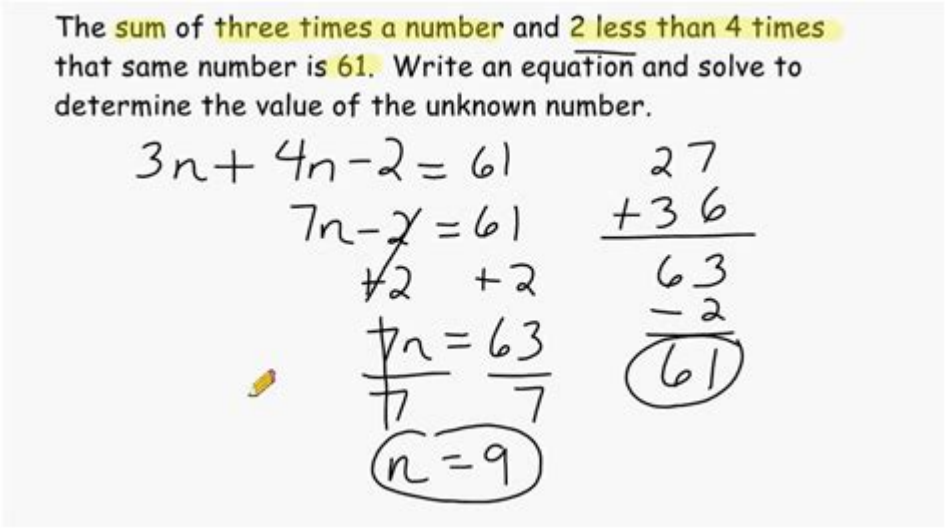
Example Of Algebra Word Problems With Solutions



Example of algebra word problems with solutions can provide valuable insight into how to approach and solve real-world situations using algebraic concepts. Algebraic word problems require the ability to translate verbal descriptions into mathematical expressions or equations. This article will explore several examples of algebra word problems, presenting solutions step-by-step to enhance understanding and application of algebraic techniques.

Understanding Algebra Word Problems

Algebra word problems are scenarios that can be modeled and solved using algebraic equations. They often involve unknown quantities and require the use of variables to represent these quantities. The goal is to formulate an equation based on the given information and then solve for the unknown.

Key Steps in Solving Algebra Word Problems

To effectively solve algebra word problems, follow these key steps:

1. Read the Problem Carefully: Understand what is being asked and identify the important information.

2. Define Variables: Assign variables to the unknown quantities you need to find.

3. Set Up the Equation: Create an equation based on the relationships described in the problem.

4. Solve the Equation: Use algebraic techniques to find the value of the variable.

5. Check Your Solution: Substitute the value back into the original scenario to ensure it makes sense.

Example 1: The Age Problem

Problem Statement: John is 4 years older than his sister, Maria. If the sum of their ages is 28, how old are John and Maria?

Step-by-Step Solution

1. Define Variables:
- Let m represent Maria's age.
- Then, John's age can be expressed as $m + 4$.

2. Set Up the Equation:
- According to the problem, the sum of their ages is 28:

$$
m + (m + 4) = 28
$$

3. Simplify and Solve:
- Combine like terms:

\[

2m + 4 = 28

\]

- Subtract 4 from both sides:

\[

2m = 24

\]

- Divide both sides by 2:

\[

m = 12

\]

4. Find John's Age:

- Substitute \(m \) back to find John's age:

\[

m + 4 = 12 + 4 = 16

\]

5. Check the Solution:

- Sum of their ages: \(12 + 16 = 28 \), which matches the problem statement.

Conclusion: Maria is 12 years old, and John is 16 years old.

Example 2: The Distance Problem

Problem Statement: A car travels 60 miles per hour. How long will it take to travel 240 miles?

Step-by-Step Solution

1. Define Variables:

- Let t represent the time in hours it takes to travel 240 miles.

2. Set Up the Equation:

- Use the formula for distance:

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

- Substitute the known values:

$$
240 = 60t
$$

3. Solve the Equation:

- Divide both sides by 60:

$$
t = \frac{240}{60} = 4
$$

4. Check the Solution:

- Distance traveled at 60 mph for 4 hours: $60 \times 4 = 240$.

Conclusion: It will take 4 hours to travel 240 miles.

Example 3: The Mixture Problem

Problem Statement: A chemist has a solution that is 30% salt and another solution that is 70% salt.

How much of each solution should be mixed to obtain 50 liters of a solution that is 50% salt?

Step-by-Step Solution

1. Define Variables:

- Let x be the amount of the 30% solution.

- Let y be the amount of the 70% solution.

2. Set Up the Equations:

- We know the total volume of the mixture:

$$
x + y = 50
$$

- We also know the total amount of salt in the mixture:

$$
0.30x + 0.70y = 0.50 \times 50
$$

- This simplifies to:

$$
0.30x + 0.70y = 25
$$

3. Solve the System of Equations:

- From the first equation, express y:

$$
y = 50 - x
$$

- Substitute y into the salt equation:

$$
0.30x + 0.70(50 - x) = 25
$$

\]

- Distribute:

\[

0.30x + 35 - 0.70x = 25

\]

- Combine like terms:

\[

-0.40x + 35 = 25

\]

- Subtract 35 from both sides:

\[

-0.40x = -10

\]

- Divide by -0.40:

\[

x = 25

\]

- Substitute back to find \(y \):

\[

y = 50 - 25 = 25

\]

4. Check the Solution:

- Amount of salt from both solutions:

- From 30%: \(0.30 \times 25 = 7.5 \) liters.

- From 70%: \(0.70 \times 25 = 17.5 \) liters.

- Total salt: \(7.5 + 17.5 = 25 \) liters.

Conclusion: The chemist should mix 25 liters of the 30% solution and 25 liters of the 70% solution.

Example 4: The Work Problem

Problem Statement: If a worker can complete a task in 10 hours and another worker can complete the same task in 15 hours, how long will it take them to complete the task if they work together?

Step-by-Step Solution

1. Define Variables:

- Let t be the time it takes for both workers to complete the task together.

2. Set Up the Equation:

- The rate of the first worker is $\frac{1}{10}$ of the task per hour.

- The rate of the second worker is $\frac{1}{15}$ of the task per hour.

- Together, their rates add up:

$$
\frac{1}{10} + \frac{1}{15} = \frac{1}{t}
$$

3. Find a Common Denominator:

- The least common multiple of 10 and 15 is 30:

$$
\frac{3}{30} + \frac{2}{30} = \frac{1}{t}
$$

- Combine:

$$
\frac{5}{30} = \frac{1}{t}
$$

- Simplify:

$$

\frac{1}{6} = \frac{1}{t}

\]

4. Solve for \(t \):

- Thus, \(t = 6 \).

5. Check the Solution:

- In 1 hour, together they complete \(\frac{1}{10} + \frac{1}{15} \) of the task, confirming in 6 hours they complete the whole task.

Conclusion: Working together, they will complete the task in 6 hours.

Conclusion

Algebra word problems can appear in various forms, from age-related scenarios to distance and work problems. By breaking down these problems into manageable steps, you can effectively find solutions. The examples provided illustrate how to define variables, set up equations, and solve for unknowns, reinforcing the importance of understanding the relationships in word problems. Practicing these steps will improve your problem-solving skills and enhance your ability to apply algebra in real-life situations.

Frequently Asked Questions

What is an example of an algebra word problem involving age?

A father is 4 times as old as his son. In 5 years, the father will be twice as old as the son. How old are they now? Let the son's age be x. The father's age is 4x. In 5 years, the equation is 4x + 5 = 2(x + 5). Solving gives x = 5 (son's age) and 20 (father's age).

Can you provide an algebra word problem related to distance?

Two cars start from the same point and drive in opposite directions. Car A travels at 60 miles per hour, and Car B travels at 90 miles per hour. How far apart will they be after 2 hours? The equation is distance = speed × time. After 2 hours, Car A travels 120 miles, and Car B travels 180 miles. Total distance apart = 120 + 180 = 300 miles.

What is a word problem involving money and savings?

Jenny has $50 more than twice the amount of money that Tom has. If together they have $200, how much does each person have? Let Tom's amount be x. Then Jenny's amount is 2x + 50. The equation is x + (2x + 50) = 200. Solving gives x = 50 (Tom) and $150 (Jenny).

How can you set up a word problem about combining items?

A store sells pencils for $2 each and erasers for $3 each. If a customer buys a total of 10 items for $24, how many pencils and erasers did they buy? Let x be the number of pencils and y be the number of erasers. The equations are x + y = 10 and 2x + 3y = 24. Solving gives x = 6 (pencils) and y = 4 (erasers).

What is an example of a word problem that involves proportions?

A recipe calls for 2 cups of flour for every 3 cups of sugar. If you want to use 5 cups of sugar, how much flour do you need? Set up the proportion 2/3 = x/5. Cross-multiplying gives 3x = 10, thus x = 10/3 or approximately 3.33 cups of flour.

Can you give an example of a word problem that involves work rates?

If Alex can complete a job in 5 hours and Beth can complete the same job in 3 hours, how long will it take them to complete the job together? Their rates are 1/5 and 1/3. Together, their combined rate is 1/5 + 1/3 = 8/15. Therefore, the time to complete the job together is the reciprocal, which is 15/8 hours or 1.875 hours.

What is a word problem involving a mixture of solutions?

A chemist has a 30% salt solution and a 50% salt solution. How much of each solution is needed to make 10 liters of a 40% salt solution? Let x be the amount of the 30% solution and (10 - x) be the amount of the 50% solution. The equation is $0.3x + 0.5(10 - x) = 0.4(10)$. Solving gives $x = 4$ liters of 30% and 6 liters of 50%.

Can you provide an algebra word problem related to investment?

If you invest $1000 at a rate of 5% per year, how much will you have after 3 years? The formula for compound interest is $A = P(1 + r)^t$. Here, $A = 1000(1 + 0.05)^3 = 1000(1.157625) =$ $1157.63.

What is an example of a word problem involving temperature?

If the temperature was 20°C at noon and it decreases by 2°C every hour, what will the temperature be at 5 PM? The equation is $20 - 2t$, where t is the number of hours since noon. At 5 PM, $t = 5$, so the temperature is $20 - 2(5) = 10$°C.

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