OPERATIONS WITH FRACTIONS

ADDITION AND SUBTRACTION OF FRACTIONS

Before fractions can be added or subtracted, the fractions must have the same denominator, that is, a common denominator. We will present two methods for adding or subtracting fractions.

AREA MODEL METHOD

Step 1: Copy the problem. \(\frac{1}{3} + \frac{1}{2}\)

Step 2: Draw and divide equal-sized rectangles for each fraction. One rectangle is cut vertically into an equal number of pieces based on the first denominator (bottom). The other is cut horizontally, using the second denominator. The number of shaded pieces in each rectangle is based on the numerator (top). Label each rectangle, with the fraction it represents.

\[
\begin{align*}
\text{Step 3: Superimpose the lines from each rectangle onto the other rectangle, as if one rectangle is placed on top of the other one.} \\
\text{Step 4: Rename the fractions as sixths, because the new rectangles are divided into six equal parts. Change the numerators to match the number of sixths in each figure.} \\
\text{Step 5: Draw an empty rectangle with sixths, then combine all sixths by shading the same number of sixths in the new rectangle as the total that were shaded in both rectangles from the previous step.}
\end{align*}
\]
Example 1

\[ \frac{1}{2} + \frac{2}{5} \] can be modeled as:

\[ \begin{array}{c}
\frac{1}{2} \\
\frac{2}{5} \\
\end{array} \]

\[ \frac{5}{10} + \frac{4}{10} \quad \text{so} \quad \frac{9}{10} \]

Thus, \( \frac{1}{2} + \frac{2}{5} = \frac{9}{10} \).

Example 2

\[ \frac{1}{2} + \frac{4}{5} \] would be:

\[ \begin{array}{c}
\frac{1}{2} \\
\frac{4}{5} \\
\frac{5}{10} \\
\frac{8}{10} \\
\frac{13}{10} = 1 \frac{3}{10} \end{array} \]

Problems

Use the area model method to add the following fractions.

1. \( \frac{3}{4} + \frac{1}{5} \)
2. \( \frac{1}{3} + \frac{2}{7} \)
3. \( \frac{2}{3} + \frac{3}{4} \)

Answers

1. \( \frac{19}{20} \)
2. \( \frac{13}{21} \)
3. \( \frac{17}{12} = 1 \frac{5}{12} \)