7. \[ \frac{7}{18} \div \frac{21}{6} \]

Interpret and Multiply

\[
\frac{7}{18} \div \frac{21}{6} = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}
\]

Multiply Numerators
Multiply Denominators
Section 2.5

49. \( \frac{2}{3} \div \frac{1}{4} \)

\[ \frac{5 \times 3}{17} + \frac{2}{17} \]

\[ 2 \times 4 = \frac{8}{9} + \frac{1}{9} \]

Divide Mixed Numbers.

Make Mixed #s Improper

Invert & Multiply

\[ \frac{17}{3} \div \frac{9}{4} = \frac{17}{3} \times \frac{4}{9} = \frac{68}{27} \]

To Mixed #

\[ 2 \frac{14}{27} \]

\[ 27 \frac{16}{27} \]

\[ \frac{14}{1 - 5 \frac{4}{14}} \]
Section 2.6

2. 6 and 9

Multiples of 6 & 9

12
18
27
36

LCM = 18

Least Common Multiple LCM

Smallest Number That 6 & 9 Go Into Evenly!
Section 2.6

Prime
2, 3, 5, 7, 11, 13, 17, 19.

Lcm

\[
\begin{array}{c|c|c}
2 & 12 & 20 \\
\hline
2 & 6 & 10 \\
3 & 3 & 5 \\
3 & 1 & 1 \\
\end{array}
\]

\[2 \cdot 3 \cdot 5 = 2 \cdot 2 \cdot 5\]

\[\text{LCM} = 2 \cdot 2 \cdot 3 \cdot 5\]

\[\text{LCM} = 60\]

Take the largest number of each factor found on either side.
Section 2.6

43. \( \frac{5}{7} = \frac{?}{49} \)

\( \frac{5}{7} \times \frac{2}{7} = \frac{10}{49} \)
2.7 Adding and Subtracting Fractions

Adding and Subtracting Fractions with a Common Denominator

You must have common denominators (denominators that are alike) to add or subtract fractions.

If your problem has fractions without a common denominator or if it has mixed numbers, you must use what you already know about changing the form of each fraction (how the fraction looks). Only after all the fractions have a common denominator can you add or subtract.

An important distinction: You must have common denominators to add or subtract fractions, but you need not have common denominators to multiply or divide fractions.

To add two fractions that have the same denominator, add the numerators and write the sum over the common denominator.

To illustrate we use $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$. The figure shows that $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$.
EXAMPLE 1  Add. \( \frac{5}{13} + \frac{7}{13} = \frac{12}{13} \)

Practice Problem 1  Add. \( \frac{3}{17} + \frac{12}{17} = \frac{15}{17} \)
Practice Problem 2  Add.

(a) \( \frac{1}{12} + \frac{5}{12} = \frac{6}{12} = \frac{1}{2} \)  

(b) \( \frac{13}{15} + \frac{7}{15} = \frac{20}{15} = \frac{4}{3} \)
A similar rule is followed for subtraction, except that the numerators are subtracted and the result placed over the common denominator. Be sure to reduce all answers when possible.

**EXAMPLE 3** Subtract.

(a) \( \frac{5}{13} - \frac{4}{13} = \frac{1}{13} \)

(b) \( \frac{17}{20} - \frac{3}{20} = \frac{14}{20} \div \frac{2}{2} = \frac{7}{10} \)

**Practice Problem 3** Subtract.

(a) \( \frac{5}{19} - \frac{2}{19} = \frac{3}{19} \)

(b) \( \frac{21}{25} - \frac{6}{25} = \frac{15}{25} \div \frac{5}{5} = \frac{3}{5} \)
Adding and Subtracting Fractions with Different Denominators

If the two fractions do not have a common denominator, we follow the procedure in Section 2.6: Find the LCD and then build each fraction so that its denominator is the LCD.

**Example 4** Add. $\frac{7}{12} + \frac{1}{4}$

**Solution** The LCD is 12. The fraction $\frac{7}{12}$ already has the least common denominator.

\[
\frac{7}{12} + \frac{1}{4} \times \frac{3}{3} = +
\]

\[
\begin{array}{c}
\frac{7}{12} \\
\frac{3}{12} \\
\hline
\frac{10}{12}
\end{array}
\]

We will need to reduce this fraction. Then we will have

\[
\frac{7}{12} + \frac{1}{4} = \frac{7}{12} + \frac{3}{12} = \frac{10}{12} = \frac{5}{6}.
\]

It is very important to remember to reduce our final answer.
Practice Problem 4  Add.

\[
\frac{2}{15} + \frac{1}{5}
\]

\[
\frac{2}{15} = \frac{2}{15}
\]

\[
+ \frac{1}{5} \cdot \frac{3}{3} = \frac{3}{15}
\]

\[
\frac{5 + 3}{15} = \frac{1}{3}
\]
EXAMPLE 5

Add. \(\frac{7}{20} + \frac{4}{15} = \frac{21}{60} + \frac{16}{60}\)

\[
\frac{7}{20} \times \frac{3}{3} = \frac{21}{60}
\]

\[
+ \frac{4}{15} \times \frac{4}{4} = \frac{16}{60}
\]

\[
= \frac{37}{60}
\]

Practice Problem 5

Add.

\[
\frac{5}{12} + \frac{5}{16}
\]
EXAMPLE 6

Add. \( \frac{3}{8} + \frac{5}{6} + \frac{1}{4} \)

\[
\frac{3}{8} \cdot \frac{3}{3} = \frac{9}{24} \\
\frac{5}{6} \cdot \frac{4}{4} = \frac{20}{24} \\
\frac{1}{4} \cdot \frac{6}{6} = \frac{6}{24}
\]

\[
= \frac{35}{24} = 1\frac{11}{24}
\]

\(\text{LCM} = 24\)

Practice Problem 6

Add.

\[
\frac{3}{16} + \frac{1}{8} + \frac{1}{12}
\]
Practice Problem 7: Subtract.

\[ \frac{9}{48} - \frac{5}{32} \]
Leon had \( \frac{9}{10} \) gallon of cleaning fluid in the garage. He used \( \frac{1}{4} \) gallon to clean the garage floor. How much cleaning fluid is left?

### Mathematics Blueprint for Problem Solving

<table>
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<tr>
<th>Gather the Facts</th>
<th>What Am I Asked to Do?</th>
<th>How Do I Proceed?</th>
<th>Key Points to Remember</th>
</tr>
</thead>
</table>
2.7 Exercises

Add or subtract. Simplify all answers.

1. \( \frac{5}{9} + \frac{2}{9} \)

2. \( \frac{5}{8} + \frac{2}{8} \)

3. \( \frac{7}{18} + \frac{15}{18} \)

4. \( \frac{11}{25} + \frac{17}{25} \)

9. \( \frac{1}{3} + \frac{1}{2} \)

10. \( \frac{1}{4} + \frac{1}{3} \)

11. \( \frac{3}{10} + \frac{3}{20} \)

12. \( \frac{4}{9} + \frac{1}{6} \)
56. *Fitness Training* Kia is training for a short triathlon. On Monday she swam $\frac{1}{4}$ mile and ran $\frac{5}{6}$ mile. On Tuesday she swam $\frac{1}{2}$ mile and ran $\frac{3}{4}$ mile. How many miles has she swum so far this week? How many miles has she run so far?

<table>
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<tbody>
<tr>
<td><strong>Gather the Facts</strong></td>
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</table>