Adding and Subtracting Rational Numbers

Explore ideas and representations

Name _____ **Date** _____ **Score** _____ / 10

QUICK REVIEW

Add numbers with the same sign by adding magnitudes and keeping the sign. With opposite signs, subtract magnitudes and keep the sign of the larger magnitude. $-8+5=-3$. For fractions, first use a common denominator: $-3/10+1/2=1/5$.

Worked example

Evaluate $(-\frac{3}{2})+(\frac{1}{2})$. Show an exact fraction or integer.

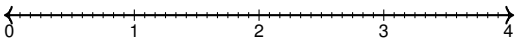
1. Use denominator 2: $-\frac{3}{2}=-3/2$ and $\frac{1}{2}=1/2$.
2. Combine the signed numerators: $-3+(1)=-2$.
3. The value is $-2/2=-1$.
Answer: -1.

Practice Problems

Show your thinking.

1. Evaluate $(-\frac{7}{2})+(1)$. Show an exact fraction or integer.

2. Model $(\frac{5}{3})-(-\frac{9}{4})$ with moves on the numbered line, then evaluate. Each unit is divided into 12 equal intervals.



3. Find the missing number: $(-\frac{3}{2})+x=-\frac{5}{2}$.

4. Find $(4)-(-\frac{4}{3})$ and its opposite. Which is greater, or are they equal?

5. Evaluate $[(-1)+(\frac{7}{4})]+(-1)$. Keep the intermediate result visible.

6. Predict whether $(1)-(-3)$ is positive, negative, or zero. Then compute to justify the prediction.

7. A check for $(-4)+(\frac{5}{3})$ uses the result $-\frac{7}{3}$. Write a numerical inverse-operation check.

8. Find $(3)-(-\frac{3}{4})$, then write the number that must be added to that result to make 0.

9. Evaluate $[(-\frac{17}{5})+(\frac{11}{6})]+(-\frac{17}{5})$. Keep the intermediate result visible.

10. Reconstruct x from $x-(-\frac{7}{12})=\frac{71}{24}$. Check by substitution.

Answer Key

1. $-\frac{5}{2}$.
2. $\frac{47}{12}$.
3. $x = -1$.
4. $\frac{16}{3}$ and $-\frac{16}{3}$; greater $\frac{16}{3}$.
5. $-\frac{1}{4}$.
6. 4, positive.
7. $(-\frac{7}{3}) - (\frac{5}{3}) = -4$.
8. Result $\frac{15}{4}$; add $-\frac{15}{4}$.
9. $-\frac{149}{30}$.
10. $x = \frac{19}{8}$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Use denominator 2: $-\frac{7}{2} = -7/2$ and $1 = 2/2$.
2. Combine the signed numerators: $-7 + (2) = -5$.
3. The value is $-5/2 = -\frac{5}{2}$.

Problem 2

1. Subtracting $-\frac{9}{4}$ means adding its opposite, $\frac{9}{4}$.
2. Start at $20/12$ and move right 27 intervals of size $\frac{1}{12}$.
3. The endpoint is $20/12 + 27/12 = \frac{47}{12}$.

Problem 3

1. Subtract the known addend from the sum.
2. Use denominator 2: $-\frac{5}{2} = -5/2$ and $-\frac{3}{2} = -3/2$.
3. $x = (-\frac{5}{2}) - (-\frac{3}{2}) = -1$.
4. Check in the original: $(-\frac{3}{2}) + (-1) = -\frac{5}{2}$.

Problem 4

1. Use denominator 3: $4 = 12/3$ and $-\frac{4}{3} = -4/3$.
2. Combine the signed numerators: $12 - (-4) = 16$.
3. The value is $16/3 = \frac{16}{3}$.
4. The opposite of $\frac{16}{3}$ is $-\frac{16}{3}$; $\frac{16}{3}$ is farther right on the number line.

Problem 5

1. Use denominator 4: $-1 = -4/4$ and $\frac{7}{4} = 7/4$.
2. Combine the signed numerators: $-4 + (7) = 3$.
3. The value is $3/4 = \frac{3}{4}$.
4. Now add (-1): $\frac{3}{4} + (-1) = -\frac{1}{4}$.

Problem 6

1. Subtracting -3 means adding 3. Both addends are positive, so expect a positive sum.
2. Use denominator 1: $1 = 1/1$ and $-3 = -3/1$.
3. Combine the signed numerators: $1 - (-3) = 4$.
4. The value is $4/1 = 4$.

Problem 7

1. Use denominator 3: $-4 = -12/3$ and $\frac{5}{3} = 5/3$.
2. Combine the signed numerators: $-12 + (5) = -7$.
3. The value is $-7/3 = -\frac{7}{3}$.
4. Inverse check: $(-\frac{7}{3}) - (\frac{5}{3}) = -4$.

Problem 8

1. Use denominator 4: $3 = 12/4$ and $-\frac{3}{4} = -3/4$.
2. Combine the signed numerators: $12 - (-3) = 15$.
3. The value is $15/4 = \frac{15}{4}$.
4. $\frac{15}{4} + (-\frac{15}{4}) = 0$, so the additive inverse is $-\frac{15}{4}$.

Problem 9

1. Use denominator 30: $-\frac{17}{5} = -102/30$ and $\frac{11}{6} = 55/30$.
2. Combine the signed numerators: $-102 + (55) = -47$.
3. The value is $-47/30 = -\frac{47}{30}$.
4. Now add $(-\frac{17}{5})$: $-\frac{47}{30} + (-\frac{17}{5}) = -\frac{149}{30}$.

Problem 10

1. Add back the amount that was subtracted.
2. Use denominator 24: $\frac{71}{24} = 71/24$ and $-\frac{7}{12} = -14/24$.
3. $x = (\frac{71}{24}) + (-\frac{7}{12}) = \frac{19}{8}$.
4. Check in the original: $(\frac{19}{8}) - (-\frac{7}{12}) = \frac{71}{24}$.

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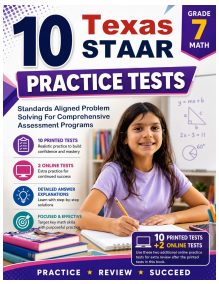

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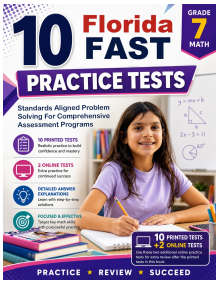

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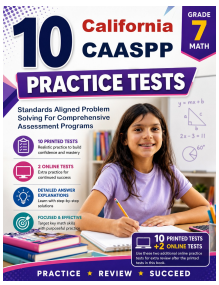

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