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UNDERSTANDING RATIOS AND MONEY DISTRIBUTION PROBLEMS IS ESSENTIAL IN MATHEMATICS, ESPECIALLY FOR STUDENTS LEARNING ABOUT FRACTIONS AND PROPORTIONS. THIS PARTICULAR PROBLEM INVOLVES COMPARING THE AMOUNTS OF MONEY HELD BY SITI AND BETTY, AND ANALYZING HOW THEIR AMOUNTS CHANGE AFTER A SPECIFIC TRANSACTION. BY EXPLORING THIS SCENARIO STEP-BY-STEP, LEARNERS CAN DEVELOP A CLEAR UNDERSTANDING OF RATIOS, FRACTIONAL OPERATIONS, AND REAL-WORLD APPLICATIONS OF MATHEMATICS.

INTRODUCTION TO RATIOS AND MONEY DISTRIBUTION PROBLEMS

BEFORE DELVING INTO THE SPECIFIC PROBLEM, IT'S IMPORTANT TO UNDERSTAND THE FOUNDATIONAL CONCEPTS INVOLVED:

WHAT IS A RATIO?

- A RATIO COMPARES TWO QUANTITIES, SHOWING HOW MANY TIMES ONE VALUE CONTAINS OR IS CONTAINED WITHIN THE OTHER.
- IT IS EXPRESSED AS TWO NUMBERS SEPARATED BY A COLON, E.G., 2:5.
- RATIOS CAN BE SIMPLIFIED OR SCALED UP/DOWN DEPENDING ON THE CONTEXT.

UNDERSTANDING FRACTIONS IN REAL-LIFE CONTEXTS

- FRACTIONS REPRESENT PARTS OF A WHOLE.
- WHEN DEALING WITH MONEY, FRACTIONS CAN DESCRIBE PORTIONS OF TOTAL AMOUNTS.
- OPERATIONS LIKE ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION OF FRACTIONS HELP IN SOLVING PROBLEMS INVOLVING PARTS OF MONEY.

MONEY SHARING AND DISTRIBUTION

- SHARING MONEY INVOLVES DIVIDING OR TRANSFERRING AMOUNTS BASED ON CERTAIN FRACTIONS.
- ANALYZING HOW THESE TRANSFERS AFFECT THE RATIO OF AMOUNTS HELPS IN UNDERSTANDING PROPORTIONAL RELATIONSHIPS.

SETTING UP THE PROBLEM

THE PROBLEM STATES:

> "SITI HAS $\frac{2}{5}$ AS MUCH MONEY AS BETTY. IF BETTY GIVES $\frac{1}{2}$ OF HER MONEY TO SITI WHAT WILL BE THE RATIO OF"

TO ANALYZE THIS PROBLEM, LET'S DEFINE VARIABLES FOR THE AMOUNTS OF MONEY:

- LET B REPRESENT THE AMOUNT OF MONEY BETTY INITIALLY HAS.
- SINCE SITI HAS $\frac{2}{5}$ AS MUCH AS BETTY, SITI'S INITIAL AMOUNT IS $S = (\frac{2}{5}) B$.

THE PROBLEM INVOLVES A TRANSFER: BETTY GIVES HALF OF HER MONEY TO SITI. AFTER THIS TRANSFER, WE SEEK THE RATIO OF THEIR AMOUNTS.

STEP-BY-STEP SOLUTION APPROACH

1. ASSIGN VARIABLES FOR INITIAL AMOUNTS

- BETTY'S INITIAL AMOUNT: B
- SITI'S INITIAL AMOUNT: $S = (2/5) B$

2. CALCULATE THE AMOUNT BETTY GIVES TO SITI

- BETTY GIVES HALF OF HER MONEY: $(1/2) B$
- THIS AMOUNT: $G = (1/2) B$

3. DETERMINE NEW AMOUNTS AFTER THE TRANSFER

- BETTY'S REMAINING MONEY AFTER GIVING AWAY HALF: $B - G = B - (1/2) B = (1/2) B$
- SITI'S NEW AMOUNT AFTER RECEIVING THE TRANSFER: $S + G = (2/5) B + (1/2) B$

CALCULATING THE NEW AMOUNTS OF SITI AND BETTY

1. SIMPLIFY SITI'S NEW AMOUNT

- TO ADD THE AMOUNTS, FIND A COMMON DENOMINATOR FOR THE FRACTIONS:
- $(2/5) B$ AND $(1/2) B$
- COMMON DENOMINATOR: 10
- CONVERT:
- $(2/5) = (4/10)$
- $(1/2) = (5/10)$
- SUM:
- $(4/10) B + (5/10) B = (9/10) B$

RESULT: SITI NOW HAS $(9/10) B$.

2. BETTY'S REMAINING MONEY

- BETTY'S REMAINING AFTER GIVING HALF:
- $(1/2) B$

CALCULATING THE FINAL RATIO OF SITI TO BETTY

NOW, THE AMOUNTS ARE:

- SITI: $(9/10)B$
- BETTY: $(1/2)B$

TO FIND THE RATIO OF SITI'S MONEY TO BETTY'S MONEY:

RATIO = SITI'S AMOUNT : BETTY'S AMOUNT

EXPRESSED AS:

$(9/10)B : (1/2)B$

SINCE B APPEARS IN BOTH TERMS, IT CANCELS OUT:

$(9/10) : (1/2)$

TO COMPARE THESE RATIOS, CONVERT THEM TO HAVE A COMMON DENOMINATOR OR DIRECTLY CROSS-MULTIPLY:

- CONVERT BOTH TO FRACTIONS WITH DENOMINATOR 10:

$(9/10) : (5/10)$

- NOW, THE RATIO SIMPLIFIES TO:

$(9/10) \div (5/10) = (9/10) (10/5) = 9/5$

FINAL RATIO: 9:5

THIS MEANS SITI HAS 9 PARTS FOR EVERY 5 PARTS BETTY HAS AFTER THE TRANSACTION.

INTERPRETING THE RESULT

THE FINAL RATIO 9:5 INDICATES THAT AFTER BETTY GIVES HALF OF HER MONEY TO SITI, SITI'S SHARE BECOMES SIGNIFICANTLY LARGER RELATIVE TO BETTY'S. SPECIFICALLY:

- SITI'S NEW AMOUNT IS 1.8 TIMES BETTY'S AMOUNT BECAUSE $9/5 = 1.8$.
- BETTY'S REMAINING MONEY IS HALF OF HER ORIGINAL, REFLECTING THE TRANSFER.

THIS PROBLEM DEMONSTRATES HOW FRACTIONAL OPERATIONS AND RATIOS CAN BE APPLIED TO REAL-WORLD SITUATIONS, ENABLING BETTER UNDERSTANDING OF PROPORTIONAL RELATIONSHIPS AND FINANCIAL REASONING.

PRACTICAL APPLICATIONS OF RATIO AND FRACTION PROBLEMS

UNDERSTANDING RATIO PROBLEMS LIKE THIS HAS REAL-WORLD APPLICATIONS SUCH AS:

- FINANCIAL PLANNING AND BUDGETING

- DIVIDING PROFITS OR EXPENSES AMONG PARTNERS
- SHARING RESOURCES FAIRLY BASED ON PROPORTIONS
- ANALYZING INVESTMENT RETURNS AND DISTRIBUTIONS

BY MASTERING THESE CONCEPTS, STUDENTS CAN APPROACH COMPLEX PROBLEMS INVOLVING PROPORTIONS, FRACTIONS, AND RATIOS WITH CONFIDENCE.

SUMMARY OF KEY POINTS

1. RATIOS COMPARE TWO QUANTITIES AND CAN BE SIMPLIFIED OR SCALED.
2. FRACTIONS ARE CRUCIAL IN REPRESENTING PARTS OF A WHOLE, ESPECIALLY IN SHARING SCENARIOS.
3. SETTING VARIABLES HELPS IN ORGANIZING AND SOLVING WORD PROBLEMS SYSTEMATICALLY.
4. TRANSFERRING FRACTIONS OF AMOUNTS IMPACTS THE RATIOS AND REQUIRES CAREFUL CALCULATION.
5. CONVERTING RATIOS TO COMMON DENOMINATORS SIMPLIFIES COMPARISON AND CALCULATION.
6. THE FINAL RATIO IN THIS PROBLEM IS 9:5, INDICATING SITI'S AMOUNT IS 1.8 TIMES BETTY'S AFTER THE TRANSFER.

CONCLUSION

IN THIS PROBLEM, UNDERSTANDING HOW TO MANIPULATE FRACTIONS AND RATIOS ALLOWS US TO DETERMINE THE NEW RELATIONSHIP BETWEEN SITI'S AND BETTY'S MONEY AFTER A TRANSFER. BY BREAKING DOWN THE PROBLEM INTO MANAGEABLE STEPS—DEFINING VARIABLES, CALCULATING TRANSFERS, AND SIMPLIFYING RATIOS—WE GAIN INSIGHT INTO HOW FRACTIONAL SHARING AFFECTS PROPORTIONS. THESE SKILLS ARE FUNDAMENTAL IN MATHEMATICS AND HAVE VALUABLE APPLICATIONS IN EVERYDAY FINANCIAL DECISIONS AND RESOURCE MANAGEMENT.

ADDITIONAL PRACTICE QUESTIONS

TO REINFORCE UNDERSTANDING, CONSIDER ATTEMPTING THESE RELATED PROBLEMS:

1. IF SITI INITIALLY HAS $\frac{3}{4}$ AS MUCH MONEY AS BETTY, AND BETTY GIVES $\frac{1}{3}$ OF HER MONEY TO SITI, WHAT IS THE NEW RATIO OF SITI'S TO BETTY'S MONEY?
2. BETTY HAS \$200, AND SITI HAS $\frac{2}{5}$ OF BETTY'S MONEY. IF SITI GIVES $\frac{1}{4}$ OF HER MONEY TO BETTY, WHAT IS THE RATIO OF THEIR REMAINING AMOUNTS?

3. A PERSON HAS \$150, AND THEIR FRIEND HAS TWICE AS MUCH. IF THEY SHARE HALF OF THEIR FRIEND'S MONEY EQUALLY, WHAT WILL BE THE NEW RATIO OF THEIR AMOUNTS?

ENGAGING WITH THESE PROBLEMS WILL FURTHER STRENGTHEN YOUR UNDERSTANDING OF RATIOS, FRACTIONS, AND THEIR APPLICATIONS.

REMEMBER: PRACTICE MAKES PERFECT WHEN IT COMES TO MASTERING RATIOS AND FRACTIONAL OPERATIONS. WHETHER IN ACADEMICS OR REAL LIFE, THE ABILITY TO ANALYZE AND MANIPULATE THESE CONCEPTS IS INVALUABLE FOR FINANCIAL LITERACY AND PROBLEM-SOLVING SKILLS.

FREQUENTLY ASKED QUESTIONS

IF SITI HAS $\frac{2}{5}$ OF BETTY'S MONEY, HOW CAN WE EXPRESS SITI'S AMOUNT IN TERMS OF BETTY'S?

SITI HAS $(\frac{2}{5})$ OF BETTY'S MONEY, SO IF BETTY HAS B , SITI HAS $(\frac{2}{5}) \times B = (\frac{2B}{5})$.

WHAT HAPPENS TO SITI'S AMOUNT IF BETTY GIVES HER HALF OF HER MONEY?

BETTY GIVES $(\frac{1}{2})$ OF HER MONEY, $B/2$, TO SITI. SITI'S NEW AMOUNT BECOMES $(\frac{2B}{5}) + (B/2)$.

HOW DO YOU FIND THE NEW RATIO OF SITI'S MONEY TO BETTY'S REMAINING MONEY AFTER THE GIFT?

CALCULATE SITI'S NEW AMOUNT AND BETTY'S REMAINING MONEY, THEN DIVIDE SITI'S AMOUNT BY BETTY'S REMAINING AMOUNT TO GET THE RATIO.

WHAT IS BETTY'S REMAINING AMOUNT AFTER GIVING HALF HER MONEY TO SITI?

BETTY'S REMAINING AMOUNT IS $B - B/2 = B/2$.

WHAT IS SITI'S AMOUNT AFTER RECEIVING HALF OF BETTY'S MONEY?

SITI'S AMOUNT BECOMES $(\frac{2B}{5}) + (B/2)$.

SIMPLIFY THE TOTAL AMOUNT SITI HAS AFTER RECEIVING THE GIFT.

SITI'S NEW AMOUNT: $(\frac{2B}{5}) + (B/2) = (\frac{4B}{10}) + (\frac{5B}{10}) = (\frac{9B}{10})$.

WHAT IS THE RATIO OF SITI'S MONEY TO BETTY'S REMAINING MONEY AFTER THE GIFT?

SITI'S AMOUNT IS $(\frac{9B}{10})$, BETTY'S REMAINING AMOUNT IS $(B/2)$. THE RATIO IS $(\frac{9B}{10}) : (B/2) = (\frac{9B}{10}) \div (B/2) = (\frac{9B}{10}) \times (\frac{2}{B}) = (\frac{9}{10}) \times 2 = \frac{18}{10} = \frac{9}{5}$.

WHAT IS THE FINAL SIMPLIFIED RATIO OF SITI'S MONEY TO BETTY'S REMAINING MONEY

AFTER THE GIFT?

THE RATIO IS 9:5.

ADDITIONAL RESOURCES

SITI HAS $\frac{2}{5}$ AS MUCH MONEY AS BETTY. IF BETTY GIVES $\frac{1}{2}$ OF HER MONEY TO SITI, WHAT WILL BE THE RATIO? IS A CLASSIC PROBLEM IN ALGEBRA AND RATIO ANALYSIS THAT TESTS UNDERSTANDING OF PROPORTIONAL RELATIONSHIPS AND BASIC ARITHMETIC OPERATIONS. SUCH PROBLEMS ARE FREQUENTLY ENCOUNTERED IN MATH EXAMINATIONS, COMPETITIVE TESTS, AND REAL-LIFE FINANCIAL SCENARIOS WHERE RESOURCE SHARING AND PROPORTIONALITY PLAY CRUCIAL ROLES. IN THIS DETAILED GUIDE, WE WILL DISSECT THIS PROBLEM STEP-BY-STEP, DEVELOP A CLEAR UNDERSTANDING OF THE CONCEPTS INVOLVED, AND ILLUSTRATE THE PROCESS WITH LOGICAL EXPLANATIONS, EXAMPLES, AND TIPS FOR SOLVING SIMILAR PROBLEMS EFFICIENTLY.

UNDERSTANDING THE PROBLEM STATEMENT

BEFORE JUMPING INTO CALCULATIONS, IT'S ESSENTIAL TO CAREFULLY INTERPRET WHAT THE PROBLEM IS ASKING. THE KEY DETAILS ARE:

- SITI HAS $\frac{2}{5}$ AS MUCH MONEY AS BETTY.
- BETTY GIVES $\frac{1}{2}$ OF HER MONEY TO SITI.
- WE NEED TO FIND THE RATIO OF SITI'S MONEY TO BETTY'S MONEY AFTER THIS TRANSACTION.

THIS PROBLEM INVOLVES TWO MAIN ACTIONS:

1. ESTABLISHING THE INITIAL AMOUNTS OF MONEY SITI AND BETTY HAVE.
2. ANALYZING THE EFFECT OF BETTY GIVING HALF OF HER MONEY TO SITI.
3. CALCULATING THE NEW AMOUNTS AND THEIR RATIO.

STEP 1: ASSIGN VARIABLES TO UNKNOWNNS

TO WORK SYSTEMATICALLY, ASSIGN VARIABLES:

- LET B = BETTY'S INITIAL AMOUNT OF MONEY.
- SINCE SITI HAS $\frac{2}{5}$ AS MUCH AS BETTY, SITI'S INITIAL AMOUNT IS $S = (\frac{2}{5}) B$.

THIS VARIABLE ASSIGNMENT SIMPLIFIES CALCULATIONS AND MAKES THE RELATIONSHIPS CLEARER.

STEP 2: EXPRESS INITIAL AMOUNTS

WITH THE VARIABLES:

- BETTY'S INITIAL AMOUNT = B
- SITI'S INITIAL AMOUNT = $(\frac{2}{5}) B$

NOW, WE UNDERSTAND THEIR STARTING POINTS RELATIVE TO EACH OTHER.

STEP 3: MODEL THE TRANSACTION

BETTY GIVES $\frac{1}{2}$ OF HER MONEY TO SITI:

- BETTY'S AMOUNT AFTER GIVING = $B - (1/2)B = (1/2)B$
- SITI'S AMOUNT AFTER RECEIVING = $S + (1/2)B = (2/5)B + (1/2)B$

NOTE: BOTH AMOUNTS ARE EXPRESSED IN TERMS OF B, MAKING CALCULATIONS STRAIGHTFORWARD.

STEP 4: CALCULATE THE NEW AMOUNTS

BETTY'S AMOUNT AFTER GIVING:

$$B_{\text{NEW}} = \frac{1}{2} B$$

SITI'S AMOUNT AFTER RECEIVING:

$$S_{\text{NEW}} = \frac{2}{5} B + \frac{1}{2} B$$

TO COMBINE THESE, FIND A COMMON DENOMINATOR:

$$\frac{2}{5} B + \frac{1}{2} B = \left(\frac{2}{5} + \frac{1}{2} \right) B$$

CALCULATE THE SUM INSIDE PARENTHESES:

$$\frac{2}{5} + \frac{1}{2} = \frac{4}{10} + \frac{5}{10} = \frac{9}{10}$$

So,

$$S_{\text{NEW}} = \frac{9}{10} B$$

STEP 5: DETERMINE THE FINAL RATIO

THE QUESTION ASKS: WHAT WILL BE THE RATIO OF SITI'S MONEY TO BETTY'S MONEY AFTER THE TRANSACTION?

EXPRESSED AS:

$$\text{RATIO} = \frac{S_{\text{NEW}}}{B_{\text{NEW}}} = \frac{\frac{9}{10} B}{\frac{1}{2} B}$$

SINCE B APPEARS IN NUMERATOR AND DENOMINATOR, THEY CANCEL OUT:

$$\begin{aligned} \text{RATIO} &= \frac{\frac{9}{10}}{\frac{1}{2}} = \frac{9}{10} \times \frac{2}{1} = \frac{9 \times 2}{10} \\ &= \frac{18}{10} = \frac{9}{5} \end{aligned}$$

THEREFORE, THE RATIO OF SITI'S MONEY TO BETTY'S MONEY AFTER THE TRANSACTION IS 9:5.

SUMMARIZING THE KEY STEPS

1. DEFINE VARIABLES FOR INITIAL AMOUNTS BASED ON THE PROBLEM STATEMENT.
2. EXPRESS THE AMOUNTS AFTER THE TRANSACTION USING ALGEBRA.
3. COMBINE FRACTIONS TO SIMPLIFY CALCULATIONS.
4. CALCULATE THE RATIO OF THE NEW AMOUNTS.
5. SIMPLIFY THE RATIO TO ITS LOWEST TERMS.

ADDITIONAL INSIGHTS AND TIPS

1. USING VARIABLES SIMPLIFIES COMPLEX RATIOS

ASSIGNING VARIABLES HELPS MANAGE UNKNOWNNS AND PREVENTS CONFUSION DURING MULTIPLE OPERATIONS.

2. ALWAYS CONVERT TO A COMMON DENOMINATOR

WHEN ADDING OR SUBTRACTING FRACTIONS, CONVERTING TO A COMMON DENOMINATOR SIMPLIFIES THE PROCESS.

3. CANCEL OUT COMMON FACTORS

WHEN CALCULATING RATIOS, B CANCELS OUT, EMPHASIZING THE PROPORTIONAL RELATIONSHIPS RATHER THAN ABSOLUTE AMOUNTS.

4. CHECK YOUR WORK

VERIFY THE FINAL RATIO MAKES LOGICAL SENSE—HERE, THE RATIO OF $9:5$ INDICATES SITI HAS MORE THAN BETTY AFTER THE TRANSACTION, WHICH ALIGNS WITH THE FACT THAT SHE RECEIVED HALF OF BETTY'S INITIAL AMOUNT.

REAL-LIFE APPLICATIONS OF RATIO PROBLEMS

PROBLEMS LIKE THIS ARE NOT JUST ACADEMIC EXERCISES—THEY MIRROR REAL-LIFE FINANCIAL SCENARIOS SUCH AS:

- SHARING RESOURCES AMONG PARTNERS OR FAMILY MEMBERS.
- ADJUSTING BUDGETS AFTER TRANSACTIONS.
- UNDERSTANDING PROPORTIONAL RELATIONSHIPS IN INVESTMENTS OR SAVINGS.

MASTERING THESE PROBLEMS ENHANCES PROBLEM-SOLVING SKILLS AND FINANCIAL LITERACY.

PRACTICE PROBLEMS FOR REINFORCEMENT

TO DEEPEN UNDERSTANDING, TRY SOLVING SIMILAR PROBLEMS:

1. IF SITI HAS $\frac{3}{4}$ AS MUCH MONEY AS BETTY, AND BETTY GIVES $\frac{1}{3}$ OF HER MONEY TO SITI, WHAT IS THE NEW RATIO OF THEIR AMOUNTS?
2. BETTY INITIALLY HAS \$200, AND SITI HAS $\frac{2}{5}$ OF BETTY'S AMOUNT. AFTER BETTY GIVES HALF HER MONEY TO SITI, WHAT IS THEIR RATIO?

CONCLUSION

THE PROBLEM "SITI HAS $\frac{2}{5}$ AS MUCH MONEY AS BETTY. IF BETTY GIVES $\frac{1}{2}$ OF HER MONEY TO SITI, WHAT WILL BE THE RATIO?" PROVIDES A CLEAR EXAMPLE OF APPLYING ALGEBRAIC REASONING TO RATIO PROBLEMS. BY SYSTEMATICALLY ASSIGNING VARIABLES, MODELING TRANSACTIONS, AND SIMPLIFYING CALCULATIONS, YOU CAN CONFIDENTLY ANALYZE SIMILAR PROBLEMS. THE KEY TAKEAWAY IS UNDERSTANDING HOW PROPORTIONAL RELATIONSHIPS CHANGE THROUGH TRANSACTIONS AND

HOW TO REPRESENT THESE RELATIONSHIPS ALGEBRAICALLY. WITH CONSISTENT PRACTICE, SOLVING SUCH PROBLEMS BECOMES INTUITIVE, BOOSTING BOTH MATH SKILLS AND FINANCIAL REASONING.

HAPPY PROBLEM-SOLVING!

Siti Has 2 5 As Much Money As Betty If Betty Gives 1 2 Of Her Money To Siti What Will Be The Ratio Of

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