

Set Up An Equation And Show All Work To Solve. Round Final Answers To The Nearest Hundredth.

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Mastering the skill of setting up equations and solving them systematically is fundamental in mathematics. Whether you're tackling word problems in algebra, geometry, or applied math, the ability to translate real-world scenarios into mathematical expressions is crucial. This article explores the step-by-step process of setting up equations from problem statements, solving them diligently, and ensuring your solutions are accurate by rounding to the nearest hundredth. By understanding these techniques, you'll improve your problem-solving efficiency and develop a stronger mathematical foundation.

Understanding the Importance of Setting Up Equations

Before diving into solving equations, it's essential to recognize why setting up the correct equation is the most critical step. An equation is a mathematical statement that asserts the equality of two expressions. When solving real-world problems, the key is to translate words into symbols and variables that accurately represent the scenario.

Why is setting up the correct equation important?

- It provides a clear framework for solving the problem.
- It reduces errors by clarifying the relationships between quantities.
- It enables the use of algebraic techniques to find solutions efficiently.

Without a properly formulated equation, subsequent calculations may be misguided, leading to incorrect answers. Therefore, understanding how to interpret and model problems is a foundational skill in mathematics.

Steps to Set Up and Solve an Equation

The process of solving a problem typically involves several stages:

1. Read and Understand the Problem

- Carefully identify what is being asked.
- Highlight or underline key information such as quantities, relationships, and conditions.
- Determine what unknowns or variables need to be found.

2. Define Variables

- Assign a letter (commonly x , y , or z) to represent the unknown quantity.
- Clearly state what the variable represents to avoid confusion later.

3. Translate Words into Mathematical Expressions

- Convert the relationships and conditions described in the problem into algebraic expressions.
- Use mathematical operators (+, -, $\times$, $\div$) appropriately.
- Set up an equation that embodies the problem's condition.

4. Solve the Equation

- Use algebraic techniques such as combining like terms, isolating the variable, and applying inverse operations.
- Check for special cases like no solution or infinitely many solutions.

5. Interpret and Verify the Solution

- Substitute the solution back into the original problem to verify accuracy.
- Round the final answer to the nearest hundredth, as required.

Example Problem: Setting Up and Solving an Equation

Let's work through a practical example to illustrate the entire process.

Problem:

A car rental company charges a flat fee of \$50 plus \$0.20 per mile driven. If a customer pays a total of \$90, how many miles did they drive?

Step 1: Understand the problem

- The total cost includes a fixed fee and a variable charge based on miles driven.
- The total amount paid is \$90.
- Find the number of miles driven.

Step 2: Define the variable

- Let x = number of miles driven.

Step 3: Set up the equation

- Fixed fee: \$50
- Variable fee: \$0.20 per mile, so $(0.20x)$
- Total cost: $(50 + 0.20x)$

Equation:

$$[50 + 0.20x = 90]$$

Step 4: Solve the equation

- Subtract 50 from both sides:

$$[0.20x = 90 - 50]$$

$$[0.20x = 40]$$

- Divide both sides by 0.20:

$$[x = \frac{40}{0.20}]$$

$$[x = 200]$$

Step 5: Round and interpret

- The answer is exactly 200 miles.

- Since it's already a whole number, rounding to the nearest hundredth doesn't change the value: 200.00 miles.

Answer: The customer drove 200.00 miles.

Tips for Effective Equation Setup and Solving

To enhance your skills, keep these tips in mind:

- **Break down complex problems:** If a problem involves multiple steps or relationships, divide it into smaller parts and set up multiple equations if necessary.
- **Use consistent units:** Ensure all measurements are in the same units before setting up your equation.
- **Write clear and organized work:** Label your variables and intermediate steps to avoid confusion.
- **Check your work:** After solving, substitute your solution back into the original equation to verify correctness.
- **Practice rounding correctly:** Round your final answers to the nearest hundredth by looking at the third decimal place. If it's 5 or more, round up; if less, round down.

Additional Examples and Practice Problems

Example 1:

A rectangle's length is 5 meters longer than its width. If the perimeter is 34 meters, find the dimensions of the rectangle. Round your answers to the nearest hundredth.

Solution:

- Let w = width
- Length $l = w + 5$

Perimeter formula:

$$2l + 2w = 34$$

Substitute l :

$$2(w + 5) + 2w = 34$$

$$2w + 10 + 2w = 34$$

$$4w + 10 = 34$$

Subtract 10:

$$4w = 24$$

Divide:

$$w = 6$$

Find length:

$$l = 6 + 5 = 11$$

Final dimensions: 6 meters (width), 11 meters (length).

Answer: Width = 6.00 meters, Length = 11.00 meters.

Practice Problem 2:

A mixture contains alcohol and water. If the mixture has 30% alcohol and you want to prepare 200 ml of this mixture, how much pure alcohol and water should be used? Round your answers to the nearest hundredth.

Conclusion

Setting up an equation accurately and showing all your work is a vital skill that empowers you to solve complex problems confidently. Remember to thoroughly understand the problem, define your variables clearly, translate words into precise equations, and follow through with systematic solving techniques. Practicing these steps will not only improve your mathematical proficiency but also help you tackle real-world problems efficiently. Always verify your solutions and round your final answers to the nearest hundredth for precision and clarity. With consistent effort, you'll develop a strong problem-solving mindset that applies across various mathematical contexts.

Frequently Asked Questions

If the sum of twice a number and 5 equals 19, what is the

number? Round your answer to the nearest hundredth.

Let the number be x . Write the equation: $2x + 5 = 19$. Subtract 5 from both sides: $2x = 14$. Divide both sides by 2: $x = 7.00$.

A rectangle has a length that is 3 units longer than its width. If the perimeter is 34 units, what are the dimensions? Round your answers to the nearest hundredth.

Let width be w . Then length = $w + 3$. Perimeter: $2(w + (w + 3)) = 34$. Simplify: $2(2w + 3) = 34 \rightarrow 4w + 6 = 34$. Subtract 6: $4w = 28$. Divide by 4: $w = 7.00$. Length = $7 + 3 = 10.00$.

A car rental company charges a flat fee of \$50 plus \$0.20 per mile. If a customer pays \$90, how many miles did they drive? Round to the nearest hundredth.

Let m be miles driven. Write the equation: $50 + 0.20m = 90$. Subtract 50: $0.20m = 40$. Divide both sides by 0.20: $m = 200.00$ miles.

A triangle has sides of length x , $2x$, and $3x$. If the perimeter is 36 units, what is the length of the smallest side? Round to the nearest hundredth.

Sum of sides: $x + 2x + 3x = 36 \rightarrow 6x = 36$. Divide: $x = 6.00$. The smallest side is $x = 6.00$ units.

A bookstore sells a book for \$15 with a 10% discount. What is the discounted price? Round your answer to the nearest hundredth.

Discounted price = $15 - (10\% \text{ of } 15) = 15 - 0.10 \cdot 15 = 15 - 1.50 = 13.50$.

A water tank is being filled at a rate of 8 gallons per minute. If the tank currently has 50 gallons and needs to reach 150 gallons, how long will it take? Round your answer to the nearest hundredth.

Let t be minutes. Set up: $8t + 50 = 150$. Subtract 50: $8t = 100$. Divide: $t = 12.50$ minutes.

A train travels at a constant speed. If it covers 120 miles in 3 hours, what is its speed in miles per hour? Round to the nearest hundredth.

Speed = distance / time = $120 / 3 = 40.00$ miles per hour.

A company's profit P (in thousands of dollars) is modeled by $P = 5x - 20$, where x is the number of units sold. What is the break-even point? Round your answer to the nearest hundredth.

Set $P = 0$: $0 = 5x - 20$. Add 20: $20 = 5x$. Divide: $x = 4.00$ units.

Additional Resources

Set Up An Equation And Show All Work To Solve. Round Final Answers To The Nearest Hundredth.

In the realm of mathematics, the ability to translate real-world problems into algebraic expressions and then solve them systematically is an essential skill. Whether dealing with financial calculations, engineering challenges, or everyday scenarios, setting up an equation correctly forms the foundation for arriving at an accurate solution. This article offers a comprehensive exploration of how to create equations based on problem statements, solve them step-by-step, and present answers rounded to the nearest hundredth. Through detailed explanations and illustrative examples, readers will gain a solid understanding of the entire process, emphasizing clarity, precision, and analytical thinking.

Understanding the Importance of Setting Up Equations

Before diving into specific methods or examples, it's crucial to recognize why setting up equations is fundamental in problem-solving. When faced with a problem, the goal is to translate the verbal or written scenario into a mathematical form—a process that involves identifying known quantities, unknowns, relationships, and constraints.

Why Set Up Equations?

- Clarity and Structure: Equations provide a clear framework for organizing information.
- Systematic Solution: They allow for applying algebraic rules and formulas to find unknowns.
- Error Reduction: Proper setup minimizes misunderstandings and computational mistakes.
- Versatility: Equations can adapt to various problem types—linear, quadratic, exponential, etc.

This process involves several steps, from understanding the problem to formulating an equation, solving it, and interpreting the result.

Step-by-Step Approach to Setting Up and Solving

Equations

To facilitate mastery, we will examine a structured approach:

1. Comprehend the Problem Thoroughly

- Read the problem carefully.
- Identify what is being asked.
- List all given information and unknown quantities.
- Recognize relationships or formulas relevant to the scenario.

2. Define Variables

- Assign symbols (like x , y , or specific letters) to unknown quantities.
- Clearly state what each variable represents.

3. Translate Words Into Mathematical Expressions

- Convert the relationships described into algebraic expressions.
- Use the known information to form an equation involving the variables.

4. Formulate the Equation

- Combine the expressions into a single equation.
- Ensure all parts of the problem are represented accurately.

5. Solve the Equation Step-by-Step

- Apply algebraic operations systematically.
- Isolate the variable to find its value.
- Perform inverse operations where necessary.

6. Round the Final Answer

- Round the solution to the nearest hundredth, as specified.
- Verify the reasonableness of the answer.

7. Interpret the Solution

- Check if the answer makes sense in the context.
- Confirm that it satisfies the original problem conditions.

Illustrative Examples and Detailed Solutions

To illustrate these steps, consider a variety of real-world problems.

Example 1: Simple Linear Equation — Distance, Speed, and Time

Problem Statement:

A car travels at a constant speed. If it covers 150 miles in 3 hours, what is its average speed in miles per hour? Round to the nearest hundredth.

Step 1: Understand the problem

We need to find the speed of the car, given distance and time.

Step 2: Define variables

Let s = speed in miles per hour.

Step 3: Translate into an equation

Using the basic distance-speed-time relationship:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

This translates to:

$$150 = s \times 3$$

Step 4: Formulate the equation

$$150 = 3s$$

Step 5: Solve for s

Divide both sides by 3:

$$s = \frac{150}{3} = 50$$

Step 6: Round the answer

Since 50 is already to the nearest hundredth, the answer remains 50.00 mph.

Step 7: Interpretation

The car's average speed is 50.00 miles per hour.

Example 2: Solving a Quadratic Equation — Projectile Motion

Problem Statement:

A ball is thrown upward with an initial velocity of 20 meters per second from the top of a building. The height h (in meters) of the ball after t seconds is given by:

$$h = -4.9t^2 + 20t + 15$$

Find the time when the ball hits the ground. Round to the nearest hundredth.

Step 1: Understand the problem

The ball hits the ground when height $h = 0$.

Step 2: Define variables

Time t in seconds.

Step 3: Translate into an equation

Set $h = 0$:

$$0 = -4.9t^2 + 20t + 15$$

Step 4: Formulate the quadratic equation

Standard form:

$$-4.9t^2 + 20t + 15 = 0$$

Step 5: Solve the quadratic equation

Using the quadratic formula:

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Identify coefficients:

$a = -4.9$, $b = 20$, $c = 15$.

Calculate discriminant:

$$D = b^2 - 4ac = 20^2 - 4 \times (-4.9) \times 15$$

Compute:

$$D = 400 - 4 \times (-4.9) \times 15$$

Note that $-4.9 \times 15 = -73.5$. Since a is negative,

$$D = 400 - (4 \times -73.5) = 400 + 294 = 694$$

Calculate the square root:

$$\sqrt{694}$$

$$\sqrt{694} \approx 26.33$$

\]

Apply quadratic formula:

\[

$$t = \frac{-20 \pm 26.33}{2 \times -4.9} = \frac{-20 \pm 26.33}{-9.8}$$

\]

Calculate both solutions:

- First solution:

\[

$$t = \frac{-20 + 26.33}{-9.8} = \frac{6.33}{-9.8} \approx -0.65$$

\]

- Second solution:

\[

$$t = \frac{-20 - 26.33}{-9.8} = \frac{-46.33}{-9.8} \approx 4.73$$

\]

Since time cannot be negative in this context, discard the negative value.

Step 6: Round the answer

The time when the ball hits the ground is approximately 4.73 seconds.

Step 7: Interpretation

The ball reaches the ground approximately 4.73 seconds after being thrown.

Tips for Accurate Equation Setup and Solution

- Read Carefully: Ensure you understand all parts of the problem before translating into an equation.
- Identify Key Quantities: Distinguish between knowns and unknowns.
- Use Appropriate Variables: Assign meaningful symbols for clarity.
- Express Relationships Precisely: Pay attention to units and context.
- Check Units and Dimensions: Confirm that all parts of the equation are consistent.
- Validate Your Equation: Think about whether the equation makes sense logically before solving.
- Use Calculator or Software When Needed: For complex calculations, employ tools to maintain accuracy.
- Round Correctly: Final answers should be rounded to the nearest hundredth, i.e., two decimal places.

Common Challenges and How to Overcome Them

- Misinterpretation of Word Problems:

Carefully dissect sentences, highlight key information, and paraphrase if necessary.

- Incorrect Variable Assignment:

Be explicit about what each variable represents to prevent confusion.

- Algebraic Mistakes:

Double-check operations, especially signs and order of operations.

- Ignoring Constraints:

Remember to consider the context (e.g., negative time or distances are usually invalid).

- Rounding Errors:

Perform calculations with sufficient precision before rounding to ensure accuracy.

Conclusion: Mastering Equation Setup and Problem Solving

The process of setting up an equation and solving it systematically is a cornerstone of effective problem-solving in mathematics. It enables practitioners to connect theoretical concepts with practical scenarios, leading to meaningful and accurate solutions. By following a structured approach—comprehending the problem, defining variables, translating words into equations, solving step-by-step, and properly rounding answers—students and professionals alike can enhance their analytical skills.

Moreover, developing proficiency in this area fosters critical thinking, precision, and confidence in tackling a wide array of mathematical challenges. Whether you are calculating financial interests, analyzing physical phenomena, or solving everyday puzzles, mastering the art of translating words into equations and solving them thoroughly and accurately is an invaluable skill that will serve you well across disciplines.

Remember: Clear setup, meticulous calculation, and careful rounding are the keys

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