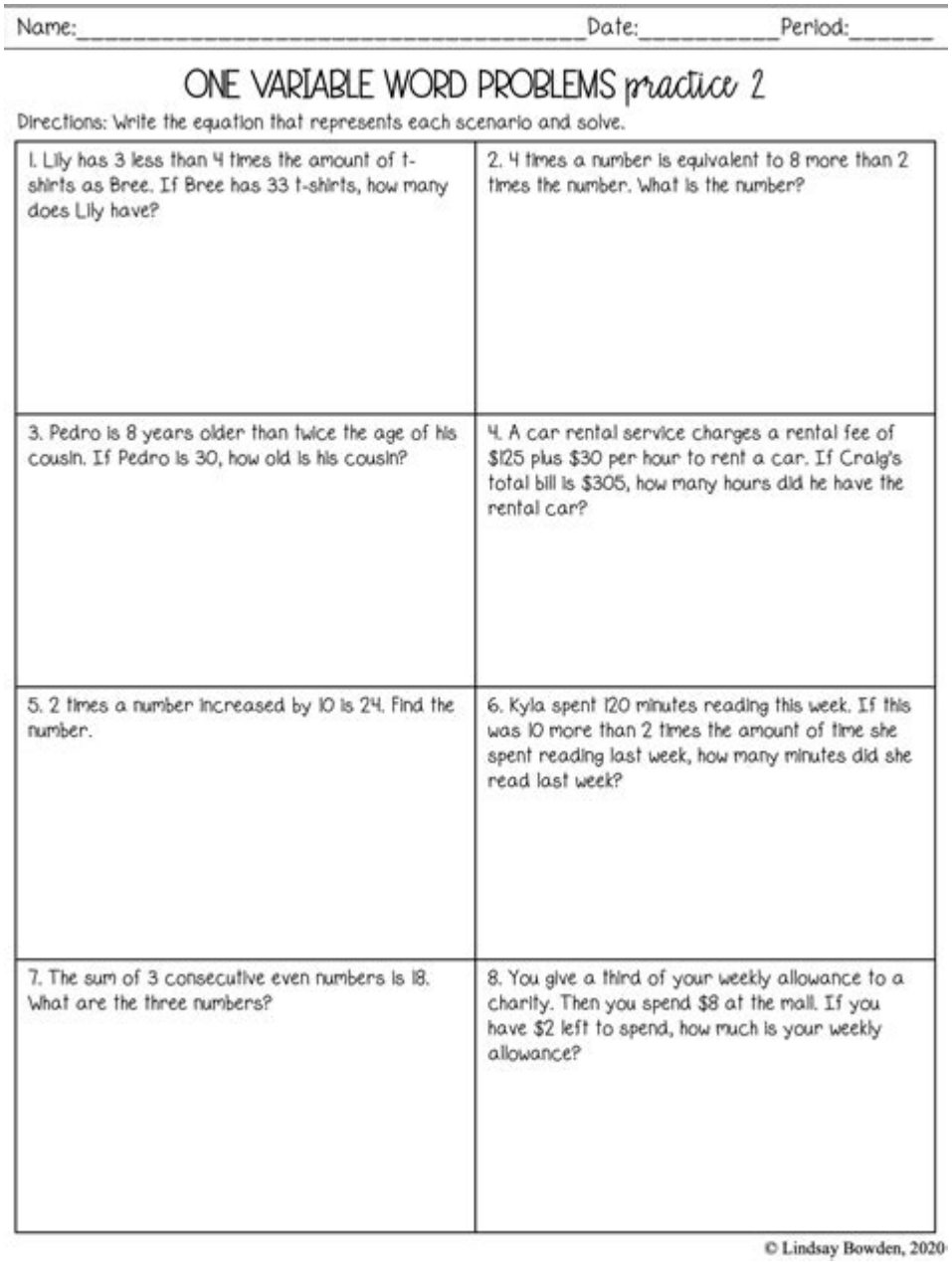
Word Problems In Algebra With Solutions



Name:_____Date:_____Period:_____

ONE VARIABLE WORD PROBLEMS *practice 2*

Directions: Write the equation that represents each scenario and solve.

1. Lily has 3 less than 4 times the amount of t-shirts as Bree. If Bree has 33 t-shirts, how many does Lily have?	2. 4 times a number is equivalent to 8 more than 2 times the number. What is the number?
3. Pedro is 8 years older than twice the age of his cousin. If Pedro is 30, how old is his cousin?	4. A car rental service charges a rental fee of $125 plus $30 per hour to rent a car. If Craig's total bill is $305, how many hours did he have the rental car?
5. 2 times a number increased by 10 is 24. Find the number.	6. Kyla spent 120 minutes reading this week. If this was 10 more than 2 times the amount of time she spent reading last week, how many minutes did she read last week?
7. The sum of 3 consecutive even numbers is 18. What are the three numbers?	8. You give a third of your weekly allowance to a charity. Then you spend $8 at the mall. If you have $2 left to spend, how much is your weekly allowance?

Word problems in algebra are crucial for developing problem-solving skills and applying mathematical concepts to real-world situations. They often require translating a verbal description into a mathematical equation or expression, which can then be solved to find the answer. This article will explore various types of word problems in algebra, strategies for solving them, and provide examples along with their solutions.

Understanding Word Problems

Word problems typically present a scenario that requires mathematical reasoning. They can cover a wide range of topics, including:

- Rates and Ratios: Problems involving speed, distance, and time.
- Mixture Problems: Scenarios that involve combining different substances.
- Age Problems: Questions related to the ages of individuals at different times.
- Work Problems: Scenarios involving people or machines working together to complete a task.

Key Strategies for Solving Word Problems

To tackle word problems effectively, consider the following strategies:

1. Read Carefully: Understand the problem in its entirety before attempting to solve it. Identify the key information and what is being asked.

2. Identify Variables: Assign variables to unknown quantities. Let x represent the unknown value, and label other quantities accordingly.

3. Translate Words into Equations: Convert the verbal descriptions into mathematical equations. Look for keywords that indicate mathematical operations:
- "Total" often implies addition.
- "Difference" indicates subtraction.
- "Product" suggests multiplication.
- "Per" typically denotes division.

4. Solve the Equation: Use algebraic techniques to solve for the unknown variable.

5. Check Your Work: Verify your solution by substituting it back into the original problem to ensure it makes sense.

Types of Word Problems with Examples

Let’s delve into several types of word problems, providing examples and detailed solutions.

1. Rate and Distance Problems

Example: A car travels 150 miles in 3 hours. What is its average speed?

Solution:
- Identify Variables: Let $d = 150$ miles (distance), $t = 3$ hours (time), and r be the average speed.
- Translate into Equation: The formula for speed is given by $r = \frac{d}{t}$.
- Substitute Values:
$$
r = \frac{150}{3} = 50 \text{ miles per hour}
$$

So, the average speed of the car is 50 miles per hour.

2. Mixture Problems

Example: A chemist has a solution that is 30% acid. She wants to mix it with another solution that is 70% acid to obtain 10 liters of a solution that is 50% acid. How much of each solution should she use?

Solution:
- Identify Variables: Let x be the amount of 30% acid solution and $10 - x$ be the amount of 70% acid solution.
- Translate into Equation: The total amount of acid in the mixture can be represented as:
$$
0.3x + 0.7(10 - x) = 0.5(10)
$$
- Simplify and Solve:
$$
0.3x + 7 - 0.7x = 5
$$
$$
-0.4x + 7 = 5
$$
$$
-0.4x = -2 \implies x = 5
$$

Thus, the chemist should use 5 liters of the 30% acid solution and 5 liters of the 70% acid solution.

3. Age Problems

Example: John is twice as old as his sister Sarah. In 5 years, the sum of their ages will be 50. How old are John and Sarah now?

Solution:
- Identify Variables: Let s be Sarah’s current age. Then, John’s age is $2s$.
- Translate into Equation: In 5 years, Sarah's age will be $s + 5$ and John's age will be $2s + 5$. The equation becomes:
$$
(s + 5) + (2s + 5) = 50
$$
- Simplify and Solve:
$$
3s + 10 = 50
$$
$$
3s = 40 \implies s = \frac{40}{3} \approx 13.33
$$

John’s age is $2s = \frac{80}{3} \approx 26.67$.

So, Sarah is approximately 13.33 years old, and John is approximately 26.67 years old.

4. Work Problems

Example: Two workers can complete a job in 6 hours and 8 hours, respectively. How long will it take them to complete the job together?

Solution:
- Identify Rates: The rate of the first worker is $\frac{1}{6}$ of the job per hour, and the second worker's rate is $\frac{1}{8}$ of the job per hour.
- Combined Rate: The combined rate is:
$$
\frac{1}{6} + \frac{1}{8} = \frac{4}{24} + \frac{3}{24} = \frac{7}{24}
$$
- Time to Complete the Job Together: Let t be the time taken to complete the job together. Thus:
$$
\frac{7}{24}t = 1 \implies t = \frac{24}{7} \approx 3.43 \text{ hours}
$$

So, together they can complete the job in approximately 3.43 hours.

Conclusion

Word problems in algebra serve as valuable tools for enhancing mathematical understanding and application. By following a structured approach to solving these problems, such as identifying variables, translating words into equations, and verifying solutions, students can develop strong problem-solving skills. The examples provided illustrate common types of word problems and showcase effective methods for arriving at solutions. Practicing these problems regularly can significantly improve one's confidence and proficiency in algebra.

Frequently Asked Questions

What is a word problem in algebra, and how can it be solved?

A word problem in algebra is a mathematical problem expressed in words rather than numbers or equations. To solve it, identify the variables, translate the words into mathematical expressions, set up an equation, and solve for the unknown. For example, 'If a car travels 60 miles per hour for 2 hours, how far does it go?' translates to the equation distance = speed × time, or distance = 60 × 2, which gives a solution of 120 miles.

How do you set up an equation from a word problem?

To set up an equation from a word problem, first read the problem carefully and identify what you need to find. Assign variables to unknown quantities. Translate the relationships described in the text into mathematical operations (addition, subtraction, multiplication, or division). Finally, write

the equation based on these relationships. For instance, 'Anna has twice as many apples as Bob. Together they have 18 apples.' Let x be the number of apples Bob has, then the equation is x + 2x = 18.

Can you provide an example of a word problem involving inequalities?

Sure! Here's an example: 'A movie theater sells tickets for $10 each. If the theater wants to make at least $500, how many tickets must they sell?' Let x be the number of tickets sold. The inequality is 10x ≥ 500. Solving for x, we divide both sides by 10 to get x ≥ 50. Therefore, the theater must sell at least 50 tickets.

What strategies can help in solving algebraic word problems?

Some strategies to solve algebraic word problems include: 1) Read the problem multiple times to understand it fully. 2) Identify the knowns and unknowns. 3) Break the problem down into smaller parts. 4) Draw diagrams or tables if necessary. 5) Check your work by substituting your answer back into the original context. Practice with various problems helps build confidence.

How do you solve a word problem involving rates, such as speed and distance?

To solve a word problem involving rates, use the formula: Distance = Rate × Time. For example, 'If a cyclist travels at a speed of 12 miles per hour for 3 hours, how far does she travel?' Here, the rate is 12 mph and the time is 3 hours. Plugging these values into the formula gives Distance = 12 × 3 = 36 miles. Thus, the cyclist travels 36 miles.

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

Common mistakes include misreading the problem, overlooking important information, setting up the wrong equation, performing incorrect arithmetic, and not checking the solution in the context of the problem. It's crucial to double-check each step and ensure that the final answer makes sense within the scenario described in the word problem.

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