

Step 1: Understand the Division Concept

Reasoning: Division is essentially the process of determining how many times one number fits into another. When we divide a number, we are splitting it into equal parts. In this case, we want to find out how many times 2 fits into 0.5.

Step 2: Rewrite the Numbers in Fraction Form

Mathematical Expression:

$$\frac{0.5}{2}$$

Reasoning: Converting decimal numbers to fractions can make the division easier to visualize. The decimal 0.5 can be written as the fraction: $0.5 = \frac{5}{10} = \frac{1}{2}$

Thus, our division problem becomes: $\frac{1}{2} \div 2$

Step 3: Use the Property of Division by a Fraction

Mathematical Expression:

When dividing by a whole number, we can multiply by its reciprocal. The reciprocal of 2 is $\frac{1}{2}$. Thus:
$$\frac{1}{2} \div 2 = \frac{1}{2} \times \frac{1}{2}$$

Reasoning: This step relies on the principle that dividing by a number is the same as multiplying by its reciprocal, making calculations simpler.

Step 4: Multiply the Fractions

Mathematical Expression:

Now we multiply the two fractions: $\frac{1 \times 1}{2 \times 2} = \frac{1}{4}$

Reasoning: To multiply fractions, you multiply the numerators together and the denominators together. This gives you a new fraction that represents the division.

Step 5: Convert Back to Decimal (if necessary)

Result:

The result $\frac{1}{4}$ can be converted back to decimal form. Since 1 divided by 4 equals 0.25, we have:
$$0.5 \div 2 = 0.25$$

Summary

Putting it all together, we find: $0.5 \div 2 = 0.25$

Additional Context

- **Visual Representation:** You can visualize dividing 0.5 by 2 by thinking of it as taking a half (0.5) and splitting it into two equal parts. Each part would then be 0.25.
- **Real-Life Application:** This kind of division is common in various scenarios, such as measuring ingredients in cooking or calculating portions.

1. Division of Fractions

Problem: $\frac{2}{3} \div \frac{1}{4}$

Explanation: When dividing fractions, multiply by the reciprocal. This means:

$$\frac{2}{3} \div \frac{1}{4} = \frac{2}{3} \times \frac{4}{1} = \frac{8}{3}$$

2. Dividing Whole Numbers by Fractions

Problem: $6 \div \frac{1}{3}$

Explanation: To divide a whole number by a fraction, multiply by the reciprocal of the fraction:

$$6 \div \frac{1}{3} = 6 \times 3 = 18$$

3. Dividing Mixed Numbers

Problem: $2\frac{1}{2} \div 1\frac{1}{3}$

Explanation: Convert mixed numbers to improper fractions first:

$$2\frac{1}{2} = \frac{5}{2} \quad \text{and} \quad 1\frac{1}{3} = \frac{4}{3}$$

Then perform the division:

$$\frac{5}{2} \div \frac{4}{3} = \frac{5}{2} \times \frac{3}{4} = \frac{15}{8}$$

4. Dividing Decimals

Problem: $0.75 \div 0.25$

Explanation: Convert the decimals to fractions or simply perform the division as is:

$$0.75 \div 0.25 = 3$$

5. Dividing Mixed Numbers by Whole Numbers

Problem: $3\frac{1}{2} \div 2$

Explanation: Convert the mixed number to an improper fraction:

$$3\frac{1}{2} = \frac{7}{2}$$

Then divide by the whole number:

$$\frac{7}{2} \div 2 = \frac{7}{2} \times \frac{1}{2} = \frac{7}{4}$$

6. Dividing Ratios

Problem: Divide the ratio 3 : 5 by 2.

Explanation: To divide a ratio by a whole number, divide each part of the ratio by that number:

$$\frac{3}{2} : \frac{5}{2} = 1.5 : 2.5 \quad (\text{or}) \quad \frac{3}{2} : \frac{5}{2}$$

7. Dividing Percentages

Problem: What is 40% of 60%?

Explanation: Convert percentages to decimals and multiply:

$$0.40 \times 0.60 = 0.24 \quad \text{or} \quad 24\%$$

8. Dividing by Zero

Problem: $5 \div 0$

Explanation: Division by zero is undefined in mathematics. There is no number that can be multiplied by zero to produce a non-zero number.

9. Dividing Algebraic Expressions

Problem: $\frac{x^2-4}{x-2}$

Explanation: Factor the numerator if possible. Here, $x^2 - 4$ can be factored:

$$\frac{(x-2)(x+2)}{(x-2)} = x+2 \quad (\text{for } x \neq 2)$$

10. Dividing Negative Numbers

Problem: $-8 \div 4$

Explanation: The result will be negative since a negative number divided by a positive number gives a negative result:

$$-8 \div 4 = -2$$