Multiplying Fractions by Fractions

Multiplying Fractions by Fractions: Find, Fix, and Work Backward

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QUICK REVIEW

A fraction of a fraction can be modeled by overlap in a unit rectangle. For $\frac{2}{5}$ of $\frac{1}{3}$, 2 of 15 cells overlap, so $\frac{2}{5} \times \frac{1}{3} = \frac{2}{15}$. Multiply numerators and denominators, then simplify.

Worked example

Calculate $\frac{3}{7} \times \frac{7}{8}$. Show the place-value or fraction calculation.

1. Multiply numerators: $3 \times 7 = 21$.
2. Multiply denominators: $7 \times 8 = 56$.
3. $\frac{3}{7} \times \frac{7}{8} = \frac{21}{56} = \frac{3}{8}$ after simplifying.
Answer: $\frac{3}{8}$.

Practice Problems

Show your thinking.

1. A student writes $\frac{3}{5} \times \frac{3}{4} = \frac{19}{20}$. Correct the result and check it.

2. Find the missing number: $\square \times \frac{5}{6} = \frac{10}{21}$. Check by substitution.

3. Find the missing number: $\frac{4}{5} \times \square = \frac{8}{15}$. Check by substitution.

4. A recorded result for $\frac{5}{7} \times \frac{3}{7}$ is $\frac{139}{294}$. By exactly how much, and in which direction, must that record change? Give the repaired equation.

5. Complete the two-output table for the rule: input $\times \frac{3}{4}$. Inputs are $\frac{3}{4}$ and $\frac{3}{2}$. Compare the outputs.

Input	Output
$\frac{3}{4}$	
$\frac{3}{2}$	

6. Is $\frac{2}{5} \times \frac{4}{5}$ greater than, less than, or equal to $\frac{57}{100}$? Find the exact gap.

Answer Key

1. $\frac{9}{20}$, not $\frac{19}{20}$.
2. $\frac{4}{7}$.
3. $\frac{2}{3}$.
4. Decrease by $\frac{1}{6}$; $\frac{5}{7} \times \frac{3}{7} = \frac{15}{49}$.
5. Outputs $\frac{9}{16}$ and $\frac{9}{8}$; second minus first is $\frac{9}{16}$.
6. Less than by $\frac{1}{4}$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Multiply numerators: $3 \times 3 = 9$.
2. Multiply denominators: $5 \times 4 = 20$.
3. $\frac{3}{5} \times \frac{3}{4} = \frac{9}{20} = \frac{9}{20}$ after simplifying.
4. The claimed value differs by $\frac{1}{2}$, so it fails the exact calculation.

Problem 2

1. Use like pieces: the product $\frac{10}{21} = \frac{20}{42}$ and the known factor $\frac{5}{6} = \frac{35}{42}$.
2. The product is 20 of the 35 equal pieces in the known factor. The recovered factor is $\frac{20}{35} = \frac{4}{7}$.
3. Check the completed product: $\frac{4}{7} \times \frac{5}{6} = \frac{10}{21}$.

Problem 3

1. Use like pieces: the product $\frac{8}{15} = \frac{8}{15}$ and the known factor $\frac{4}{5} = \frac{12}{15}$.
2. The product is 8 of the 12 equal pieces in the known factor. The recovered factor is $\frac{8}{12} = \frac{2}{3}$.
3. Check the completed product: $\frac{4}{5} \times \frac{2}{3} = \frac{8}{15}$.

Problem 4

1. Multiply numerators: $5 \times 3 = 15$.
2. Multiply denominators: $7 \times 7 = 49$.
3. $\frac{5}{7} \times \frac{3}{7} = \frac{15}{49} = \frac{15}{49}$ after simplifying.
4. The correction is $\frac{139}{294} - \frac{15}{49} = \frac{1}{6}$, so subtract that amount from the record.

Problem 5

1. Multiply numerators: $3 \times 3 = 9$.
2. Multiply denominators: $4 \times 4 = 16$.
3. $\frac{3}{4} \times \frac{3}{4} = \frac{9}{16} = \frac{9}{16}$ after simplifying.
4. Second output: $\frac{3}{2} \times \frac{3}{4} = \frac{9}{8}$; difference $\frac{9}{8} - \frac{9}{16} = \frac{9}{16}$.

Problem 6

1. Multiply numerators: $2 \times 4 = 8$.
2. Multiply denominators: $5 \times 5 = 25$.
3. $\frac{2}{5} \times \frac{4}{5} = \frac{8}{25} = \frac{8}{25}$ after simplifying.
4. $\frac{57}{100} - \frac{8}{25} = \frac{1}{4}$, so the expression is smaller.

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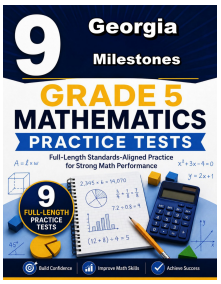

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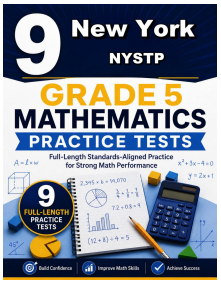

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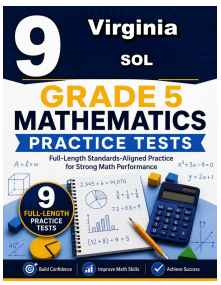

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