Adding Fractions with Unlike Denominators

Adding Fractions with Unlike Denominators: Apply, Compare, and Design

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QUICK REVIEW

Add equal-sized parts, not denominators. For $\frac{1}{4}+\frac{1}{6}$, use twelfths: $\frac{3}{12}+\frac{2}{12}=\frac{5}{12}$. Keep the common denominator and simplify. A result greater than 1 may be written as a mixed number.

Worked example

Calculate $\frac{2}{5}+\frac{1}{6}$. Show the place-value or fraction calculation.

1. A common denominator is 30: $\frac{2}{5}=\frac{12}{30}$ and $\frac{1}{6}=\frac{5}{30}$.
2. $\frac{2}{5}+\frac{1}{6}=\frac{12+5}{30}=\frac{17}{30}$.
3. Simplify to $\frac{17}{30}$; check $\frac{17}{30}-\frac{1}{6}=\frac{2}{5}$.
Answer: $\frac{17}{30}$.

Practice Problems

Show your thinking.

1. A container holds $\frac{3}{4}$ L. Another $\frac{1}{3}$ L is added. How much is in the container now?

2. Choose the missing amount so this plan totals $\frac{7}{5}$: $1+\square$. Write the completed equation.

3. Plan A uses $\frac{13}{12}+\frac{1}{4}$ units. Plan B uses $\frac{13}{12}+\frac{5}{12}$ units. Which produces the larger amount, and by how much?

4. Each of two containers holds $\frac{11}{12}+\frac{3}{8}$ L. Another $\frac{1}{4}$ L is added to their combined contents. Find the final volume.

5. Choose the missing amount so this plan totals $\frac{31}{20}$: $\frac{17}{20}+\square$. Write the completed equation.

6. Complete the two-output table for the rule: input $+\frac{2}{9}$. Inputs are $\frac{5}{12}$ and $\frac{5}{6}$. Compare the outputs.

Input	Output
$\frac{5}{12}$	
$\frac{5}{6}$	

7. Use an inverse operation to verify a proposed result of $\frac{23}{24}$ for $\frac{5}{6}+\frac{1}{8}$. Show both computations.

8. A student writes $\frac{21}{20}+\frac{5}{6}=\frac{143}{60}$. Correct the result and check it.

Answer Key

1. $\frac{13}{12}$ L.
2. $\frac{2}{5}$; $1 + \frac{2}{5} = \frac{7}{5}$.
3. Plan B by $\frac{1}{6}$ units.
4. $\frac{17}{6}$ L.
5. $\frac{7}{10}$; $\frac{17}{20} + \frac{7}{10} = \frac{31}{20}$.
6. Outputs $\frac{23}{36}$ and $\frac{19}{18}$; second minus first is $\frac{5}{12}$.
7. The result $\frac{23}{24}$ is correct.
8. $\frac{113}{60}$, not $\frac{143}{60}$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The quantities call for $\frac{3}{4} + \frac{1}{3}$; the result is measured in L.
2. A common denominator is 12: $\frac{3}{4} = \frac{9}{12}$ and $\frac{1}{3} = \frac{4}{12}$.
3. $\frac{3}{4} + \frac{1}{3} = \frac{9+4}{12} = \frac{13}{12}$.
4. Simplify to $\frac{13}{12}$; check $\frac{13}{12} - \frac{1}{3} = \frac{3}{4}$.

Problem 2

1. A common denominator is 5: $1 = \frac{5}{5}$ and $\frac{2}{5} = \frac{2}{5}$.
2. $1 + \frac{2}{5} = \frac{5+2}{5} = \frac{7}{5}$.
3. Simplify to $\frac{7}{5}$; check $\frac{7}{5} - \frac{2}{5} = 1$.
4. Using $\frac{2}{5}$ in the plan gives exactly $\frac{7}{5}$.

Problem 3

1. A common denominator is 12: $\frac{13}{12} = \frac{13}{12}$ and $\frac{1}{4} = \frac{3}{12}$.
2. $\frac{13}{12} + \frac{1}{4} = \frac{13+3}{12} = \frac{16}{12}$.
3. Simplify to $\frac{4}{3}$; check $\frac{4}{3} - \frac{1}{4} = \frac{13}{12}$.
4. Plan B: $\frac{13}{12} + \frac{5}{12} = \frac{3}{2}$ units.
5. The difference in amounts is $\frac{1}{6}$ units.

Problem 4

1. A common denominator is 24: $\frac{11}{12} = \frac{22}{24}$ and $\frac{3}{8} = \frac{9}{24}$.
2. $\frac{11}{12} + \frac{3}{8} = \frac{22+9}{24} = \frac{31}{24}$.
3. Simplify to $\frac{31}{24}$; check $\frac{31}{24} - \frac{3}{8} = \frac{11}{12}$.
4. Two containers hold $2 \times \frac{31}{24} = \frac{31}{12}$ L.
5. After the addition: $\frac{31}{12} + \frac{1}{4} = \frac{17}{6}$ L.

Problem 5

1. A common denominator is 20: $\frac{17}{20} = \frac{17}{20}$ and $\frac{7}{10} = \frac{14}{20}$.
2. $\frac{17}{20} + \frac{7}{10} = \frac{17+14}{20} = \frac{31}{20}$.
3. Simplify to $\frac{31}{20}$; check $\frac{31}{20} - \frac{7}{10} = \frac{17}{20}$.
4. Using $\frac{7}{10}$ in the plan gives exactly $\frac{31}{20}$.

Problem 6

1. A common denominator is 36: $\frac{5}{12} = \frac{15}{36}$ and $\frac{2}{9} = \frac{8}{36}$.
2. $\frac{5}{12} + \frac{2}{9} = \frac{15+8}{36} = \frac{23}{36}$.
3. Simplify to $\frac{23}{36}$; check $\frac{23}{36} - \frac{2}{9} = \frac{5}{12}$.
4. Second output: $\frac{5}{6} + \frac{2}{9} = \frac{19}{18}$; difference $\frac{19}{18} - \frac{23}{36} = \frac{5}{12}$.

Problem 7

1. A common denominator is 24: $\frac{5}{6} = \frac{20}{24}$ and $\frac{1}{8} = \frac{3}{24}$.
2. $\frac{5}{6} + \frac{1}{8} = \frac{20+3}{24} = \frac{23}{24}$.
3. Simplify to $\frac{23}{24}$; check $\frac{23}{24} - \frac{1}{8} = \frac{5}{6}$.
4. Inverse check: $\frac{23}{24} - \frac{1}{8} = \frac{5}{6}$.

Problem 8

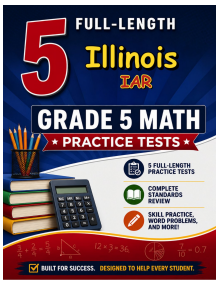
1. A common denominator is 60: $\frac{21}{20} = \frac{63}{60}$ and $\frac{5}{6} = \frac{50}{60}$.
2. $\frac{21}{20} + \frac{5}{6} = \frac{63+50}{60} = \frac{113}{60}$.
3. Simplify to $\frac{113}{60}$; check $\frac{113}{60} - \frac{5}{6} = \frac{21}{20}$.
4. The claimed value differs by $\frac{1}{2}$, so it fails the exact calculation.

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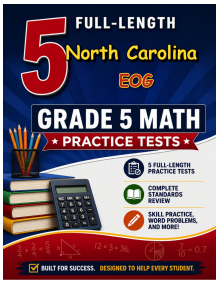
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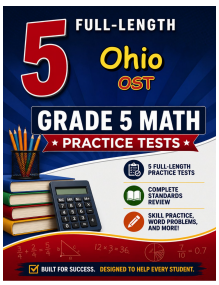
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