# 1/2 Of Cindy's Money Is Equal To 2/3 Of Emily's Money. They Have $105 Altogether. How Much Money Does

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Understanding how to solve problems involving fractions and total amounts of money is essential for developing strong mathematical reasoning skills. This problem involves determining the individual amounts of Cindy and Emily based on their relationship expressed through fractions and their combined total. In this comprehensive guide, we will explore the problem step-by-step, discuss relevant concepts, and provide a detailed solution.

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## Understanding the Problem

Before diving into calculations, it’s important to clearly understand what the problem is asking.

Problem Restatement:

- Cindy's money, when halved, equals two-thirds of Emily's money.
- The total amount of money they both have is $105.
- The goal is to find out how much money Cindy and Emily each have.

Key Information:

- Relationship between Cindy's and Emily's money: $\frac{1}{2}$ of Cindy's money = $\frac{2}{3}$ of Emily's money.
- Total combined money: $105.

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## Breaking Down the Problem

To approach this, we need to translate the relationships into algebraic expressions.

Step 1: Define Variables

Let:

- $C$ = amount of Cindy's money
- $E$ = amount of Emily's money

Step 2: Write the Relationship as an Equation

Given that:

$$
\frac{1}{2} \times C = \frac{2}{3} \times E
$$

This is the key relationship connecting Cindy's and Emily's money.

Step 3: Express One Variable in Terms of the Other

To relate $C$ and $E$, solve the equation:

$$
\frac{1}{2} C = \frac{2}{3} E
$$

Multiply both sides by the least common denominator (6) to clear fractions:

$$
6 \times \left( \frac{1}{2} C \right) = 6 \times \left( \frac{2}{3} E \right)
$$

Simplify:

$$
3 C = 4 E
$$

Now, express $C$ in terms of $E$:

$$
C = \frac{4}{3} E
$$

---

# Setting Up the Total Money Equation

Since $C = \frac{4}{3} E$, and the total money is \$105:

$$
C + E = 105
$$

Substitute $C$:

$$
\frac{4}{3} E + E = 105
$$

Combine like terms:

$$
\frac{4}{3} E + \frac{3}{3} E = 105
$$

$$
\frac{7}{3} E = 105
$$

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# Solving for Emily's Money

To find $E$, multiply both sides by 3 to clear the denominator:

$$
7 E = 105 \times 3
$$

$$
7 E = 315
$$

Divide both sides by 7:

$$
E = \frac{315}{7} = 45
$$

Emily has $45.

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# Calculating Cindy's Money

Recall:

$$
C = \frac{4}{3} E
$$

Plug in $E = 45$:

$$
C = \frac{4}{3} \times 45 = 4 \times 15 = 60
$$

Cindy has $60.

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# Summary of Findings

| Person | Amount of Money | Calculation |
|---|---|---|
| Cindy | $60 | $C = \frac{4}{3} \times 45$ |
| Emily | $45 | $E = 45$ |

Total:

$$
C + E = 60 + 45 = 105
$$

\]

which matches the total amount specified in the problem.

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# Key Concepts and Mathematical Principles

Understanding this problem requires knowledge of several mathematical concepts:

## Fractions and Ratios

- Recognizing relationships expressed through fractions.
- Converting fractional relationships into algebraic equations.

## Algebraic Substitution

- Expressing one variable in terms of another to simplify the problem.
- Substituting back into a total sum equation.

## Solving Linear Equations

- Combining like terms.
- Clearing fractions by multiplying both sides by the least common denominator.
- Isolating variables to find solutions.

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# Common Mistakes to Avoid

When solving problems involving fractions and money, be mindful of these pitfalls:

- Misreading the relationships: Ensure the fractions are correctly interpreted and translated into equations.
- Incorrect algebraic manipulation: Maintain accuracy when multiplying, dividing, or simplifying

equations.
- Forgetting to check the total: Verify that the sum of the individual amounts matches the total given.
- Overlooking units: Always remember the amounts are in dollars; keep units consistent.

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# Additional Practice Problems

To reinforce understanding, here are some similar problems:

1. Problem: Sarah has $80. Her savings are twice as much as her brother's. How much does her brother have?
Solution: Let $B$ = brother's amount.
$2 B = 80 \Rightarrow B = 40$.

2. Problem: A total of $150 is split between two friends, Alex and Brian. If Alex has $\frac{3}{4}$ of what Brian has, how much does each have?
Solution:
$A = \frac{3}{4} B$
$A + B = 150$
Substitute:
$\frac{3}{4} B + B = 150 \Rightarrow \frac{3}{4} B + \frac{4}{4} B = 150 \Rightarrow \frac{7}{4} B = 150$
$B = 150 \times \frac{4}{7} \approx 85.71$
$A = \frac{3}{4} \times 85.71 \approx 64.29$

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# Conclusion

By translating the fractional relationships into algebraic equations and carefully solving for each variable, we've determined that Cindy has $60 and Emily has $45. This problem exemplifies the importance of understanding fractions, algebraic manipulation, and the process of solving for unknown quantities. Mastery of these skills not only helps in solving similar problems but also builds a solid foundation for more advanced mathematical concepts.

Remember: Always verify your solutions by checking if they satisfy the original relationships and total sum, ensuring accuracy and consistency.

# Frequently Asked Questions

## How do you set up an equation to find Cindy's and Emily's money based on the given ratios?

Let C be Cindy's money and E be Emily's money. The problem states: 1/2 of Cindy's money equals 2/3 of Emily's money, so $(1/2)C = (2/3)E$. Additionally, their total money is $105, so $C + E = 105$.

## What is the first step to solve for Cindy's and Emily's amounts?

Express one variable in terms of the other using the ratio equation, for example, from $(1/2)C = (2/3)E$, solve for C in terms of E or vice versa.

## How do you solve for Cindy's money using the ratio equation?

From $(1/2)C = (2/3)E$, multiply both sides by 6 to clear denominators: $3C = 4E$. Then, express C in terms of E: $C = (4E)/3$.

## How can you find Emily's money once you have an expression for Cindy's money?

Use the total amount equation $C + E = 105$. Substitute $C = (4E)/3$ into this equation and solve for E.

## What is the value of Emily's money in this problem?

Solving the equations yields E = $45, and subsequently, Cindy's money C = (4/3) 45 = $60.

## How much money does Cindy have according to the solution?

Cindy has $60.

## What is the total amount of money Cindy and Emily have, and does it match the given total?

Yes, Cindy has $60 and Emily has $45, totaling $105, which matches the problem's total.

## Can this problem be generalized to other ratios and totals?

Yes, by setting variables for the amounts, establishing the ratio relationship, and using the total sum to form equations, similar problems can be solved systematically.

## Additional Resources

Understanding the Relationship Between Cindy’s and Emily’s Money: A Deep Dive into the Problem

When it comes to solving word problems involving ratios and total amounts, the key is to carefully analyze the information given, translate it into algebraic expressions, and then work through the steps systematically. The problem "Half of Cindy's money is equal to two-thirds of Emily's money. Together, they have $105" provides an excellent example of how to approach such problems. Let’s explore this problem in depth, breaking down the concepts, methods, and step-by-step solutions.

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# Breaking Down the Problem Statement

Before diving into calculations, it’s crucial to understand what the problem is asking and interpret the statements accurately.

The problem states:

- "Half of Cindy’s money is equal to two-thirds of Emily’s money."
- "They have $105 altogether."

From this, our goal is to find how much money Cindy has and how much money Emily has.

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# Key Concepts and Mathematical Foundations

To solve this problem, several mathematical concepts are essential:

## Ratios and Proportions

Ratios compare two amounts, showing the relative size of one to the other. Here, the ratio involves parts of Cindy's and Emily's money:
- Cindy's money: \( C \)
- Emily's money: \( E \)

The statement "Half of Cindy’s money" translates to \( \frac{1}{2} C \), and "two-thirds of Emily’s money" becomes \( \frac{2}{3} E \).

### Algebraic Expressions

Expressing relationships algebraically allows for systematic solving:
- The given equality: $\frac{1}{2} C = \frac{2}{3} E$.

### Sum of amounts

Total money: $C + E = 105$.

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## Step-by-Step Solution Strategy

To find the amounts of Cindy and Emily’s money, follow these steps:

1. Translate the given statements into equations.
2. Express one variable in terms of the other.
3. Substitute into the total sum equation.
4. Solve for one variable.
5. Determine the other variable.

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## Detailed Breakdown of Each Step

### Step 1: Write the given relationships as equations

From the statement:

> "Half of Cindy's money is equal to two-thirds of Emily's money"

Mathematically:

$$
\frac{1}{2} C = \frac{2}{3} E
$$

This is the key relationship connecting Cindy's and Emily's amounts.

## Step 2: Express one variable in terms of the other

To make calculations manageable, solve for $C$ in terms of $E$:

$$
\frac{1}{2} C = \frac{2}{3} E
$$

Multiply both sides by 2 to isolate $C$:

$$
C = 2 \times \frac{2}{3} E
$$

$$
C = \frac{4}{3} E
$$

This expression tells us Cindy's amount is $\frac{4}{3}$ times Emily's amount.

## Step 3: Use the total sum to set up an equation

Total money is given as:

$$
C + E = 105
$$

Substitute $C$ with $\frac{4}{3} E$:

$$
\frac{4}{3} E + E = 105
$$

## Step 4: Simplify and solve for $E$

Combine like terms:

$$
\frac{4}{3} E + \frac{3}{3} E = 105
$$

$$
\left( \frac{4}{3} + \frac{3}{3} \right) E = 105
$$

$$
\frac{7}{3} E = 105
$$

Multiply both sides by 3 to clear the denominator:

$$
7 E = 105 \times 3
$$

$$
7 E = 315
$$

Divide both sides by 7:

$$
E = \frac{315}{7} = 45
$$

Emily has $45.

## Step 5: Find Cindy's amount

Recall:

$$
C = \frac{4}{3} E
$$

Substitute $E = 45$:

$$
C = \frac{4}{3} \times 45
$$

Calculate:

$$
C = 4 \times 15 = 60
$$

Cindy has \$60.

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## Verification and Final Checks

Verifying the solution ensures accuracy:

- Half of Cindy's money: $\frac{1}{2} \times 60 = 30$.
- Two-thirds of Emily's money: $\frac{2}{3} \times 45 = 30$.

Since both are equal, the first condition is satisfied.

Total money:

$$
60 + 45 = 105
$$

which matches the total given.

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## Additional Insights and Variations

Understanding this problem opens doors to other similar problems involving ratios, proportions, and total sums. Here are some insights:

### Extensions and Related Problems

- Change the total amount: How would the amounts change if the total were different?
- Alter the ratios: What if "half" and "two-thirds" are replaced with other fractions?
- Add more variables: Incorporate additional people or constraints for more complex scenarios.

### Common Mistakes to Avoid

- Forgetting to convert ratios into algebraic expressions.
- Mixing the order of operations during substitution.
- Not verifying the solution by plugging it back into the original conditions.

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## Practical Applications of Such Mathematical Problems

While this problem is theoretical, similar concepts are encountered in real-world scenarios:

- Financial planning: Distributing money or resources according to ratios.
- Business profit sharing: Allocating profits based on ratios of investment.
- Resource allocation: Dividing supplies or workload proportionally.

Understanding how to set up and solve such problems enhances problem-solving skills, critical thinking, and quantitative reasoning.

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## Summary of the Solution

- Cindy's money: $60
- Emily's money: $45

Their combined total: $105, satisfying the problem statement.

The key takeaway is the importance of translating words into algebraic expressions, simplifying step-by-step, and verifying solutions against the original conditions.

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## Conclusion: Mastering Ratio and Total Money Problems

Problems like "1/2 of Cindy’s money equals 2/3 of Emily’s money" are common in math education because they develop essential skills such as:

- Interpreting word problems
- Formulating algebraic equations
- Manipulating ratios and proportions
- Applying algebraic substitution
- Verifying solutions

Through systematic analysis and careful calculation, complex-sounding problems become manageable and solvable.

Developing proficiency in these areas lays a solid foundation for tackling more advanced topics in algebra, geometry, and real-world quantitative analysis. Whether you're a student, educator, or lifelong learner, mastering these techniques empowers you to confidently approach a wide array of mathematical challenges.

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In summary, Cindy has $60, and Emily has $45. Their combined amount of $105 aligns perfectly with the problem’s conditions, demonstrating the effectiveness of algebraic reasoning in solving ratio-based word problems.

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