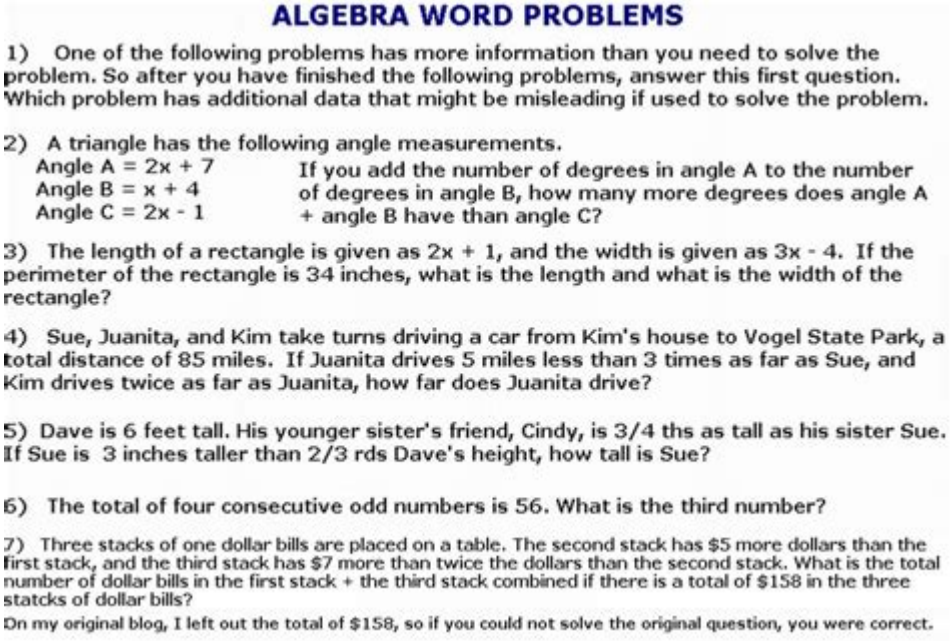
College Algebra Word Problems



ALGEBRA WORD PROBLEMS

1) One of the following problems has more information than you need to solve the problem. So after you have finished the following problems, answer this first question. Which problem has additional data that might be misleading if used to solve the problem.

2) A triangle has the following angle measurements.
Angle A = 2x + 7
Angle B = x + 4
Angle C = 2x - 1
If you add the number of degrees in angle A to the number of degrees in angle B, how many more degrees does angle A + angle B have than angle C?

3) The length of a rectangle is given as 2x + 1, and the width is given as 3x - 4. If the perimeter of the rectangle is 34 inches, what is the length and what is the width of the rectangle?

4) Sue, Juanita, and Kim take turns driving a car from Kim's house to Vogel State Park, a total distance of 85 miles. If Juanita drives 5 miles less than 3 times as far as Sue, and Kim drives twice as far as Juanita, how far does Juanita drive?

5) Dave is 6 feet tall. His younger sister's friend, Cindy, is 3/4 ths as tall as his sister Sue. If Sue is 3 inches taller than 2/3 rds Dave's height, how tall is Sue?

6) The total of four consecutive odd numbers is 56. What is the third number?

7) Three stacks of one dollar bills are placed on a table. The second stack has $5 more dollars than the first stack, and the third stack has $7 more than twice the dollars than the second stack. What is the total number of dollar bills in the first stack + the third stack combined if there is a total of $158 in the three statcks of dollar bills?
On my original blog, I left out the total of $158, so if you could not solve the original question, you were correct.

College algebra word problems are an integral part of mathematics education, bridging the gap between abstract concepts and real-world applications. These problems require students to translate verbal descriptions into mathematical expressions and equations, enabling them to develop critical thinking and problem-solving skills. In this article, we will explore various types of college algebra word problems, strategies for solving them, and examples that illustrate these concepts.

Understanding Word Problems

Word problems often present scenarios that involve quantities, relationships, and operations. They typically consist of:

1. A scenario: A real-life situation that needs to be modeled mathematically.
2. Quantities: Specific values or variables that represent unknowns.
3. Operations: Mathematical operations (addition, subtraction, multiplication, division) that relate the quantities.

To solve these problems, students must first identify the key components and then formulate a corresponding mathematical equation or expression.

Types of College Algebra Word Problems

Word problems can be categorized into several types, each requiring different

approaches to find solutions. Here are some common types:

1. Age Problems

Age problems typically involve relationships between the ages of two or more individuals. These problems often require the use of algebraic expressions to represent the ages and their relationships over time.

Example:
- If Anna is 3 years older than Bob, and the sum of their ages is 27, how old are they?

To solve:
- Let Bob's age be b. Then Anna's age is $b + 3$.
- Set up the equation: $b + (b + 3) = 27$.
- Solve for b.

2. Mixture Problems

Mixture problems involve combining two or more substances with different properties to create a mixture. These problems often involve percentages, concentrations, or costs.

Example:
- If a chemist has a 30% acid solution and a 70% acid solution, how much of each should be mixed to obtain 10 liters of a 50% acid solution?

To solve:
- Let x be the amount of the 30% solution, and $10 - x$ be the amount of the 70% solution.
- Set up the equation based on the concentration: $0.30x + 0.70(10 - x) = 0.50(10)$.
- Solve for x.

3. Distance, Rate, and Time Problems

These problems involve calculating the relationship between distance, rate, and time, often using the formula: distance = rate × time.

Example:
- A car travels 60 miles per hour. How long will it take to travel 150 miles?

To solve:
- Use the formula: time = distance/rate.
- Set up the equation: $t = 150/60$.

- Solve for t.

4. Work Problems

Work problems analyze situations where multiple entities work together to complete a task. The combined work rates can be represented in equations.

Example:
- If Alice can complete a task in 4 hours and Bob in 6 hours, how long will it take them to complete the task together?

To solve:
- Calculate individual work rates: Alice's rate = $1/4$ of the task per hour, Bob's rate = $1/6$.
- Set up the combined rate: $1/4 + 1/6 = 1/t$.
- Solve for t.

Strategies for Solving Word Problems

When tackling college algebra word problems, using a systematic approach can significantly enhance understanding and efficiency. Here are some effective strategies:

1. Read the Problem Carefully

Understanding the problem is crucial. Read it several times to grasp the scenario fully. Identify relevant information and ignore extraneous details that don't contribute to solving the problem.

2. Identify the Unknowns

Determine which quantities are unknown and need to be solved. Assign variables to these unknowns to create a clearer picture of the relationships.

3. Translate Words into Mathematical Expressions

Convert the verbal descriptions into mathematical language. This includes translating phrases into equations, using arithmetic operations to express relationships.

4. Set Up the Equation

Based on the translated expressions, set up equations that accurately represent the relationships within the problem. Ensure all components are correctly accounted for.

5. Solve the Equation

Use algebraic techniques to solve the equation for the unknown variable. This may involve simplification, isolating the variable, and performing inverse operations.

6. Check Your Solution

After finding a solution, substitute it back into the original scenario to verify that it satisfies the conditions of the problem. This step is crucial for ensuring accuracy.

Example Problems and Solutions

To illustrate the strategies and concepts discussed, let’s go through a couple of example problems in detail.

Example 1: Age Problem

Problem: The sum of John and Sarah's ages is 50 years. If Sarah is 10 years older than John, how old are they?

Solution:
1. Let John's age be j.
2. Then Sarah's age is $j + 10$.
3. Set up the equation: $j + (j + 10) = 50$.
4. Simplify: $2j + 10 = 50$.
5. Solve for j: $2j = 40$ → $j = 20$.
6. Therefore, John is 20, and Sarah is $20 + 10 = 30$.

Example 2: Mixture Problem

Problem: How many liters of 40% acid and 80% acid should be mixed to obtain 30 liters of a 60% acid solution?

Solution:
1. Let x be the amount of the 40% acid solution, and $30 - x$ be the amount of the 80% acid solution.
2. Set up the equation based on the concentration:
$$
0.40x + 0.80(30 - x) = 0.60(30)
$$
3. Simplify and solve:
$$
0.40x + 24 - 0.80x = 18
$$
$$
-0.40x + 24 = 18
$$
$$
-0.40x = -6 \rightarrow x = 15
$$
4. Therefore, 15 liters of 40% acid and $30 - 15 = 15$ liters of 80% acid are needed.

Conclusion

College algebra word problems play a vital role in developing mathematical reasoning and problem-solving skills. By familiarizing oneself with different types of problems and employing systematic strategies, students can effectively tackle these challenges. With practice, students will gain confidence in their ability to translate real-world situations into mathematical models, ultimately enhancing their understanding of algebra. Whether in a classroom setting or in everyday life, the skills acquired from solving word problems are invaluable, providing a solid foundation for advanced mathematical studies and practical applications.

Frequently Asked Questions

What is a common strategy for solving college algebra word problems?

A common strategy is to read the problem carefully, identify the variables, translate the words into equations, and then solve the equations step by step.

How can I identify the key information in a college algebra word problem?

Look for keywords that indicate mathematical operations, such as 'total' for addition, 'difference' for subtraction, and 'product' for multiplication, as

well as any numbers provided in the problem.

What role do variables play in solving word problems in college algebra?

Variables represent unknown quantities in the problem, allowing you to set up equations based on the relationships described in the word problem.

Can you provide an example of a college algebra word problem involving systems of equations?

Sure! For example: 'A theater sold 100 tickets for a show. Adult tickets cost $10 and child tickets cost $5. If the total revenue was $800, how many adult and child tickets were sold?' This can be solved using a system of equations.

What is the importance of units in college algebra word problems?

Units are crucial as they help to ensure that the quantities being compared or calculated are compatible, preventing errors in calculations and interpretations.

How can graphs be used to solve college algebra word problems?

Graphs can visually represent the relationships between variables, making it easier to identify solutions or intersections that represent the answers to the problems.

What should I do if I can't figure out how to set up an equation from a word problem?

Try breaking down the problem into smaller parts, rephrasing it in your own words, or discussing it with someone else to gain a different perspective that might clarify how to set up the equation.

How do I check if my solution to a word problem is correct?

Substitute your solution back into the original equations or conditions of the problem to see if they hold true. This helps verify that your solution is accurate.

What are some common mistakes to avoid when solving college algebra word problems?

Common mistakes include misinterpreting keywords, overlooking details, making calculation errors, and forgetting to consider the context of the problem.

Are there specific types of word problems that frequently appear in college algebra?

`Yes, common types include problems involving mixture, distance, work, cost, and profit, often requiring the use of systems of equations or inequalities.`

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