Estimating Sums and Differences of Fractions

Estimating Sums and Differences of Fractions: Models and Computation

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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 $1 - (\frac{23}{24}) = \frac{1}{24}$.

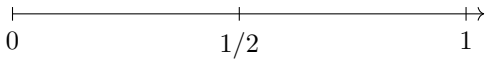
Answer: About 1. Exact value $\frac{23}{24}$. The estimate is high by $\frac{1}{24}$.

Practice Problems

Show your thinking.

1. Estimate $\frac{7}{8} + \frac{1}{9}$ using the nearest benchmarks $0, \frac{1}{2}, 1$.

2. On the line, label the closest benchmark to $\frac{5}{9}$ with A and the closest to $\frac{4}{9}$ with B. Use them to estimate $\frac{5}{9} + \frac{4}{9}$.



3. A recipe starts with $\frac{11}{12}$ cup and uses $\frac{2}{5}$ cup. Estimate the remainder using nearest benchmarks.

4. Estimate $\frac{3}{7} + \frac{1}{8}$ with nearest benchmarks, then find the exact value and state whether the estimate is high or low.

5. A student says $\frac{9}{10} - \frac{1}{12}$ is about 2. Test that estimate with nearest benchmarks $0, \frac{1}{2}, 1$.

6. Give the nearest benchmark for $\frac{5}{12}$, then use both benchmarks to estimate $\frac{5}{12} + \frac{7}{12}$.

7. Estimate $\frac{4}{5} - \frac{3}{8}$ using the nearest benchmarks $0, \frac{1}{2}, 1$.

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

Answer Key

1. About 1.
2. About 1.
3. About $\frac{1}{2}$ cup.
4. About $\frac{1}{2}$. Exact value $\frac{31}{56}$. The estimate is low by $\frac{3}{56}$.
5. The proposed estimate does not follow the benchmark rule. About 1. Exact value $\frac{49}{60}$.
6. First benchmark $\frac{1}{2}$; estimate 1.
7. About $\frac{1}{2}$.
8. About 0 cups.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. $\frac{7}{8}$ is nearest 1 and $\frac{1}{9}$ is nearest 0.
2. Benchmark calculation: $1 + 0 = 1$.

Problem 2

1. $\frac{5}{9}$ is nearest $\frac{1}{2}$ and $\frac{4}{9}$ is nearest $\frac{1}{2}$.
2. Benchmark calculation: $\frac{1}{2} + \frac{1}{2} = 1$.

Problem 3

1. $\frac{11}{12}$ is nearest 1 and $\frac{2}{5}$ is nearest $\frac{1}{2}$.
2. Using the benchmark volumes, $(1 - \frac{1}{2})$ cups $= \frac{1}{2}$ cup.

Problem 4

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 5

1. $\frac{9}{10}$ is nearest 1 and $\frac{1}{12}$ is nearest 0.
2. Benchmark calculation: $1 - 0 = 1$.
3. A common denominator is 60: $\frac{9}{10} = \frac{54}{60}$ and $\frac{1}{12} = \frac{5}{60}$.
4. $\frac{9}{10} - \frac{1}{12} = \frac{54-5}{60} = \frac{49}{60}$.
5. The estimate is high by $1 - (\frac{49}{60}) = \frac{11}{60}$.

Problem 6

1. $\frac{5}{12}$ is nearest $\frac{1}{2}$ and $\frac{7}{12}$ is nearest $\frac{1}{2}$.
2. Benchmark calculation: $\frac{1}{2} + \frac{1}{2} = 1$.

Problem 7

1. $\frac{4}{5}$ is nearest 1 and $\frac{3}{8}$ is nearest $\frac{1}{2}$.
2. Benchmark calculation: $1 - \frac{1}{2} = \frac{1}{2}$.

Problem 8

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

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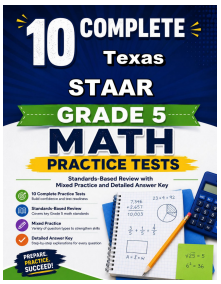

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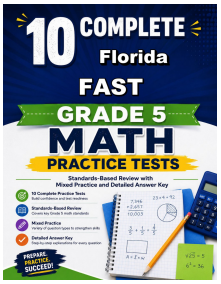

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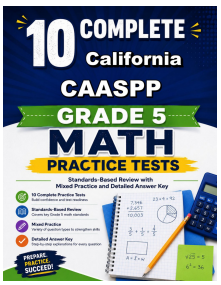

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