Multiplying Fractions by Fractions

Multiplying Fractions by Fractions: Apply, Compare, and Design

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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 full recipe uses $\frac{2}{3}$ kg of flour. A batch is $\frac{3}{4}$ times that recipe. How much flour is needed?

2. Choose the missing amount so this plan totals $\frac{25}{48}$: $\frac{5}{8} \times \square$. Write the completed equation.

3. Plan A uses $\frac{9}{11} \times \frac{2}{3}$ units. Plan B uses $\frac{9}{11} \times \frac{5}{6}$ units. Which produces the larger amount, and by how much?

4. Each of two containers holds $\frac{3}{4} \times \frac{3}{7}$ L. Another $\frac{1}{4}$ L is added to their combined contents. Find the final volume.

5. Complete the two-output table for the rule: input $\times \frac{3}{4}$. Inputs are $\frac{7}{9}$ and $\frac{14}{9}$. Compare the outputs.

Input	Output
$\frac{7}{9}$	
$\frac{14}{9}$	

6. A student writes $\frac{5}{11} \times \frac{4}{5} = \frac{19}{22}$. Correct the result and check it.

Answer Key

1. $\frac{1}{2}$ kg.
2. $\frac{5}{6}$; $\frac{5}{8} \times \frac{5}{6} = \frac{25}{48}$.
3. Plan B by $\frac{3}{22}$ units.
4. $\frac{25}{28}$ L.
5. Outputs $\frac{7}{12}$ and $\frac{7}{6}$; second minus first is $\frac{7}{12}$.
6. $\frac{4}{11}$, not $\frac{19}{22}$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The quantities call for $\frac{2}{3} \times \frac{3}{4}$; the result is measured in kg.
2. Multiply numerators: $2 \times 3 = 6$.
3. Multiply denominators: $3 \times 4 = 12$.
4. $\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2}$ after simplifying.

Problem 2

1. Use like pieces: the product $\frac{25}{48} = \frac{25}{48}$ and the known factor $\frac{5}{8} = \frac{30}{48}$.
2. The product is 25 of the 30 equal pieces in the known factor. The recovered factor is $\frac{25}{30} = \frac{5}{6}$.
3. Check the completed product: $\frac{5}{8} \times \frac{5}{6} = \frac{25}{48}$.

Problem 3

1. Plan A: $\frac{9}{11} \times \frac{2}{3} = \frac{18}{33} = \frac{6}{11}$ units.
2. Plan B: $\frac{9}{11} \times \frac{5}{6} = \frac{45}{66} = \frac{15}{22}$ units.
3. A common denominator is 22: $\frac{15}{22} = \frac{15}{22}$ and $\frac{6}{11} = \frac{12}{22}$.
4. $\frac{15}{22} - \frac{6}{11} = \frac{15-12}{22} = \frac{3}{22}$.
5. The larger plan is B, by $\frac{3}{22}$ units.

Problem 4

1. Multiply numerators: $3 \times 3 = 9$.
2. Multiply denominators: $4 \times 7 = 28$.
3. $\frac{3}{4} \times \frac{3}{7} = \frac{9}{28} = \frac{9}{28}$ after simplifying.
4. Two containers hold $2 \times \frac{9}{28} = \frac{9}{14}$ L.
5. After the addition: $\frac{9}{14} + \frac{1}{4} = \frac{25}{28}$ L.

Problem 5

1. Multiply numerators: $7 \times 3 = 21$.
2. Multiply denominators: $9 \times 4 = 36$.
3. $\frac{7}{9} \times \frac{3}{4} = \frac{21}{36} = \frac{7}{12}$ after simplifying.
4. Second output: $\frac{14}{9} \times \frac{3}{4} = \frac{7}{6}$; difference $\frac{7}{6} - \frac{7}{12} = \frac{7}{12}$.

Problem 6

1. Multiply numerators: $5 \times 4 = 20$.
2. Multiply denominators: $11 \times 5 = 55$.
3. $\frac{5}{11} \times \frac{4}{5} = \frac{20}{55} = \frac{4}{11}$ after simplifying.
4. The claimed value differs by $\frac{1}{2}$, so it fails the exact calculation.

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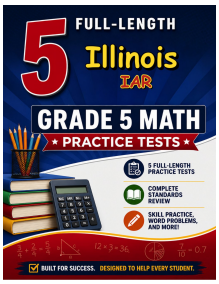

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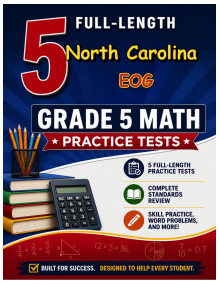

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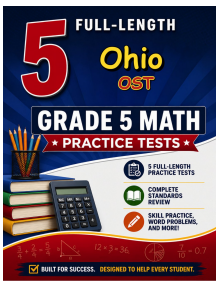

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