{21}{x} = \frac{70}{100} \\ & \backslash] \end{aligned}$$

6. Solve the Proportion

- Cross-multiplied:

$$\begin{aligned} & \backslash[\\ 21 & \times 100 = 70 \times x \\ & \backslash] \end{aligned}$$

- Simplify:

$$\begin{aligned} & \backslash[\\ 2100 & = 70x \\ & \backslash] \end{aligned}$$

- Solve for (x) :

$$\begin{aligned} & \backslash[\\ x & = \frac{2100}{70} = 30 \\ & \backslash] \end{aligned}$$

7. Interpret the Result

- The total number is 30; thus, 21 is 70% of 30.

Advantages of Using the Grid Model

Employing a grid to solve percent problems offers several benefits:

- Visual Clarity: It transforms abstract numbers into concrete visual representations, aiding comprehension.
- Conceptual Understanding: Helps learners grasp the relationship between parts, wholes, and percentages.
- Versatility: Can be adapted for various percentages and parts by adjusting the shaded areas.
- Engagement: Interactive and visual methods increase engagement, especially for visual learners.

Extending the Model to Other Percent Problems

The grid approach isn't limited to this specific problem. Here are ways to adapt it:

- Different Parts and Percentages: If given different parts and percentages, shade corresponding sections proportionally.
- Unknown Percentages: When the part and whole are known, but the percentage is unknown, use the grid to estimate or set up proportions.
- Multiple Steps: For more complex problems, combine grid models with algebraic methods for reinforcement.

Summary and Practical Tips

Using a grid to create a model for percent problems can significantly enhance understanding and problem-solving skills. Here are practical tips:

- Always start with a clear grid, preferably a 100-unit square for simplicity.
- Shade the known part, then relate it to the percentage.
- Set up proportions based on the visual representation.
- Confirm your solution by checking whether the part corresponds to the percentage of the total.

By integrating visual models into mathematical reasoning, learners can build stronger conceptual foundations, transforming abstract calculations into understandable, tangible concepts.

Conclusion

The problem "21 is 70% of what number?" exemplifies how visual tools like grids can facilitate comprehension and accurate problem-solving. Constructing a grid model not only simplifies the calculation but also deepens understanding of the percent concept by illustrating the relationship between parts and wholes. Whether used in classrooms or self-study, this approach empowers learners to approach percent problems with confidence, clarity, and a stronger grasp of the underlying mathematics.

Remember, visual models like grids are versatile tools—so next time you encounter a percent problem, consider sketching a grid to illuminate the path to your solution.

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