

Josh Earned \$72 Less Than His Sister Who Earned \$93 More Than Her Mom. If They Earned A Total Of \$504,

Josh Earned \$72 Less Than His Sister Who Earned \$93 More Than Her Mom. If They Earned A Total Of \$504, understanding the relationships between their earnings involves unraveling some basic algebra and applying logical reasoning. This problem, while seemingly simple, offers a great opportunity to explore how to set up equations, solve for unknowns, and interpret the results in a real-world context. In this article, we'll dive into the details of this problem, analyze the relationships between the three individuals' earnings, and provide a comprehensive guide on how to approach similar word problems.

Understanding the Problem Statement

The problem involves three individuals: Josh, his sister, and their mom. The key points are:

- Josh earned \$72 less than his sister.
- The sister earned \$93 more than her mom.
- The total combined earnings of all three individuals amount to \$504.

Using these clues, our goal is to determine the individual earnings of Josh, his sister, and their mom.

Breaking Down the Relationships

Before jumping into the calculations, it's important to understand the relationships described:

1. Josh's earnings relative to his sister:

Josh earned \$72 less than his sister.

Mathematically:

$$\text{Josh's earnings} = \text{Sister's earnings} - 72$$

2. Sister's earnings relative to her mom:

The sister earned \$93 more than her mom.

Mathematically:

$$\text{Sister's earnings} = \text{Mom's earnings} + 93$$

3. Total earnings:

Combined earnings of Josh, his sister, and their mom sum to \$504:

$$\text{Josh} + \text{Sister} + \text{Mom} = 504$$

Using these relationships, we can set up equations to find each person's earnings.

Setting Up the Equations

Let's define variables for each individual:

- Let J = Josh's earnings
- Let S = Sister's earnings
- Let M = Mom's earnings

Based on the relationships:

- From point 1:
 $J = S - 72$

- From point 2:
 $S = M + 93$

- The total sum:
 $J + S + M = 504$

Now, substitute the expressions for J and S into the total earnings equation:

1. Replace J with $S - 72$:
 $(S - 72) + S + M = 504$
2. Replace S with $M + 93$:
 $((M + 93) - 72) + (M + 93) + M = 504$

Now, simplify the equation.

Solving the Equations Step-by-Step

Let's go through the algebraic steps:

1. Simplify the first term:
 $(M + 93 - 72) = M + 21$
2. Rewrite the entire sum:
 $(M + 21) + (M + 93) + M = 504$
3. Combine like terms:
 $M + 21 + M + 93 + M = 504$

4. Sum the M terms:

$$(M + M + M) = 3M$$

5. Sum the constants:

$$21 + 93 = 114$$

So, the equation becomes:

$$3M + 114 = 504$$

6. Subtract 114 from both sides:

$$3M = 504 - 114$$

$$3M = 390$$

7. Divide both sides by 3:

$$M = 390 / 3$$

$$M = 130$$

Now, having found Mom's earnings, find the sister's earnings:

$$S = M + 93 = 130 + 93 = 223$$

And Josh's earnings:

$$J = S - 72 = 223 - 72 = 151$$

Final Earnings Breakdown

Based on the calculations:

- Mom's earnings: \$130
- Sister's earnings: \$223
- Josh's earnings: \$151

Check the total sum:

$$151 + 223 + 130 = 504$$

The total matches the problem statement, confirming our solution.

Interpreting the Results

This problem illustrates essential algebraic techniques, including substitution and solving linear equations, which are fundamental in solving real-world word problems. Understanding the relationships between variables allows us to set up equations effectively and find precise solutions.

Summary of earnings:

- Josh earned \$151
- His sister earned \$223
- Their mom earned \$130

Applications and Similar Problems

This type of problem can be adapted to various scenarios involving relationships between different quantities. Some common applications include:

- Budget allocations among family members or departments
- Salary comparisons within organizations
- Profit sharing models
- Distribution of resources based on certain rules or relationships

Sample similar problems include:

- "A and B's combined age is 60 years. B is 5 years older than A. What are their ages?"
- "A store sells two products with a combined revenue of \$1000. Product A earns \$200 more than Product B. Find the individual revenues."

Tips for Solving Similar Word Problems

When approaching similar problems, consider these steps:

1. **Identify the variables:** Assign a variable to each unknown quantity.
2. **Translate relationships into equations:** Express the relationships mentioned in the problem using algebra.
3. **Set up the total sum equation:** Combine all variables with their relationships.
4. **Solve systematically:** Use substitution or elimination methods to find variable values.
5. **Verify your solutions:** Check if the solution satisfies all original relationships and the total sum.

Conclusion

Understanding how to interpret relationships in word problems and translating them into equations is a vital skill in mathematics. The problem of calculating individual earnings based on their differences exemplifies how algebra can provide clarity and precision. By carefully setting up equations and solving step-by-step, you can efficiently solve problems involving multiple variables and relationships. Whether in academic settings or real-life situations like budgeting or resource allocation, these skills are invaluable for making informed decisions and analyses.

Remember: Practice makes perfect. The more you practice setting up and solving such problems, the more intuitive they will become, enabling you to tackle even more complex scenarios with confidence.

Frequently Asked Questions

How much did Josh earn if his sister earned \$93 more than her mom?

Josh earned \$111.

What is the total amount earned by Josh, his sister, and his mom combined?

They earned a total of \$504.

How much did Josh's sister earn?

Josh's sister earned \$232.

How much did Josh's mom earn?

Josh's mom earned \$139.

What is the relationship between Josh's earnings and his sister's earnings?

Josh earned \$72 less than his sister.

Can you verify the total earnings of all three individuals?

Yes, Josh earned \$111, his sister earned \$232, and his mom earned \$139, totaling \$482, which suggests a discrepancy from the given total of \$504,

indicating potential data inconsistency.

Additional Resources

Financial Dynamics and Family Income Analysis: Dissecting the Earnings of Josh, His Sister, and Their Mom

Understanding family income distributions can often seem complex, especially when multiple variables such as relative earnings and total combined income are involved. The scenario involving Josh, his sister, and their mother offers a fascinating case study into how individual earnings relate to each other and how these relationships influence overall family financial dynamics. In this detailed review, we will explore the problem statement, develop mathematical models, analyze the relationships, and interpret the implications step-by-step.

Introduction to the Scenario

The problem provides three key pieces of information:

- Josh earned \$72 less than his sister.
- The sister earned \$93 more than their mother.
- The total combined income of all three individuals was \$504.

From these, our goal is to determine the individual earnings of each person, analyze the relationships, and understand the broader implications of these earnings within the family context.

Breaking Down the Problem: Defining Variables

To systematically approach this problem, we first assign variables to each person's earnings:

- Let M = the amount the mother earned.
- Let S = the amount the sister earned.
- Let J = the amount Josh earned.

Using these variables, the problem's statements translate into algebraic equations.

Constructing the Mathematical Model

Based on the information provided:

1. Relationship between sister and mother:

$$\begin{aligned} & \backslash[\\ & S = M + 93 \\ & \backslash] \end{aligned}$$

This indicates the sister earned \$93 more than the mother.

2. Relationship between Josh and sister:

$$\begin{aligned} & \backslash[\\ & J = S - 72 \\ & \backslash] \end{aligned}$$

Josh earned \$72 less than his sister.

3. Total combined income:

$$\begin{aligned} & \backslash[\\ & J + S + M = 504 \\ & \backslash] \end{aligned}$$

Using these equations, we can substitute the expressions for J and S to find the individual earnings.

Solving the Equations Step-by-Step

Step 1: Express J in terms of M:

$$\begin{aligned} & \backslash[\\ & J = (M + 93) - 72 = M + 21 \\ & \backslash] \end{aligned}$$

Step 2: Write the total income equation in terms of M:

$$\begin{aligned} & \backslash[\\ & J + S + M = 504 \\ & \backslash] \end{aligned}$$

Substituting the expressions:

$$\begin{aligned} & \backslash[\\ & (M + 21) + (M + 93) + M = 504 \\ & \backslash] \end{aligned}$$

Step 3: Simplify the equation:

$$\begin{aligned} & \backslash[\\ & M + 21 + M + 93 + M = 504 \\ & \backslash] \\ & \backslash[\\ & (M + M + M) + (21 + 93) = 504 \\ & \backslash] \\ & \backslash[\\ & 3M + 114 = 504 \\ & \backslash] \end{aligned}$$

Step 4: Solve for M:

$$\begin{aligned} & \backslash[\\ & 3M = 504 - 114 = 390 \\ & \backslash] \\ & \backslash[\\ & M = \frac{390}{3} = 130 \\ & \backslash] \end{aligned}$$

Step 5: Find S and J:

- Sister's earnings:

$$\begin{aligned} & \backslash[\\ & S = M + 93 = 130 + 93 = 223 \\ & \backslash] \end{aligned}$$

- Josh's earnings:

$$\begin{aligned} & \backslash[\\ & J = M + 21 = 130 + 21 = 151 \\ & \backslash] \end{aligned}$$

Summary of Individual Earnings

Person	Earnings (\$)
Mother	130
Sister	223
Josh	151

Verification:

Sum check:

$$\begin{aligned} & \backslash[\\ & 130 + 223 + 151 = 504 \\ & \backslash] \end{aligned}$$

The calculations align perfectly with the total income given, confirming the accuracy of our solution.

Deeper Analysis: Understanding the Income Relationships

With the individual earnings known, it becomes insightful to analyze some key aspects:

1. Relative Earnings

- The sister earned the most, with \$223.
- Josh earned \$151, which is \$72 less than his sister, matching the problem statement.
- The mother earned \$130, which is less than Josh and the sister.
- The difference between the sister and mother:

$$\begin{aligned} & \backslash[\\ & 223 - 130 = 93 \\ & \backslash] \end{aligned}$$

which matches the statement that the sister earned \$93 more than the mother.

2. Percentage Contributions

Calculating each person's percentage of the total family income:

- Mother:

$$\begin{aligned} & \backslash[\\ & \frac{130}{504} \times 100 \approx 25.8\% \\ & \backslash] \end{aligned}$$

- Sister:

$$\begin{aligned} & \backslash[\\ & \frac{223}{504} \times 100 \approx 44.2\% \\ & \backslash] \end{aligned}$$

- Josh:

$$\begin{aligned} & \backslash[\\ & \frac{151}{504} \times 100 \approx 29.9\% \\ & \backslash] \end{aligned}$$

Insights:

- The sister's earnings constitute nearly 44.2% of the total, nearly half.
- Josh's earnings are about 29.9%, a significant portion but less than the sister.
- The mother earns approximately 25.8%, the smallest share among the three.

3. Earnings Disparity and Family Income Distribution

The differences highlight a family where the earnings are concentrated more heavily among the daughter (sister). It suggests:

- The sister's income might reflect higher-paying employment or investments.
- Josh's earning, while substantial, is notably less than his sister's.
- The mother earns less than both children, which could imply retirement, part-time work, or other factors influencing her income.

Implications and Broader Contexts

Understanding these income figures opens discussions on several broader topics:

1. Economic Disparities within Families

The earnings disparity suggests possible differences in employment status, education, or opportunities. For example:

- The sister might have a higher-paying career.
- Josh might be earning less due to part-time work or entry-level positions.
- The mother could be retired or earning from limited sources.

2. Financial Support and Family Planning

Knowing individual earnings helps in:

- Planning family budgets.
- Allocating resources for education, healthcare, and investments.
- Understanding the capacity for financial support within the family.

3. Tax and Financial Planning Considerations

In real-world applications, individual earnings influence:

- Tax brackets.
- Eligibility for benefits.
- Investment strategies.

4. Socioeconomic Insights

The data might reflect broader socioeconomic trends, such as:

- Gender wage gaps if the sister's higher earnings are influenced by gender biases.
- Generational income differences.
- Impact of education and career choices.

Potential Variations and Additional Scenarios

While the current problem is precisely defined, exploring variations can deepen understanding:

- What if the total income changed?

How would individual earnings shift?

- What if the relationships between earnings changed?

For example, if the sister earned \$50 more than the mother instead of \$93, how would the earnings distribute?

- Impact of additional family members

How would the distribution change with more individuals involved?

Real-World Applications of Such Analysis

This kind of financial analysis isn't just theoretical; it has practical uses:

- Personal Financial Planning:

Families can use similar calculations to assess income distribution and plan budgets.

- Business and HR:

Companies analyze employee earnings relative to each other for salary adjustments and fairness.

- Policy Making:

Governments evaluate income disparities for taxation, social welfare, and economic development programs.

- Educational Purposes:

Teaching students how to approach algebraic word problems, interpret data, and understand economic relationships.

Conclusion: Key Takeaways

This detailed exploration highlights the importance of systematic problem-solving, algebraic modeling, and contextual understanding when analyzing family income scenarios. By assigning variables and solving step-by-step, we uncovered:

- The individual earnings: Mother (\$130), Sister (\$223), and Josh (\$151).
- The relationships and disparities among their incomes.
- Broader socioeconomic implications and applications.

Understanding such financial relationships provides valuable insights into family dynamics, economic disparities, and the importance of analytical skills in real-world financial assessments. Whether for academic purposes or practical family finance planning, mastering these methods enhances our ability to interpret and manage complex income data effectively.

If you have further questions or wish to explore related scenarios, feel free to ask!

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