Estimating Sums and Differences of Fractions

Estimating Sums and Differences of Fractions: Apply, Compare, and Design

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

Choose the nearest of $0, \frac{1}{2}, 1$ for each proper fraction, then calculate with those benchmarks. For $\frac{7}{8} + \frac{1}{10}$, use $1 + 0 = 1$. The exact sum is $\frac{39}{40}$, close to 1. An estimate does not settle a close exact comparison.

Worked example

Estimate $\frac{5}{6} + \frac{1}{8}$ with nearest benchmarks, then find the exact value and state whether the estimate is high or low.

1. $\frac{5}{6}$ is nearest 1 and $\frac{1}{8}$ is nearest 0.
2. Benchmark calculation: $1 + 0 = 1$.
3. A common denominator is 24: $\frac{5}{6} = \frac{20}{24}$ and $\frac{1}{8} = \frac{3}{24}$.
4. $\frac{5}{6} + \frac{1}{8} = \frac{20+3}{24} = \frac{23}{24}$.
5. The estimate is high by $1 - (\frac{23}{24}) = \frac{1}{24}$.
Answer: About 1. Exact value $\frac{23}{24}$. The estimate is high by $\frac{1}{24}$.

Practice Problems

Show your thinking.

1. A recipe combines $\frac{1}{10}$ cup and $\frac{1}{6}$ cup. Estimate the total using nearest benchmarks.

2. Estimate $\frac{4}{5} - \frac{3}{8}$ with nearest benchmarks. Is an exact calculation still needed to decide whether it is greater than $\frac{1}{2}$? Explain with the exact value.

3. Estimate $\frac{5}{12} + \frac{7}{12}$ with nearest benchmarks, then find the exact value and state whether the estimate is high or low.

4. A recipe starts with $\frac{9}{10}$ cup and uses $\frac{1}{12}$ cup. Estimate the remainder using nearest benchmarks.

5. Estimate $\frac{3}{7} + \frac{1}{8}$ with nearest benchmarks. Is an exact calculation still needed to decide whether it is greater than $\frac{1}{2}$? Explain with the exact value.

6. Give the nearest benchmark for $\frac{11}{12}$, then use both benchmarks to estimate $\frac{11}{12} - \frac{2}{5}$.

7. A recipe combines $\frac{5}{9}$ cup and $\frac{4}{9}$ cup. Estimate the total using nearest benchmarks.

8. A student says $\frac{7}{8} + \frac{1}{9}$ is about 2. Test that estimate with nearest benchmarks $0, \frac{1}{2}, 1$.

Answer Key

1. About 0 cups.
2. About $\frac{1}{2}$. Exact value $\frac{17}{40}$. Yes, check exactly; the exact value is not greater.
3. About 1. Exact value 1. The estimate is exact.
4. About 1 cup.
5. About $\frac{1}{2}$. Exact value $\frac{31}{56}$. Yes, check exactly; the exact value is greater.
6. First benchmark 1; estimate $\frac{1}{2}$.
7. About 1 cup.
8. The proposed estimate does not follow the benchmark rule. About 1. Exact value $\frac{71}{72}$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. $\frac{1}{10}$ is nearest 0 and $\frac{1}{6}$ is nearest 0.
2. Using the benchmark volumes, $(0 + 0)$ cups $= 0$ cups.

Problem 2

1. $\frac{4}{5}$ is nearest 1 and $\frac{3}{8}$ is nearest $\frac{1}{2}$.
2. Benchmark calculation: $1 - \frac{1}{2} = \frac{1}{2}$.
3. A common denominator is 40: $\frac{4}{5} = \frac{32}{40}$ and $\frac{3}{8} = \frac{15}{40}$.
4. $\frac{4}{5} - \frac{3}{8} = \frac{32-15}{40} = \frac{17}{40}$.
5. The estimate is high by $\frac{1}{2} - (\frac{17}{40}) = \frac{3}{40}$.

Problem 3

1. $\frac{5}{12}$ is nearest $\frac{1}{2}$ and $\frac{7}{12}$ is nearest $\frac{1}{2}$.
2. Benchmark calculation: $\frac{1}{2} + \frac{1}{2} = 1$.
3. A common denominator is 12: $\frac{5}{12} = \frac{5}{12}$ and $\frac{7}{12} = \frac{7}{12}$.
4. $\frac{5}{12} + \frac{7}{12} = \frac{5+7}{12} = \frac{12}{12}$.
5. The benchmark estimate equals the exact value 1 in this case.

Problem 4

1. $\frac{9}{10}$ is nearest 1 and $\frac{1}{12}$ is nearest 0.
2. Using the benchmark volumes, $(1 - 0)$ cups $= 1$ cup.

Problem 5

1. $\frac{3}{7}$ is nearest $\frac{1}{2}$ and $\frac{1}{8}$ is nearest 0.
2. Benchmark calculation: $\frac{1}{2} + 0 = \frac{1}{2}$.
3. A common denominator is 56: $\frac{3}{7} = \frac{24}{56}$ and $\frac{1}{8} = \frac{7}{56}$.
4. $\frac{3}{7} + \frac{1}{8} = \frac{24+7}{56} = \frac{31}{56}$.
5. The estimate is low by $\frac{31}{56} - (\frac{1}{2}) = \frac{3}{56}$.

Problem 6

1. $\frac{11}{12}$ is nearest 1 and $\frac{2}{5}$ is nearest $\frac{1}{2}$.
2. Benchmark calculation: $1 - \frac{1}{2} = \frac{1}{2}$.

Problem 7

1. $\frac{5}{9}$ is nearest $\frac{1}{2}$ and $\frac{4}{9}$ is nearest $\frac{1}{2}$.
2. Using the benchmark volumes, $(\frac{1}{2} + \frac{1}{2})$ cups $= 1$ cup.

Problem 8

1. $\frac{7}{8}$ is nearest 1 and $\frac{1}{9}$ is nearest 0.
2. Benchmark calculation: $1 + 0 = 1$.
3. A common denominator is 72: $\frac{7}{8} = \frac{63}{72}$ and $\frac{1}{9} = \frac{8}{72}$.
4. $\frac{7}{8} + \frac{1}{9} = \frac{63+8}{72} = \frac{71}{72}$.
5. The estimate is high by $1 - (\frac{71}{72}) = \frac{1}{72}$.

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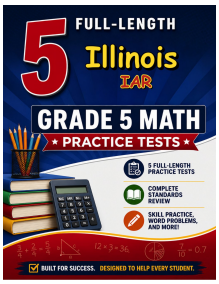

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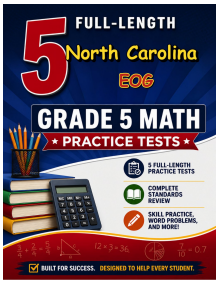

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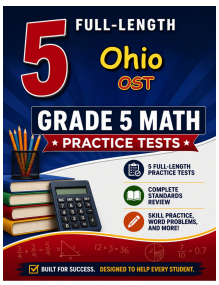

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