PROBLEM SOLVED
MAKING SENSE OF MATHEMATICS

Subtracting Fractions
Check Your Understanding

One indicator of how well a student understands subtracting fractions is to compare a student's work and explanation for a problem with how other students have responded to the same problem. Students, parents, or teachers can use the following problem and sample responses to evaluate understanding.

Directions for the Student:

1) Solve the following problem and explain your work and answer.
2) Compare your work to the sample responses in order to determine if your work indicates deep, partial, or beginning understanding.

Problem:

Mr. Baldwin is putting wood trim around the base of a wall. He needs a piece that is $8\frac{3}{4}$ inches long to fit into a corner. He has a piece that is $12\frac{5}{8}$ inches long. How much will he have to cut off of that piece so that what is left fits in the corner?

Level of Understanding	Sample Student Response	Comments
Deep Understanding	**Student 1:** "I started at $8\frac{3}{4}$. One-fourth more is 9 inches. Then you just have to add $3\frac{5}{8}$ more to get $12\frac{5}{8}$. So, $3\frac{5}{8}$ plus $\frac{1}{4}$ is what needs to be cut off. Since $\frac{1}{4}$ is $\frac{2}{8}$, it's just $3\frac{5}{8}$ plus $\frac{2}{8}$, or $3\frac{7}{8}$ inches."	This student used addition to solve a subtraction problem. The student started at $8\frac{3}{4}$ and added to the next whole number. Then it is easy to see that $3\frac{5}{8}$ more is needed. Since $\frac{1}{4}+3\frac{5}{8}=3\frac{7}{8}$, the student added $3\frac{7}{8}$ to $8\frac{3}{4}$ to get $12\frac{5}{8}$.
	Student 2: "To subtract, I had to change $12\frac{5}{8}$ to $11\frac{13}{8}$. That works because $\frac{8}{8}$ is 1. I also had to change $\frac{3}{4}$ to $\frac{6}{8}$." $12\frac{5}{8}-8\frac{3}{4}=11\frac{13}{8}-8\frac{6}{8}$ $\left(3\frac{7}{8}\right)$	This student made sense of the standard subtraction algorithm for fractions. The student changed both numbers to a common denominator and converted 1 of the 12 to $\frac{8}{8}$ so the $\frac{6}{8}$ could be subtracted from $\frac{13}{8}$.

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Level of Understanding	Sample Student Response	Comments
Partial Understanding	**Student 3:** "I subtracted $12\frac{5}{8} - 8\frac{3}{4}$. First you have to rename. So it's $11\frac{15}{8} - 8\frac{6}{8}$. Eleven minus eight is three and $\frac{15}{8} - \frac{6}{8}$ is $\frac{9}{8}$. So it's $3\frac{9}{8}$."	This student renamed $12\frac{5}{8}$ incorrectly. Instead of using $\frac{8}{8}$ for 1, the student uses $\frac{10}{8}$ for 1. This student may be thinking of whole numbers, when there are always 10 units, not 8.
	Student 4: $12\frac{5}{8} - 8\frac{3}{4}$ $\frac{68}{8} - \frac{28}{4}$ $\frac{136}{16} - \frac{112}{16} = \frac{24}{16}$ or $1\frac{1}{2}$	This student changed the mixed numbers to improper fractions, changed the fractions to equivalent fractions with a common denominator, and then subtracted. This method is not efficient and often results in computational errors similar to the errors this student made. $12\frac{5}{8} = (12 \times 8) + 5$ rather than $(12 \times 5) + 8$

Level of Understanding	Sample Student Response	Comments
Beginning Understanding	**Student 5:** "I just subtracted 8 from 12 and got 4. Then I subtracted $\frac{5}{8}$ from $\frac{6}{8}$ and got $\frac{1}{8}$. So it's $4\frac{1}{8}$."	This student subtracted the smaller fractional part from the larger instead of renaming $12\frac{5}{8}$ as $11\frac{13}{8}$.
	Student 6: $12\frac{5}{8} - 8\frac{3}{4} = 4\frac{2}{4}$	After subtracting the whole numbers, this student is just subtracting the numerators and subtracting denominators. The student does not appear to understand subtraction with fractions.