14. A Father Is Twice As Old As His Son Now. Ten Years Ago, The Ratio Of Their Ages Was 5:2. Find Their

14. A Father Is Twice As Old As His Son Now. Ten Years Ago, The Ratio Of Their Ages Was 5:2. Find Their current ages and understand the mathematical concepts involved in solving such age-related problems.

Understanding the Problem: Age Problems in Mathematics

Age problems are common exercises in algebra and reasoning that involve finding the current ages of individuals based on certain conditions and historical data. These problems often involve ratios, differences, and sometimes multiple steps to reach the solution.

In this particular problem, we are told that:

- The father is currently twice as old as his son.
- Ten years ago, the ratio of their ages was 5:2.

Our goal is to determine their current ages.

Breaking Down the Problem

Before jumping into calculations, it's essential to understand what the problem states:

1. Current Ages Relationship:
The father's current age = 2 × Son's current age.

2. Historical Age Ratio:
Ten years ago, the father's age and son's age had a ratio of 5:2.

Defining Variables

Let’s assign variables to make the problem more manageable:

- Let S = Son’s current age.
- Since the father is twice as old as his son, F = 2S.

Formulating Equations Based on the Given Data

Given the data, we can now write equations:

- Father’s age ten years ago:
F - 10.

- Son’s age ten years ago:
S - 10.

According to the problem, the ratio of their ages ten years ago was 5:2:

$$
\frac{F - 10}{S - 10} = \frac{5}{2}
$$

Substitute F = 2S into the equation:

$$
\frac{2S - 10}{S - 10} = \frac{5}{2}
$$

Solving the Equation

To find the son’s current age, we solve the equation:

$$
\frac{2S - 10}{S - 10} = \frac{5}{2}
$$

Cross multiply:

$$
2 \times (2S - 10) = 5 \times (S - 10)

\]

Simplify both sides:

$$
2 \times 2S - 2 \times 10 = 5S - 50
$$

$$
4S - 20 = 5S - 50
$$

Bring all terms to one side:

$$
4S - 20 - 5S + 50 = 0
$$

Simplify:

$$
- S + 30 = 0
$$

Solve for S:

$$
S = 30
$$

Now, find F:

$$
F = 2S = 2 \times 30 = 60
$$

Interpretation of Results

- Son’s current age: 30 years.
- Father’s current age: 60 years.

Verification of Results

It’s always good to verify the solution:

- Ten years ago, the son was:

$$
30 - 10 = 20
$$

- The father was:

$$
60 - 10 = 50
$$

Calculate the ratio:

$$
\frac{50}{20} = \frac{5}{2}
$$

which matches the given ratio. The calculations are consistent, confirming the solution is correct.

Conclusion and Real-World Applications

This problem exemplifies the application of algebra to solve age-related questions, a common scenario in both academic exercises and real-life reasoning. Understanding how to translate words into mathematical equations, manipulate ratios, and verify solutions are vital skills in problem-solving.

Additional Tips for Solving Age Problems

- Always define variables clearly.
- Translate words into algebraic expressions accurately.
- Use ratios carefully, cross-multiplied to eliminate fractions.
- Verify your solutions by substituting back into original conditions.
- Practice with varied problems to strengthen understanding.

Related Topics in Mathematics

- Algebraic equations and their solutions.
- Ratios and proportions.
- Word problems involving ages, distances, and time.
- Application of algebra in real-world scenarios.

Summary

In this problem, by defining the son’s current age as S, and knowing the father’s age is twice that, F = 2S, we set up an equation based on the age ratio ten years ago. Solving algebraically, we found that the son is currently 30 years old, and the father is 60, satisfying all given conditions.

Mastering such problems enhances logical thinking and algebraic skills, which are fundamental in various fields including engineering, finance, and everyday decision-making.

By understanding and practicing similar problems, students and learners can develop strong mathematical reasoning and problem-solving abilities that are applicable beyond academic settings.

Frequently Asked Questions

How do you set up equations to find the current ages of the father and son?

Let the son's current age be x and the father's current age be 2x. Using the ratio from ten years ago, (x - 10)/(2x - 10) = 5/2, we can set up an equation to solve for x.

What is the significance of the ratio 5:2 ten years ago in solving this problem?

The ratio 5:2 provides a relationship between their ages ten years ago, allowing us to form an equation relating their current ages and solve for the son's current age.

How do you solve the equation (x - 10)/(2x - 10) = 5/2?

Cross-multiplied, it becomes 2(x - 10) = 5(2x - 10). Expanding both sides gives 2x - 20 = 10x - 50, which simplifies to 8x = 30, leading to x = 30/8 = 15/4 = 3.75.

Are fractional ages acceptable in such problems, and what could they imply?

In typical age problems, ages are whole numbers. If the solution yields a fraction, it may suggest a need to re-express or check the problem assumptions, or interpret the fractional age as an approximate or theoretical value.

What are the current ages of the father and son based on this calculation?

Given x = 15/4 or 3.75, the son's age is approximately 3.75 years, and the father's age is twice that, approximately 7.5 years. However, since ages are usually whole numbers, rechecking the problem may be necessary.

Is there an inconsistency in the problem setup that leads to fractional ages, and how can it be resolved?

Yes, the fractional ages suggest a possible misinterpretation or miscalculation. Re-evaluating the problem with the assumption that ages are whole numbers or rechecking the ratio conditions can help resolve this.

What is the correct method to find the current ages if fractional answers arise?

Use the ratio condition to set up an algebraic equation, solve for the variable, and interpret the result. If fractional ages appear, consider that the problem may be designed to have approximate solutions or check for algebraic errors that could lead to such results.

Additional Resources

A Father Is Twice As Old As His Son Now – this classic problem in algebra and age-related word puzzles offers an intriguing glimpse into how relationships and ages evolve over time. These types of problems are not only great exercises for sharpening mathematical reasoning but also serve as interesting real-world scenarios that encourage logical thinking. In this comprehensive guide, we will explore how to approach, formulate, and solve this particular problem step-by-step, ensuring that you understand the underlying concepts and can apply similar strategies to other age-related puzzles.

Understanding the Problem

Before diving into the solution, it's important to clearly understand what the problem is asking:

> "A father is twice as old as his son now. Ten years ago, the ratio of their ages was 5:2. Find their current ages."

This problem provides two key pieces of information:

1. The current age relationship between the father and son.
2. The ratio of their ages a decade ago.

Breaking Down the Information

Let's extract and organize the given data:

- Current ages:
- Father’s age: Let's denote it as F.
- Son’s age: Let's denote it as S.

- Relationship now:
- The father is twice as old as his son.
- Algebraically:
F = 2S

- Ten years ago:
- The father's age was: F - 10
- The son's age was: S - 10
- The ratio of their ages at that time was: 5:2

Algebraically:
(F - 10) / (S - 10) = 5 / 2

Developing the Mathematical Model

With these pieces of information, we can set up equations to find the current ages.

Step 1: Express one variable in terms of the other

From the first piece of information:

$F = 2S$

Step 2: Write the ratio equation

Using the second piece:

$(F - 10) / (S - 10) = 5 / 2$

Substitute $F = 2S$ into this equation:

$(2S - 10) / (S - 10) = 5 / 2$

Solving the Equations

Now, let's proceed to solve the equation for S (the son's current age).

Step 3: Cross-multiplied form

Cross-multiplied, the equation becomes:

$2 (2S - 10) = 5 (S - 10)$

Simplify both sides:

$2 (2S - 10) = 5S - 50$

Expanding:

$4S - 20 = 5S - 50$

Step 4: Isolate S

Bring all S terms to one side and constants to the other:

$4S - 5S = -50 + 20$

Simplify:

$-S = -30$

Multiply both sides by -1:

$S = 30$

Now, we have $S = 30$.

Step 5: Find F

Recall $F = 2S$:

F = 2 30 = 60

Verification of the Solution

It's always good to verify the solution against the original conditions.

- Current ages:
- Father: 60
- Son: 30

- Ten years ago:
- Father: 60 - 10 = 50
- Son: 30 - 10 = 20

- Ratio ten years ago:
- 50 / 20 = 5 / 2

The ratio matches the given condition, confirming our solution.

Summary of Findings

Age	Father	Son
Current	60 years	30 years
Ten years ago	50 years	20 years

The father is currently 60 years old, and his son is 30 years old.

Additional Insights and Practice Tips

1. Recognize Key Phrases

- "Twice as old" indicates a direct proportional relationship, leading to an algebraic equation.
- "Ten years ago" signals a shift in age values, crucial for setting up ratio equations.

2. Formulate Variables Carefully

- Always assign variables that make sense and are easy to relate to the problem.
- Clearly express relationships, such as F = 2S, before substituting into other equations.

3. Check Your Work

- Verify your solution by plugging the values back into the original conditions.
- Confirm that ratios match and relationships hold true.

4. Practice Similar Problems

- Adjust the ratio or the number of years to create variations.
- For example: "A mother is three times as old as her daughter now; ten years ago, the ratio was 7:3."

Common Mistakes to Avoid

- Forgetting to subtract the same number of years from both ages when calculating ages "x" years ago.
- Mixing up the order of ratios when setting up equations.
- Not verifying the solution with the original problem conditions.

Final Thoughts

Problems like "A father is twice as old as his son now. Ten years ago, the ratio of their ages was 5:2" demonstrate the power of algebra in solving real-world puzzles. By systematically translating words into equations, carefully solving step-by-step, and verifying your answers, you can confidently tackle similar age-related problems. Remember, practice makes perfect—so challenge yourself with variations to strengthen your understanding and problem-solving skills.

Ready to take on more age puzzles? Keep practicing, and soon you'll master even the trickiest of age-related riddles!

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