# BLOCK 1 ~ RATIONAL NUMBERS AND EQUATIONS

## POSITIVE RATIONAL NUMBERS

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Simplifying Fractions</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Explore! Fraction Tiles</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Mixed Numbers and Improper Fractions</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Adding &amp; Subtracting Fractions</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Explore! Fraction Careers</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Multiplying and Dividing Fractions</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>Operations with Mixed Numbers</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Explore! Rope Rodeo</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Adding and Subtracting Decimals</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>Multiplying and Dividing Decimals</td>
<td>28</td>
</tr>
<tr>
<td>REVIEW</td>
<td>Block 1 ~ Positive Rational Numbers</td>
<td>32</td>
</tr>
</tbody>
</table>

---

**Word Wall**

- Reciprocal
- Equivalent Fractions
- Least Common Multiple
- Simplest Form
- Improper Fraction
- Fraction
- Mixed Number
- Greatest Common Factor
- Least Common Denominator

---

Block 1 ~ Rational Numbers And Equations ~ Positive Rational Numbers 1
<table>
<thead>
<tr>
<th><strong>Which is the Biggest?</strong></th>
<th><strong>Real-World Uses</strong></th>
<th><strong>GCF and LCM</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Order and compare fractions with unlike denominators.</td>
<td>Survey people about how they use fractions and decimals in their everyday lives. Write a report summarizing your findings.</td>
<td>Write two different poems about the greatest common factor and least common multiple.</td>
</tr>
<tr>
<td>See page 7 for details.</td>
<td>See page 19 for details.</td>
<td>See page 19 for details.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Memory Game</strong></th>
<th><strong>Numbers Galore</strong></th>
<th><strong>Recipe Conversion</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a matching game using fraction and decimal expressions and their solutions.</td>
<td>Find the value of fraction or decimal expressions including more than two numbers.</td>
<td>Write one recipe in 5 different formats. Give situations where each format would be useful.</td>
</tr>
<tr>
<td>See page 31 for details.</td>
<td>See page 31 for details.</td>
<td>See page 10 for details.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Decimals or Fractions?</strong></th>
<th><strong>Grid Game</strong></th>
<th><strong>Hardware Store</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Write a play where the characters, decimals and fractions, are each trying to prove they are the easiest to work with.</td>
<td>Create a grid game using decimal expressions that include the four operations (+, −, ×, ÷).</td>
<td>Take a trip to a hardware store to find at least 10 items described by fractions. Create a display of the items.</td>
</tr>
<tr>
<td>See page 35 for details.</td>
<td>See page 24 for details.</td>
<td>See page 7 for details.</td>
</tr>
</tbody>
</table>
Kar and Kevin ordered a pizza for lunch. The large pepperoni pizza came with 8 evenly cut slices. Karl ate two pieces and Kevin ate \( \frac{1}{4} \) of the pizza. Who ate more?

A fraction is a number that represents a part of a whole number. Fractions represent division of two numbers or a comparison of two numbers. A fraction is written in the form \( \frac{\text{numerator}}{\text{denominator}} \). In a fraction, the denominator cannot be 0.

In the pizza problem, you can compare 2 slices to the entire pizza of 8 slices as \( \frac{2}{8} \).

To figure out who ate more pizza, determine whether \( \frac{2}{8} \) or \( \frac{1}{4} \) is larger. Look at the diagrams below. It turns out that both boys ate equal portions of the pizza. One quarter (\( \frac{1}{4} \)) of the pizza is the same as 2 out of 8 slices (\( \frac{2}{8} \)). These two fractions are called equivalent fractions. Equivalent fractions are fractions that represent the same number but have different numerators and denominators.

Karl's Portion                      Kevin's Portion

Equivalent fractions can be found by multiplying or dividing the numerator and denominator by the same non-zero number. If you are dividing both the numerator and denominator to find an equivalent fraction, the number must be a factor other than 1 that is common to both numbers.

**EXAMPLE 1**

Find two fractions that are equivalent to \( \frac{10}{14} \).

**Solution**

There are many equivalent fractions. When multiplying the top and bottom of the fraction to create an equivalent fraction, you may choose any number.

To find an equivalent fraction by dividing the numerator and denominator, the number you are dividing by must be a common factor. In this case, the only common factor of 10 and 14 is 2.
Each large rectangle below represents one whole. Each rectangle is divided into equal parts. It is called a fraction bar.

**Step 1:** Write a fraction to represent \( \frac{\text{number of shaded sections}}{\text{total number of sections}} \) for each fraction bar.

\[
\begin{array}{ll}
a. & \\
b. & \\
c. & \\
d. & \\
e. & \\
f. & \\
g. & \\
h. & \\
i. & \\
j. & \\
k. & \\
l. & \\
m. & \\
n. & \\
\end{array}
\]

**Step 2:** Match each fraction in the left column with its equivalent fraction in the right column. Write the pair of equivalent fractions. For example, \( \frac{1}{5} = \frac{2}{10} \).

**Step 3:** Write a third equivalent fraction for each pair in Step 2.

**Step 4:** Draw two fraction bars to show \( \frac{3}{4} \) and \( \frac{6}{8} \). Are these equivalent fractions? Explain. If so, write a third equivalent fraction to \( \frac{3}{4} \) and \( \frac{6}{8} \).

**Step 5:** The fractions in the left column are in simplest form. Look at the fractions in the left column compared to those in the right column and explain what simplest form means.

The greatest common factor (GCF) is the greatest factor that is common to two or more numbers. To determine the greatest common factor, find the prime factorization of each number. The GCF is the product of the prime factors which are common to both numbers.

**Example 2**

**Find the GCF of:**

a. 10 and 15 

b. 24 and 36

**Solutions**

a. Look at the prime factorization of 10 and 15.

\[
\begin{align*}
10 &= 2 \cdot 5 \\
15 &= 3 \cdot 5
\end{align*}
\]

The only common prime factor is 5, so the GCF = 5.
Lesson 1 ~ Simplifying Fractions

b. Look at the prime factorization of 24 and 36.

\[
24 = 2 \cdot 2 \cdot 2 \cdot 3 \\
36 = 2 \cdot 2 \cdot 3 \cdot 3
\]

The common prime factors of 24 and 36 are 2, 2 and 3. The GCF can be found by multiplying these factors together.

\[
2 \cdot 2 \cdot 3 = 12 \\
\text{GCF} = 12
\]

A fraction is in simplest form when the numerator and the denominator’s only common factor is 1. When you divide the numerator and denominator by its greatest common factor, the fraction will be in its simplest form. You can also get a fraction into simplest form by repeatedly dividing by common factors until the only common factor between the numerator and denominator is 1.

### Writing Fractions in Simplest Form

Divide the numerator and denominator by the greatest common factor (GCF).

OR

Divide the numerator and denominator by common factors until the only common factor is 1.

### Example 3

Write each fraction in simplest form.

a. \( \frac{20}{50} \)

b. \( \frac{45}{60} \)

#### Solutions

a. Find the GCF of 20 and 50.

\[
20 = 2 \cdot 2 \cdot 5 \\
50 = 2 \cdot 5 \cdot 5
\]

The common prime factors of 20 and 50 are 2 and 5.

\[
\text{GCF} = 2 \cdot 5 = 10
\]

Divide the numerator and denominator by the GCF.

\[
\frac{20}{50} \text{ in simplest form is } \frac{2}{5}
\]

b. One common factor of 45 and 60 is 5. Divide the numerator and denominator by 5.

\[
\frac{45}{60} = \frac{9}{12} \rightarrow \frac{9}{12} = \frac{3}{4}
\]

\[
\frac{45}{60} \text{ in simplest form is } \frac{3}{4}
\]
Write two fractions that are equivalent to the given fraction.

1. \( \frac{8}{16} \)  
2. \( \frac{5}{15} \)  
3. \( \frac{4}{10} \)  
4. \( \frac{4}{14} \)  
5. \( \frac{2}{8} \)  
6. \( \frac{6}{9} \)

Find the greatest common factor (GCF) of each pair of numbers.

7. 4 and 8  
8. 10 and 15  
9. 12 and 30  
10. 30 and 40  
11. 40 and 60  
12. 6 and 15

Write each fraction in simplest form.

13. \( \frac{12}{18} \)  
14. \( \frac{20}{50} \)  
15. \( \frac{4}{12} \)  
16. \( \frac{10}{24} \)  
17. \( \frac{6}{14} \)  
18. \( \frac{24}{42} \)  
19. \( \frac{6}{15} \)  
20. \( \frac{16}{30} \)  
21. \( \frac{18}{27} \)  
22. \( \frac{75}{100} \)  
23. \( \frac{20}{35} \)  
24. \( \frac{120}{150} \)

Write each fraction in simplest form. Tell whether or not the pair of fractions is equivalent.

25. \( \frac{6}{8} \) and \( \frac{9}{12} \)  
26. \( \frac{10}{20} \) and \( \frac{14}{24} \)  
27. \( \frac{20}{30} \) and \( \frac{16}{24} \)

28. Fractions can be simplified by dividing the numerator and denominator by the GCF or by dividing the numerator and denominator by a common factor until the only common factor that remains between the numerator and denominator is 1. Which method do you prefer to use? Why?

29. A worm measured \( \frac{6}{16} \) foot long using a ruler. Simplify this measurement.

30. Carmen weighed her baby kitten and found that he weighed \( \frac{28}{32} \) pound. Simplify this measurement.

31. Write two equivalent fractions to represent the following fraction bar:

32. A student claims that \( \frac{26}{39} \) is in simplest form. Do you agree? Explain.
In this activity you will arrange sets of fractions from least to greatest. In order to compare fractions, it helps if the fractions have a common denominator. For each set of fractions, find the least common denominator (LCD) and write the equivalent fractions using the LCD. Once the fractions have a common denominator, the numerators can be compared. When you write the set of numbers from least to greatest, you must use the original fractions in simplest form.

For example: List the following fractions from least to greatest. \(\frac{2}{5}, \frac{1}{4}, \frac{3}{10}\)

Rewrite all fraction using the LCD of 20.

\[
\begin{align*}
\frac{2}{5} \times 4 & \rightarrow \frac{8}{20} \\
\frac{1}{4} \times 5 & \rightarrow \frac{5}{20} \\
\frac{3}{10} \times 2 & \rightarrow \frac{6}{20}
\end{align*}
\]

List the fractions from least to greatest. \(\frac{5}{20}, \frac{6}{20}, \frac{8}{20}\)

Rewrite the fractions in simplest form. \(\frac{1}{4}, \frac{3}{10}, \frac{2}{5}\)

List each set of fractions from least to greatest.

1. \(\frac{1}{2}, \frac{3}{4}, \frac{5}{8}\) 
2. \(\frac{7}{15}, \frac{2}{5}, \frac{7}{10}\) 
3. \(\frac{5}{6}, \frac{11}{12}, \frac{23}{24}\) 
4. \(\frac{23}{24}, \frac{1}{6}, \frac{2}{9}, \frac{5}{12}\) 
5. \(\frac{1}{2}, \frac{3}{7}, \frac{5}{14}, \frac{4}{7}\) 
6. \(\frac{3}{5}, \frac{13}{20}, \frac{5}{8}, \frac{23}{40}\)

7. Make your own list of four fractions with different denominators and list them from least to greatest.

---

Tic-Tac-Toe ~ Hardware Store

Take a trip to a local hardware store. Find at least 10 items that are described using fractions or mixed numbers. Make sure you have a wide variety of items. Create a display of the items by either sketching the item or using pictures. Include a table, as seen below, in your display.

**Example:**

<table>
<thead>
<tr>
<th>Picture</th>
<th>Item</th>
<th>Fraction Use</th>
<th>Possible Item Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Acorn Nut Sleeve Anchor" /></td>
<td>Acorn Nut Sleeve Anchor</td>
<td>Size: (\frac{1}{4} \times 1\frac{3}{8} \text{ in})</td>
<td>Tightening objects</td>
</tr>
</tbody>
</table>
Bali measured the length of her pointer finger with a ruler. It was $2 \frac{3}{4}$ inches long. This fraction is called a **mixed number**. A mixed number is the sum of a whole number and a fraction less than 1.

Mixed numbers can also be written as **improper fractions**. An improper fraction has a numerator that is greater than or equal to its denominator.

Bali’s finger was $2 \frac{3}{4}$ inches long. In order to write this fraction as an improper fraction, she must determine how many “fourths” are in $2 \frac{3}{4}$.

Bali drew out the three circles above and shaded in $2 \frac{3}{4}$ of the circles. She is able to see that there are 11 “fourths” which are shaded. The improper fraction for $2 \frac{3}{4}$ is $\frac{11}{4}$ which is read “eleven fourths”. Mixed numbers can be rewritten as improper fractions by following a mathematical process involving multiplication and addition.

### Rewriting Mixed Numbers as Improper Fractions

1. Multiply the whole number by the denominator.
2. Add the numerator to the product.
3. Write this number as the numerator and keep the original denominator as the denominator of the improper fraction.

### Example 1

**Write $5 \frac{1}{6}$ as an improper fraction.**

**Solution**

Multiply the whole number by the denominator. $5(6) = 30$

Add the numerator to the product. $1 + 30 = 31$

Write the improper fraction as the total over the original denominator. $\frac{31}{6}$
Improper fractions can also be rewritten as mixed numbers. In most situations, solutions are considered in simplest form when written as a mixed number.

**Rewriting Improper Fractions as Mixed Numbers**

1. Divide the numerator by the denominator. The quotient is the whole number in the mixed number.
2. Write the remainder as the numerator over the original denominator. This is the fraction in the mixed number.

**Example 2**

Write $\frac{17}{5}$ as a mixed number.

**Solution**

Divide the numerator by the denominator.

\[
\begin{align*}
5 & \mid 17 \\
5 & \mid 17 \\
-15 & \\
\text{Remainder:} & \quad 2
\end{align*}
\]

Write the mixed number with both the whole number and the fraction.

\[3 \frac{2}{5}\]

**Exercises**

Write the improper fraction and mixed number for each drawing.

1.  
2.  
3.  
4.  

Write each mixed number as an improper fraction.

5. $2\frac{1}{2}$  
6. $3\frac{2}{5}$  
7. $1\frac{6}{7}$  
8. $6\frac{1}{3}$  
9. $4\frac{3}{4}$  
10. $5\frac{7}{10}$  
11. $1\frac{4}{9}$  
12. $7\frac{7}{8}$  
13. $8\frac{2}{3}$

14. Jorge’s mom bought a house in Portland. Her interest rate on her loan was $5\frac{3}{4}\%$. Write her interest rate as an improper fraction.

15. At the 2007 Oregon High School Track & Field Meet, two girls tied for first in the high jump. Both girls cleared $5\frac{5}{12}$ feet. Write this height as an improper fraction.
16. A chef is making chicken parmesan for a banquet. His recipe calls for $3\frac{3}{8}$ cups of tomato sauce. Write this amount as an improper fraction.

Write each improper fraction as a mixed number.

17. $\frac{8}{5}$  
18. $\frac{10}{3}$  
19. $\frac{11}{4}$

20. $\frac{21}{8}$  
21. $\frac{43}{10}$  
22. $\frac{29}{9}$

23. $\frac{13}{2}$  
24. $\frac{44}{5}$  
25. $\frac{15}{4}$

26. There are several thousand species of beetles. The body of the beetles that live in Oregon could be as long as $5\frac{5}{4}$ inches. Write this length as a mixed number.

27. Mike’s hair has grown $3\frac{1}{10}$ centimeters since his last hair cut. Write this amount as a mixed number.

28. Kaitlyn visited with her grandma for $81$ minutes. Write this amount as a mixed number that represents the number of hours she visited with her grandma.

**REVIEW**

Write each fraction in simplest form.

29. $\frac{10}{35}$  
30. $\frac{25}{100}$  
31. $\frac{8}{24}$

32. $\frac{12}{16}$  
33. $\frac{14}{20}$  
34. $\frac{22}{30}$

**Tic-Tac-Toe ~ Recipe Conversion**

Find a recipe with a minimum of 8 ingredients. Create a recipe booklet with the recipe written five different ways. For example, you could cut the amount of each ingredient in half or triple the recipe. You could also make all ingredients have a common denominator. On each page, explain how the recipe was converted. Also give situations where each version of the recipe might be useful. Be creative with your recipe booklet. Include illustrations and an interesting cover for the booklet.

*For example:* Double the Recipe – Use when you have friends over…
Cut the Recipe in Fourths – Use when cooking for yourself…
Carpenters, chefs, engineers, surveyors and architects add and subtract fractions often as a part of their work. It is important to remember that two fractions must have a common denominator before you can find their sum or difference. Common denominators can be found by using the least common multiple of the two denominators. The least common multiple (LCM) is the smallest non-zero multiple that is common to two or more numbers.

**EXAMPLE 1**

Find the least common multiple of:

a. 8 and 12  

b. 4 and 5

**SOLUTIONS**

a. One method for finding the least common multiple is to list out the multiples of each number until the same number appears on each list.

8, 16, 24, 32, 40 …

12, 24, 36, 48, 60, 72 …

The LCM is 24.

b. Another method to find the LCM is to choose the largest number, in this case 5, and look at its multiples.

5, 10, 15, 20, 25, 30, 35 …

Find the smallest multiple that 4 divides into evenly.

5 – NO

10 – NO

15 – NO

20 – YES (20 ÷ 4 = 5)

The LCM is 20.

When the least common multiple of two denominators is found, it is called the least common denominator (LCD). Based on the answer in Example 1, the LCD of $\frac{1}{8}$ and $\frac{5}{12}$ is 24 because the least common multiple of 8 and 12 is 24.

**ADDING AND SUBTRACTING FRACTIONS**

1. If denominators are not equal, rewrite the fractions as equivalent fractions with common denominators using the least common denominator (LCD).

2. Add or subtract the numerators.

3. Write the sum or difference over the common denominator.

4. Write the fraction in simplest form. If the sum or difference is an improper fraction it should be changed to a mixed number.
EXAMPLE 2

Find the value of \( \frac{1}{10} + \frac{7}{10} \).

Solution

These fractions already have a common denominator. Add the numerators.

\[
\frac{1}{10} + \frac{7}{10} = \frac{8}{10} = \frac{4}{5}
\]

EXAMPLE 3

On Monday, the Portland International Airport reported \( \frac{3}{8} \) inch of rain. On Tuesday it rained \( \frac{11}{16} \) inch. What was the total rainfall for these two days?

Solution

The least common multiple of 8 and 16 is 16. Write \( \frac{3}{8} \) as an equivalent fraction with a denominator of 16.

\[
\frac{3}{8} = \frac{6}{16}
\]

Write the sum over the LCD.

\[
\frac{6}{16} + \frac{11}{16} = \frac{17}{16}
\]

Change from an improper fraction to a mixed number.

\[
\frac{17}{16} = 1 \frac{1}{16}
\]

It rained a total of 1 \( \frac{1}{16} \) inches in Portland on Monday and Tuesday.

EXAMPLE 4

Find the value of \( \frac{2}{3} - \frac{1}{4} \).

Solution

The least common multiple of 3 and 4 is 12. Write each fraction as equivalent fractions with a denominator of 12.

\[
\frac{2}{3} = \frac{8}{12} \quad \frac{1}{4} = \frac{3}{12}
\]

Write the difference over the LCD.

\[
\frac{8}{12} - \frac{3}{12} = \frac{5}{12}
\]
In each step you will perform a calculation that might be done in a certain career. Determine the solution to each step and then guess in what career you might do that specific calculation.

**Step 1:** Kara mixed \( \frac{2}{5} \) of a gallon of red paint with \( \frac{7}{10} \) gallon of blue paint to create a deep indigo paint. How much total indigo paint did Kara create? Name a possible career that Kara may have.

**Step 2:** Jillian needed to make 36 pastries for a Mother’s Day Brunch. She needed \( \frac{7}{8} \) cup of butter for the batter and \( \frac{1}{4} \) cup of butter for the topping. How much total butter did she need? What do you think Jillian does for a living?

**Step 3:** Rick nailed two boards together. One board was \( \frac{3}{8} \) inch thick. The other board was \( \frac{1}{2} \) inch thick. What is the total thickness of the two boards nailed together? What is a possible career Rick might have?

**Step 4:** Hans helped a family get a home loan for their first house. He told the family there was a \( \frac{1}{4} \% \) fee for the title company and another \( \frac{3}{4} \% \) fee for the listing agent. What was the total percentage of fees the family will have to pay? What do you think Hans does for a living?

**Step 5:** Jocelyn mixes two chemicals together to make a solution. She mixes \( \frac{7}{10} \) liter of ammonia with \( \frac{3}{20} \) liter of ethanol. What is the total number of liters of solution she has created? What do you think Jocelyn’s career is?

**Step 6:** Name another career that uses fractions. Make up a story problem that would involve adding or subtracting fractions in that career. Find the answer to your problem.

### EXERCISES

**Find the least common multiple (LCM) of the numbers given.**

1. 3 and 6  
2. 3 and 5  
3. 4 and 9  
4. 10 and 15  
5. 12 and 20  
6. 9 and 15  
7. Jaime is convinced that his answer for the problem below is correct. Look at his work below. Determine if Jaime’s answer is correct. If it is not correct, explain why the answer is incorrect and find the correct answer.

\[
\frac{1}{4} + \frac{3}{8} = \frac{4}{12} \quad \Rightarrow \quad \frac{4}{12} = \frac{1}{3}
\]

**Find each sum or difference. Write your answer in simplest form.**

8. \( \frac{2}{7} + \frac{3}{7} \)  
9. \( \frac{9}{10} - \frac{3}{10} \)  
10. \( \frac{1}{3} + \frac{1}{6} \)
11. \( \frac{7}{8} - \frac{3}{16} \)  
12. \( \frac{5}{6} - \frac{1}{3} \)  
13. \( \frac{2}{3} + \frac{1}{2} \)  
14. \( \frac{2}{3} - \frac{1}{6} \)  
15. \( \frac{2}{15} + \frac{3}{10} \)  
16. \( \frac{37}{40} + \frac{2}{5} \)  
17. \( \frac{11}{12} + \frac{1}{2} \)  
18. \( \frac{3}{5} - \frac{1}{4} \)  
19. \( \frac{7}{10} + \frac{3}{4} \)  

20. One day after school Keenan worked on his math homework for \( \frac{4}{5} \) hour and his English homework for \( \frac{1}{4} \) hour. How long did Keenan work on homework for those two subjects?

21. A carpenter measured the thickness of two pieces of plywood. One board was \( \frac{13}{16} \) inch thick. The other board was \( \frac{5}{8} \) inch thick. How much thicker is one board than the other?

22. A tomato plant measured \( \frac{3}{10} \) meter when it was planted. Two weeks later the plant measured \( \frac{17}{20} \) meter. How much did the plant grow in those two weeks?

23. A cookie recipe called for \( \frac{3}{4} \) cup of flour at the beginning and another \( \frac{2}{3} \) cup later in the recipe. What is the total amount of flour needed to make the cookies?

24. Five students sold raffle tickets at a school fundraising auction. 
   The table at right shows the portion of the total sales for each of the five students. 
   a. Clara and Maria were the top sellers. What fraction of the raffle tickets did they sell? 
   b. What is the difference between Lisa’s and Lamar’s fraction of raffle ticket sales?

<table>
<thead>
<tr>
<th>Student</th>
<th>Fraction of Total Raffle Ticket Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patrick</td>
<td>( \frac{1}{10} )</td>
</tr>
<tr>
<td>Clara</td>
<td>( \frac{7}{20} )</td>
</tr>
<tr>
<td>Maria</td>
<td>( \frac{1}{4} )</td>
</tr>
<tr>
<td>Lamar</td>
<td>( \frac{1}{12} )</td>
</tr>
<tr>
<td>Lisa</td>
<td>( \frac{13}{60} )</td>
</tr>
</tbody>
</table>

25. Ian’s family was traveling from Medford to Baker City to visit relatives. On the first day they went \( \frac{1}{3} \) of the total distance. On the second day of the trip, they went \( \frac{2}{5} \) of the total distance. What fraction of the trip have they traveled after two days?

**REVIEW**

Write each mixed number as an improper fraction.

26. \( 3\frac{3}{7} \)  
27. \( 2\frac{1}{5} \)  
28. \( 8\frac{2}{3} \)

Write each improper fraction as a mixed number.

29. \( \frac{11}{2} \)  
30. \( \frac{14}{5} \)  
31. \( \frac{59}{10} \)

Lesson 3 ~ Adding And Subtracting Fractions
Caroline was making waffles which required \( \frac{3}{4} \) cup milk. She wanted to divide the recipe in half because she was only making waffles for two people. How could she find \( \frac{1}{2} \) of \( \frac{3}{4} \)?

In math, the word “of” often means multiply. In this case, Caroline can find \( \frac{1}{2} \) of \( \frac{3}{4} \) by multiplying \( \frac{1}{2} \cdot \frac{3}{4} \). To see a model of this, use a fraction bar:

The shaded part represents \( \frac{3}{4} \)

To find \( \frac{1}{2} \) of \( \frac{3}{4} \), divide the rectangle horizontally in half. Shade one of the two horizontal regions with a different color to represent \( \frac{1}{2} \).

Count the number of sections that have been shaded twice (where yellow and blue overlap to make green). Three sections out of eight are shaded green. This means that \( \frac{1}{2} \) of \( \frac{3}{4} \) is \( \frac{3}{8} \). Caroline will need \( \frac{3}{8} \) of a cup of milk to make half the recipe of waffles.

According to the fraction model above, \( \frac{1}{2} \cdot \frac{3}{4} = \frac{3}{8} \). When you find the product of the numerators, you will have the numerator of the answer. When you multiply the denominators together, you will have the denominator of the answer. This is true for all multiplication problems involving fractions. Some fractions will need to be simplified after multiplying the numerator and denominator.

### Multiplying Fractions

For any numbers \( a, b, c \) and \( d \):

\[
\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}
\]
EXAMPLE 1

Find the value of \(\frac{2}{3} \cdot \frac{3}{5}\) using models.

Solution

Draw a model and shade \(\frac{3}{5}\) of a rectangle. Draw horizontal lines to cut the model into thirds. Shade 2 of the three horizontal rectangles to represent \(\frac{2}{3}\).

![Model showing \(\frac{2}{3} \cdot \frac{3}{5}\) shading]

The final model has 6 out of 15 regions which are shaded twice, so \(\frac{2}{3} \cdot \frac{3}{5} = \frac{6}{15}\).

In simplest form, \(\frac{6}{15} = \frac{2}{5}\).

EXAMPLE 2

Find the value of \(\frac{5}{6} \cdot \frac{2}{5}\).

Solution

Multiply.

\(\frac{5}{6} \cdot \frac{2}{5} = \frac{5 \cdot 2}{6 \cdot 5}\)

Simplify.

\(\frac{10}{30} = \frac{1}{3}\)

\(\frac{5}{6} \cdot \frac{2}{3} = \frac{1}{3}\)

Two numbers are **reciprocals** if their product is 1. To find the reciprocal of a fraction, “flip” the fraction so that the numerator becomes the denominator and the denominator becomes the numerator.

\(\frac{3}{4} \quad \text{Reciprocal} \quad \frac{4}{3}\)
\(\frac{1}{2} \quad \text{Reciprocal} \quad \frac{2}{1}\)

Reciprocals are used when dividing fractions. To divide by a fraction, multiply by its reciprocal.

**DIVIDING FRACTIONS**

For any numbers \(a, b, c\) and \(d\):

\[
\frac{a}{b} \div \frac{c}{d} = \frac{a \cdot d}{b \cdot c}
\]
EXAMPLE 3

Find the value of \( \frac{3}{5} \div \frac{7}{10} \).

**Solution**

Divide.

\[
\frac{3}{5} \div \frac{7}{10} = \frac{3 \cdot 10}{5 \cdot 7} = \frac{30}{35}
\]

Simplify.

\[
\frac{30}{35} = \frac{6}{7}
\]

\[
\frac{3}{5} \div \frac{7}{10} = \frac{6}{7}
\]

EXAMPLE 4

Find the value of \( \frac{5}{6} \div \frac{1}{8} \).

**Solution**

Divide.

\[
\frac{5}{6} \div \frac{1}{8} = \frac{5 \cdot 8}{6 \cdot 1} = \frac{40}{6}
\]

Simplify.

\[
\frac{40}{6} = \frac{20}{3}
\]

Change into a mixed number.

\[
\frac{6}{3} = \frac{20}{3}
\]

\[
\frac{5}{6} \div \frac{1}{8} = 6\frac{2}{3}
\]

**EXERCISES**

1. Find \( \frac{1}{2} \cdot \frac{4}{5} \) using fraction bars.
   
a. Draw a rectangle and divide it into 5 equal regions by drawing vertical lines.
   
b. Shade 4 of the 5 regions to represent \( \frac{4}{5} \).
   
c. To find \( \frac{1}{2} \) of \( \frac{4}{5} \), divide the 5 regions in half by drawing a horizontal line through the rectangle.
   
d. Shade one of the two horizontal regions with a different color.
   
e. Write a fraction representing the number of regions that are shaded twice out of the total number of regions.
   
f. \( \frac{1}{2} \cdot \frac{4}{5} = \)

2. Silvia is making chocolate chip cookies. The recipe calls for \( \frac{2}{3} \) cup of sugar. She wants to make half of a batch of cookies. Use fraction bars to find how much sugar Silvia needs.
Find each product. Write your answer in simplest form.

3. \(\frac{3}{4} \cdot \frac{3}{5}\)  
4. \(\frac{2}{3} \cdot \frac{1}{3}\)  
5. \(\frac{4}{7} \cdot \frac{1}{2}\)  
6. \(\frac{5}{8} \cdot \frac{3}{4}\)  
7. \(\frac{1}{3} \cdot \frac{1}{3}\)  
8. \(\frac{4}{7} \cdot \frac{1}{3}\)  
9. \(\frac{3}{4} \cdot \frac{2}{5}\)  
10. \(\frac{7}{8} \cdot \frac{2}{7}\)  
11. \(\frac{1}{3} \cdot \frac{3}{5}\)  
12. \(\frac{4}{5} \cdot \frac{1}{2}\)  
13. \(\frac{10}{5} \cdot \frac{1}{5}\)  
14. \(\frac{9}{10} \cdot \frac{2}{3}\)  

15. Penelope walks \(\frac{7}{10}\) mile to school every day. One day, she walked halfway to school before she remembered she forgot her lunch and had to go home to get it. How close was she to school when she turned around?

16. Xavier bought \(\frac{5}{7}\) pound of dog food. Each of his three dogs get \(\frac{1}{3}\) of the dog food. What fraction of a pound of dog food does each dog get?

17. Jared plays on the Harrisville Special Olympics basketball team. Each player on his team gets to be in the game for half of the playing time. The entire game lasts \(\frac{2}{3}\) hour. What fraction of an hour does each player get to play?

Write the reciprocal of each number.

18. \(\frac{2}{5}\)  
19. \(\frac{1}{3}\)  
20. \(\frac{4}{9}\)  

Find each quotient. Write your answer in simplest form.

21. \(\frac{1}{4} \div \frac{2}{3}\)  
22. \(\frac{3}{7} \div \frac{4}{5}\)  
23. \(\frac{4}{9} \div \frac{1}{5}\)  
24. \(\frac{7}{8} \div \frac{3}{4}\)  
25. \(\frac{2}{3} \div \frac{1}{4}\)  
26. \(\frac{9}{10} \div \frac{3}{5}\)  
27. \(\frac{4}{7} \div \frac{1}{2}\)  
28. \(\frac{5}{6} \div \frac{5}{9}\)  
29. \(\frac{1}{8} \div \frac{3}{4}\)  

30. Aaron has \(\frac{3}{4}\) hour left to do chores. It takes \(\frac{1}{4}\) hour to do each chore. How many chores will he be able to do in the remaining time?
31. Lily buys $\frac{7}{8}$ yard of ribbon. She plans to cut ribbons that are each $\frac{1}{16}$ yard long. How many ribbons will she be able to cut?

32. How many $\frac{1}{8}$ cup scoops will you be able to make from $\frac{3}{4}$ cup of cookie dough?

**REVIEW**

Find each sum or difference. Write the answer in simplest form.

33. $\frac{3}{4} + \frac{1}{8}$
34. $\frac{7}{10} - \frac{1}{5}$
35. $\frac{2}{3} - \frac{1}{2}$

36. $\frac{4}{5} + \frac{17}{20}$
37. $\frac{1}{2} - \frac{3}{8}$
38. $\frac{1}{4} + \frac{1}{3}$

39. Ryan purchased $\frac{3}{4}$ pound of peanuts and $\frac{7}{16}$ pound of almonds. How many total pounds of nuts did Ryan buy?

**Tic-Tac-Toe ~ GCF and LCM**

Poetry is an art form that is composed of carefully chosen words to express a greater depth of meaning. Poetry can be written about many different subjects, including mathematics. The greatest common factor (GCF) and least common multiple (LCM) are key elements needed to find the value of fraction operations in simplest form. Write two different cinquain poems as described below. One cinquain should be about the GCF and the other should be about the LCM.

**Cinquain**

Poetry with five lines.
Line 1 has one word (the title).
Line 2 has two words that describe the title.
Line 3 has three words that tell the action.
Line 4 has four words that express the feeling.
Line 5 has one word which recalls the title.

**Tic-Tac-Toe ~ Real-World Uses**

Many adults use fractions and decimals daily at work and at home. Create a survey with a minimum of four questions to gather more information about people’s uses of fractions and decimals in their everyday lives. Once your survey is approved by your teacher, give the survey to five different adults. Write a 1–2 page report to summarize your findings.
Mixed numbers are the sum of a whole number and a fraction less than 1. Mixed numbers are used in many situations. You may need $2\frac{1}{4}$ cups of flour when making cookies. You may run $3\frac{3}{4}$ miles. You might buy $1\frac{3}{8}$ pounds of potatoes. Finding sums, differences, products, and quotients with mixed numbers can be done by changing each number into an improper fraction before following the procedures you learned in previous lessons.

**Operations with Mixed Numbers**

1. Write each mixed number as an improper fraction.
2. Follow the procedures for adding, subtracting, multiplying, or dividing fractions.
3. Write the answer in simplest form. Convert the answer to a mixed number, if needed.

**EXPLORE!**

Four friends participate in the rodeo and purchased rope to use in different events.

**ROPE RODEO**

**Step 1:** Keenan purchased two pieces of rope. One piece of rope is $5\frac{1}{4}$ yards long. The other piece is $4\frac{5}{8}$ yards long. Keenan needs help finding the total length of rope he purchased.

- **a.** Write each mixed number as an improper fraction.
- **b.** Determine which operation (add, subtract, multiply, or divide) should be used.
- **c.** Follow the rules for that operation. Do you need a common denominator? Do you need the reciprocal? Look at Lessons 3 and 4 if you need help remembering the procedures.
- **d.** Simplify your answer and convert it to a mixed number, if needed.

**Step 2:** Laura bought a piece of rope that is $13\frac{1}{3}$ yards long. She wants to cut it into equal-sized pieces that are each $2\frac{2}{3}$ yards long. Help her determine how many pieces of rope she will have after cutting it.

- **a.** Write each mixed number as an improper fraction.
- **b.** Determine which operation (add, subtract, multiply, or divide) should be used.
- **c.** Follow the rules for that operation.
- **d.** Simplify your answer and convert it to a mixed number, if needed.
Step 3: Olivia bought a piece of rope that was $2 \frac{1}{5}$ yards long. She cut off a piece that was $1 \frac{2}{5}$ yards long so that the remaining piece would be just the right size. Help Olivia determine how long her remaining piece is.

a. Write each mixed number as an improper fraction.
b. Determine which operation (add, subtract, multiply or divide) should be used.
c. Follow the rules for that operation.
d. Simplify your answer and convert it to a mixed number, if needed.

Step 4: Gregory’s father told him he needed a rope that was $4 \frac{1}{2}$ times the length of his arm. If Gregory’s arm is $2 \frac{1}{5}$ feet long, what length of rope does he need?

Step 5: In your own words, explain how to add, subtract, multiply and divide with mixed numbers.

**EXAMPLE 1**

Find the value of $2 \frac{1}{4} + 1 \frac{7}{8}$.

Solution

Change each mixed number to an improper fraction.

$2 \frac{1}{4} = \frac{9}{4}, \quad 1 \frac{7}{8} = \frac{15}{8}$

Write equivalent fractions with the least common denominator, 8.

$\frac{9}{4} \times 2 = \frac{18}{8}$ and $\frac{15}{8} \times 2 = \frac{30}{8}$

Add the numerators.

$\frac{18}{8} + \frac{30}{8} = \frac{48}{8}$

Write as a mixed number.

$\frac{48}{8} = 6$.

$2 \frac{1}{4} + 1 \frac{7}{8} = 6$

Whole numbers can be turned into improper fractions by writing the whole number with 1 in the denominator. For example: $5 = \frac{5}{1}$.

**EXAMPLE 2**

Madison had a rope that was 8 feet long. She cut off a piece for a friend that was $5 \frac{3}{4}$ feet long. How much rope does she have left?

Solution

Write the problem.

$8 - 5 \frac{3}{4}$

Change each mixed or whole number to an improper fraction.

$8 = \frac{8}{1}, \quad 5 \frac{3}{4} = \frac{23}{4}$

Write equivalent fractions with the least common denominator, 4.

$\frac{8}{1} \times 4 = \frac{32}{4}$ and $\frac{23}{4} \times 4 = \frac{92}{4}$

Subtract the numerators.

$\frac{32}{4} - \frac{23}{4} = \frac{9}{4}$

Write as a mixed number.

$\frac{9}{4} = 2 \frac{1}{4}$

Madison has $2 \frac{1}{4}$ feet of rope left.
EXAMPLE 3

Find the value of \(2\frac{1}{6} \times \frac{3}{10}\).

**Solution**

Write each mixed number as an improper fraction.

\[
2\frac{1}{6} = \frac{13}{6} \quad \frac{3}{10} = \frac{3}{10}
\]

Multiply the numerators and denominators.

\[
\frac{13}{6} \times \frac{3}{10} = \frac{13 \times 3}{6 \times 10} = \frac{39}{60}
\]

Simplify the fraction.

\[
\frac{39}{60} = \frac{13}{20}
\]

Thus, \(2\frac{1}{6} \times \frac{3}{10} = 2\frac{1}{20}\).

When finding the reciprocal of a whole number, write the whole number as a fraction over 1 and then “flip” the fraction.

\[
3 = \frac{3}{1} \text{ Reciprocal } \frac{1}{3}
\]

EXAMPLE 4

Iona runs six days each week. Each of her runs is equal in length. If her total mileage for the week is \(12\frac{3}{4}\) miles, how long was each run?

**Solution**

Write the problem.

\[12\frac{3}{4} \div 6\]

Write each whole and mixed number as an improper fraction.

\[
12\frac{3}{4} = \frac{51}{4} \quad 6 = \frac{6}{1}
\]

Multiply by the reciprocal of the divisor.

\[
\frac{51}{4} \div \frac{6}{1} = \frac{51}{4} \times \frac{1}{6} = \frac{51}{24}
\]

Simplify the fraction.

\[
\frac{51}{24} = \frac{17}{8}
\]

Change into a mixed number.

\[
\frac{17}{8} = 2\frac{1}{8}
\]

Iona runs \(2\frac{1}{8}\) miles each day.

You can also cross reduce before multiplying.

\[
\frac{17}{\frac{8}{4}} = \frac{17}{2} = 2\frac{1}{8}
\]
1. In your own words, explain the process of multiplying two mixed numbers.

2. Yolanda decided that she did not need to change the two numbers in the problem below into mixed numbers in order to add them. Do you agree or disagree? Why?

5 + 2\frac{1}{5}

Find each sum, difference, product or quotient. Write your answer in simplest form.

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

6. \(4\frac{3}{7} - 2\frac{6}{7}\)
7. \(3\frac{1}{3} - 1\frac{5}{6}\)
8. \(4\frac{3}{8} + 1\frac{1}{4}\)

9. \(4\left(2\frac{3}{8}\right)\)
10. \(3\frac{3}{5} + \frac{7}{10}\)
11. \(7\frac{1}{3} ÷ 4\)

12. \(1\frac{3}{4} + 5\frac{1}{8}\)
13. \(\frac{14}{15} ÷ 2\frac{1}{3}\)
14. \((3\frac{3}{4})(1\frac{1}{5})\)

15. \(6\frac{1}{2} - 2\frac{4}{5}\)
16. \(7\frac{1}{5} ÷ 1\frac{4}{5}\)
17. \((5\frac{3}{4})(3\frac{1}{2})\)

18. You have a piece of wire that is 6\frac{3}{4} inches long. You need to cut the wire into two pieces. One piece needs to be 4\frac{1}{4} inches long and the other piece needs to be 2\frac{2}{3} inches long.
   a. Write 4\frac{1}{4} and 2\frac{2}{3} as improper fractions.
   b. Find the sum of the improper fractions.
   c. Compare your answer to 6\frac{3}{4} inches. Do you have enough wire? Explain.

19. Mia is making chocolate chip cookies. The recipe calls for 2\frac{2}{3} cups sugar. If Mia is tripling the recipe, how much sugar will she need?

20. During a weekend of rain in Astoria, the city recorded 1\frac{3}{4} inches the first day and 1\frac{1}{2} inches the second day. How many inches of rain did Astoria receive over the two-day weekend?

21. A telephone company has to install 2\frac{1}{4} miles of wire. If it takes a crew one day to install \(\frac{3}{8}\) mile of wire, how long will it take the crew to install the entire 2\frac{1}{4} miles of wire?

22. Jennifer long jumps 9\frac{1}{2} feet. Her friend, Sarah, long jumps 8\frac{7}{12} feet. How much further does Jennifer long jump than Sarah?

23. David is mailing an envelope that is 5\frac{1}{4} inches wide and 2\frac{1}{3} inches tall. Find the area of the front of the envelope.
24. Zach tells his teacher that he can add and subtract mixed numbers without changing them into improper fractions.
   a. Look at Zach’s work below to find the value of $2\frac{1}{4} + 1\frac{3}{8}$. Explain Zach’s process for adding the two mixed numbers.
      \[
      \begin{align*}
      2 & + 1 = 3 \\
      \frac{1}{4} + \frac{3}{8} & \Rightarrow \frac{2}{8} + \frac{3}{8} = \frac{5}{8} \\
      3 & + \frac{5}{8} = 3\frac{5}{8}
      \end{align*}
      \]
   b. His teacher agrees that mixed numbers can be added or subtracted without changing them into improper fractions, but says that changing mixed numbers into improper fractions might be easier sometimes. The teacher gives an example of $4\frac{2}{3} + 1\frac{5}{6}$. Why do you think it might be easier to do this operation with improper fractions?

**REVIEW**

Find each sum, difference, product or quotient. Write your answer in simplest form.

25. \( \frac{3}{4} + \frac{5}{12} \)
26. \( \frac{2}{5} - \frac{1}{6} \)
27. \( \frac{4}{11} \cdot \frac{1}{8} \)
28. \( \frac{5}{8} \div \frac{1}{4} \)
29. \( \frac{1}{4} - \frac{1}{4} \)
30. \( \frac{2}{3} \cdot \frac{7}{10} \)

**Tic-Tac-Toe ~ Grid Game**

You will create a grid game that other students can use to review fraction and decimal operations (+, −, ×, ÷). On a sheet of white paper, create an 8 inch by 8 inch grid that is divided into squares that are 2 inches on each side. Create a mixture of fraction and decimal sums, differences, products and quotients. Write an expression on an inside edge of a small square. Write the value of the expression on the adjacent square as seen below.

Continue creating fraction and decimal expressions that require the use of one operation. Put the corresponding answers on the adjacent square. Continue until all inside edges have either an expression or answer. If you would like, you may create distracters on the outside edges of the grid that do not have corresponding expressions or answers. Once your grid game is completed, cut the pieces apart and ask a friend to try to put the puzzle back together. Turn in a master copy of the grid game so your teacher could use it in the future.
Lesson 6 ~ Adding And Subtracting Decimals

Sam, Kim and Jackie got onto an elevator together. Kim weighs 45.36 kilograms. Jackie weighs 47.9 kilograms and Sam weighs 58.22 kilograms. The small elevator has a weight limit of 200 kilograms. One more person wants to get on the elevator but does not want to put them over the limit. How much can this person weigh without putting the elevator over the 200 kg limit?

When adding or subtracting decimals, you must line up the decimal points and then add or subtract the numbers as if they are whole numbers. When finished, you must bring down the decimal point.

\[
\begin{align*}
\text{Kim} & \quad 45.36 \\
\text{Jackie} & \quad 47.90 \\
\text{Sam} & \quad + \quad 58.22 \\
\hline
\text{Total} & \quad 151.48 \text{ kilograms}
\end{align*}
\]

To find how much the last person can weigh, subtract the total weight of the three people from 200 kilograms.

\[
\begin{align*}
200.00 & \\
- 151.48 & \\
\hline
48.52 & \text{ kilograms}
\end{align*}
\]

The last person who gets on the elevator can weigh a maximum of 48.52 kilograms.

---

**Adding and Subtracting Decimals**

1. Line up the decimal points vertically.
2. Insert zeros so each number has the same amount of digits after the decimal point.
3. Add or subtract as with whole numbers.
4. Bring down the decimal point.

**Example 1**

Find the value of \(3.704 + 17.58\).

**Solution**

Write so that the decimals are lined up vertically.

Insert zeros so that there are the same number of digits after the decimal point.

\[
\begin{align*}
3.704 & \\
+17.580 & \\
\hline
21.284 & \text{ Move the decimal point down into the answer.}
\end{align*}
\]

\(3.704 + 17.58 = 21.284\)
**EXAMPLE 2**

Sophia is sick with the flu. There are 5.68 ounces of medicine in the bottle. Her mother plans to give her 0.88 ounces of the medicine today. How much will she have left?

**SOLUTION**

Write the problem.  
5.68 − 0.88

Line up the decimal points and subtract.  
\[
\begin{array}{c}
5.68 \\
−0.88 \\
\hline
4.80
\end{array}
\]

Sophia will have 4.8 ounces of medicine left at the end of the day.

The Commutative and Associative Properties of Addition allow you to rearrange and regroup numbers in addition problems.

**Example 2 Solution**

It is not necessary to write a zero at the end of a decimal. 4.80 = 4.8

**Properties of Addition**

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commutative Property</strong></td>
<td>The order in which numbers are added does not change the value of the expression.</td>
</tr>
<tr>
<td></td>
<td>5 + 3 = 3 + 5</td>
</tr>
<tr>
<td><strong>Associative Property</strong></td>
<td>The way in which numbers are grouped in addition expressions does not change the value of the expression.</td>
</tr>
<tr>
<td></td>
<td>2 + (4 + 7) = (2 + 4) + 7</td>
</tr>
</tbody>
</table>

**EXAMPLE 3**

Walter went to the store and purchased the items listed below. What was the total cost for the four items?

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jar of Pickles</td>
<td>$2.30</td>
</tr>
<tr>
<td>Can of Beans</td>
<td>$1.60</td>
</tr>
<tr>
<td>Bottle of Juice</td>
<td>$1.15</td>
</tr>
<tr>
<td>Loaf of Bread</td>
<td>$1.70</td>
</tr>
</tbody>
</table>

**SOLUTION**

Using the Associative and Commutative Properties, regroup the prices so that mental math can be used.

\[
\begin{align*}
2.30 + 1.70 &= 4.00 \\
1.60 + 1.15 &= 2.75 \\
\text{Total} &= 4.00 + 2.75 = 6.75
\end{align*}
\]

Walter spent $6.75 at the store.
EXERCISES

Find each sum or difference.

1. 6.4 + 2.71  
2. 9.45 − 1.8  
3. 3.29 − 0.62  
4. 14 + 2.39  
5. 10.083 + 1.91  
6. 4 − 1.93  
7. 6.46 − 1.786  
8. 106.045 + 3.06  
9. 17.9 − 2.37  
10. 0.49 + 10.1  
11. 11.3 − 9  
12. 14 − 1.71  
13. John bought 2.64 pounds of broccoli and 3.95 pounds of carrots so his mom could make stir fry for dinner. What was the total weight of his purchase?

14. You decide to take your friend out to lunch. Your meal costs $6.34 and her meal costs $5.19.
   a. What was the total amount of the bill?
   b. If you give the cashier $15, how much change will you get back?

15. Raynesha walked 16.5 miles in the first week of January. In the second week, she walked 10.92 miles and in the third week she walked 12 miles.
   a. How far has she walked in three weeks?
   b. If she wants to reach a total of 60 miles in four weeks, how far does she need to walk in the last week?

16. Narineh has recorded her times in the 100 m dash for each of the first five track meets of the season. Look at the table. What is the difference between her fastest and slowest time?

<table>
<thead>
<tr>
<th>Week</th>
<th>Time (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14.13</td>
</tr>
<tr>
<td>2</td>
<td>13.9</td>
</tr>
<tr>
<td>3</td>
<td>14.38</td>
</tr>
<tr>
<td>4</td>
<td>13.22</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
</tr>
</tbody>
</table>

17. Brendan purchased three small presents for his mother for her birthday and wants to determine the total amount he spent. One present cost $4.40. Another cost $5.98. The last present cost $1.60.
   a. Which two numbers would be easiest to add using mental math? Find their sum.
   b. Add the last number to your sum in part a. What is the total amount Brendan spent for his mother’s birthday?

REVIEW

Find each sum, difference, product or quotient. Write your answer in simplest form.

18. $2\frac{3}{4} + 2\frac{1}{3}$
19. $(5\frac{1}{2})(\frac{3}{5})$
20. $\frac{7}{12} - \frac{1}{4}$
21. $1\frac{3}{7} - \frac{6}{7}$
22. $\frac{2}{3} + 1\frac{5}{6}$
23. $3\frac{1}{8} + 1\frac{1}{4}$
24. $6 \cdot 4\frac{4}{9}$
25. $5\frac{1}{4} - 2\frac{3}{8}$
26. $5\frac{1}{2} ÷ 10$
All marathons are the same length. Haile Gebrselassie from Ethiopia set a new world record for the marathon in 2007. He ran for 2.07 hours at 12.66 miles per hour. How long is the marathon?

In order to find the distance traveled by Gebrselassie, multiply his rate of 12.66 miles per hour by the amount of time he ran \( (d = rt) \).

\[
d = (12.66)(2.07)
\]

Multiply the two numbers as if they are whole numbers.

\[
\begin{array}{c}
12.66 \\
\times 2.07 \\
\hline
8862 \\
0000 \\
2532 \\
\hline
262062
\end{array}
\]

Count the number of digits after the decimal point in the two factors:

- 12.66 → 2 decimal places
- 2.07 → 2 decimal places

Move the decimal this many places in the product. Start on the right and move left.

\[
26.2062
\]

Round the answer to the nearest tenth.

Marathon ≈ 26.2 miles

---

**Multiplying with Decimals**

1. Multiply as if the numbers are whole numbers.
2. Add the number of digits after the decimal point in each factor to find the number of decimal places in the product.
3. Insert zeros, if necessary, to hold place value. Delete zeros that are not necessary.

**Example 1**

Find the value of 4.13(5.2).

**Solution**

Multiply as if the numbers are whole numbers and then insert the decimal point.

\[
\begin{array}{c}
4.13 \\
\times 5.2 \\
\hline
826 \\
2065 \\
\hline
21.476
\end{array}
\]

Move the decimal three places to the left.

\[
4.13(5.2) = 21.476
\]
When dividing decimals, you may first need to move the decimal point. If the divisor is not a whole number, the decimal point must be moved to the right until it is a whole number. The decimal point in the dividend must be moved the same number of places.

**Dividing with Decimals**

1. If the divisor is not a whole number, change the divisor into a whole number by moving the decimal point to the right.
2. If the decimal point in the divisor was moved, move the decimal point in the dividend the same number of places to the right as it was moved in the divisor.
3. Divide the dividend by the divisor.
4. Move the decimal point into the quotient directly above the decimal point in the dividend.
5. If necessary, insert zeros to hold place values.

---

**Example 2**

Find the value of $15.12 \div 3.6$.

**Solution**

Move decimals so the divisor is a whole number.

$15.12 \div 3.6$

Divide as if both numbers are whole numbers and then move the decimal point directly up into the quotient.

$151.2 \div 36$

Isaiah developed 30 pictures from his digital camera. He was charged $2.70. What price did he pay per picture?

**Example 3**

**Solution**

To find the price per picture, find the value of the total cost divided by the number of pictures developed:

$2.70 \div 30$

Isaiah paid $0.09 per picture.
Lesson 7 ~ Multiplying And Dividing Decimals

Find the value of $5 \div 8$.

**Solution**

```
\[
\begin{array}{c|c}
8 & 5.000 \\
\hline
48 & - \\
20 & - \\
16 & - \\
40 & - \\
30 & 0
\end{array}
\]
```

$5 \div 8 = 0.625$

**EXERCISES**

Find each product.

1. $6.2(3)$
2. $0.4(3.9)$
3. $8(0.61)$
4. $1.8(12)$
5. $1.45(5.2)$
6. $0.4(10.5)$
7. $9(2.01)$
8. $0.07(3.1)$
9. $7.2(15.6)$

10. Kendra's cell phone company charges her $0.29 per minute if she goes over her allotted minutes for the month. Last month she went over by 14 minutes. How much extra did she owe on her bill?


12. The price tag under the 10.5 ounce bag of pretzels at the grocery store says the pretzels are $0.18 per ounce. How much does the bag of pretzels cost?

Find each quotient.

13. $10.64 \div 5.6$
14. $8 \div 29.6$
15. $3.87 \div 0.9$
16. $8.84 \div 6.8$
17. $625.2 \div 12$
18. $1.6 \div 40$

19. Shawna bought 2.8 pounds of bananas for $1.68. How much did the bananas cost per pound?

20. Orin spent $12.40 at the arcade. Skyler spent $18.60. How many times greater was Skyler's spending than Orin's spending?
21. Happy Sands Trucking delivers sand to families with sandboxes. The driver delivered 113.6 cubic feet of sand to 8 different houses. Each house received the same amount of sand. Find the amount of sand delivered to each house.

**REVIEW**

Find each sum or difference.

22. 2.48 + 3.9  
23. 0.87 − 0.043  
24. 90.472 − 5.81  
25. 6.04 + 12.2  
26. 7 − 4.32  
27. 9 + 124.7

**Tic-Tac-Toe ~ Numbers Galore**

In many real-world situations, you often have to add more than two fractions or decimals to find the solution. There are two methods you can use to find the sums of expressions with more than two numbers:

1. Find the sum of the first two numbers, then add the third number to the sum, then add the fourth number, and so on...
2. Find the sum of all numbers at the same time by finding the least common denominator of all fractions or lining up the decimal points of all decimals.

Choose either method above to find the value of each expression. Write each answer in simplest form.

1. \( \frac{1}{2} + \frac{3}{4} + \frac{5}{8} \)  
4. 5.49 + 0.04 + 18.2  
7. \( \frac{3}{4} + \frac{3}{8} + \frac{1}{2} + \frac{5}{16} \)  
10. Which method did you use to add the fraction expressions? Which method did you use to add the decimal expressions? Explain why you chose the method(s) you did.

**Tic-Tac-Toe ~ Memory Game**

Write 15 fraction and decimal expressions. Make sure you have a minimum of three expressions for each operation (+, −, ×, ÷). Cut heavy paper (such as card stock, construction paper, index cards or poster board) into 30 equal-sized pieces. Write each expression on one card and write the answer to the expression on another card in simplest form. Use these cards to play a memory game with a friend, classmate or family member. Record each pair of cards each participant wins on a sheet of paper. Turn in the cards and the game sheet to your teacher.
Lesson 1 ~ Simplifying Fractions

Write two fractions that are equivalent to the given fraction.

1. \(\frac{6}{9}\)  
2. \(\frac{5}{20}\)  
3. \(\frac{6}{10}\)

Find the greatest common factor (GCF) of each pair of numbers.

4. 5 and 10  
5. 8 and 12  
6. 24 and 36

Write each fraction in simplest form.

7. \(\frac{10}{20}\)  
8. \(\frac{12}{30}\)  
9. \(\frac{4}{16}\)

10. \(\frac{9}{15}\)  
11. \(\frac{2}{22}\)  
12. \(\frac{24}{54}\)

13. Lyle said the length of his puppy’s tail is \(\frac{10}{12}\) foot long. Simplify this measure!

14. Karianne bought \(\frac{24}{32}\) pound of chicken. Simplify this measurement.
Lesson 2 ~ Mixed Numbers and Improper Fractions

Write the improper fraction and mixed number for each drawing.

15.  

16.  

Write each mixed number as an improper fraction.

17. 4 1/3

18. 2 3/4

19. 1 8/9

20. Anya’s mother is making cookies for the holidays. Her recipe calls for 1 3/4 cups of flour. Write this amount as an improper fraction.

Write each improper fraction as a mixed number.

21. 9/4

22. 22/5

23. 25/2

24. Nicki has grown 11 1/4 inches in the last year. Write this amount as a mixed number.

Lesson 3 ~ Adding and Subtracting Fractions

Find the least common multiple (LCM) of the numbers given.

25. 2 and 8

26. 8 and 12

27. 6 and 10

Find each sum or difference. Write your answer in simplest form.

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

29. \( \frac{3}{4} - \frac{1}{8} \)

30. \( \frac{3}{5} + \frac{3}{4} \)

31. \( \frac{5}{6} + \frac{7}{10} \)

32. \( \frac{1}{2} - \frac{3}{10} \)

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

34. Santiago vacuumed for \( \frac{1}{3} \) hour and then swept floors for \( \frac{1}{4} \) hour. For what fraction of an hour was he doing chores?

35. Tina brought home two kittens from the animal shelter. Slader weighed \( \frac{7}{8} \) pound and Blaze weighed \( \frac{7}{12} \) pound. How much heavier is Slader than Blaze?
Lesson 4 ~ Multiplying and Dividing Fractions

Find each product. Write the answer in simplest form.

36. $\frac{1}{3} \cdot \frac{1}{4}$
37. $\frac{3}{7} \cdot \frac{1}{6}$
38. $\frac{7}{10} \cdot \frac{5}{3}$

39. $\frac{1}{2} \cdot \frac{6}{11}$
40. $\frac{3}{4} \cdot \frac{2}{9}$
41. $\frac{5}{6} \cdot \frac{4}{5}$

42. Gary has a tarp that is $\frac{11}{12}$ yard long. He wants to cut off a piece that is $\frac{1}{3}$ of the size. How long will this piece of tarp be?

Find each quotient. Write the answer in simplest form.

43. $\frac{1}{5} \div \frac{1}{3}$
44. $\frac{3}{7} \div \frac{6}{7}$
45. $\frac{2}{9} \div \frac{1}{5}$

46. $\frac{7}{10} \div \frac{3}{4}$
47. $\frac{2}{5} \div \frac{2}{11}$
48. $\frac{9}{10} \div \frac{3}{8}$

49. Ivan has a board that is $\frac{5}{8}$ yard long. He plans to cut the board into smaller boards that are each $\frac{5}{32}$ yard long. How many boards will he be able to cut?

Lesson 5 ~ Operations with Mixed Numbers

Find each sum, difference, product or quotient. Write the answer in simplest form.

50. $2 \frac{1}{2} + 3 \frac{1}{4}$
51. $(3 \frac{1}{3})(1 \frac{1}{3})$
52. $4 \frac{1}{5} - 3 \frac{1}{4}$

53. $1 \frac{3}{7} - \frac{5}{7}$
54. $5 - 2 \frac{7}{10}$
55. $9 \frac{3}{4} + 3 \frac{1}{4}$

56. $7(1 \frac{3}{5})$
57. $1 \frac{4}{5} + 6 \frac{9}{10}$
58. $5 \frac{1}{4} \div 3$

59. Paul is making chili. The recipe calls for $1 \frac{3}{4}$ cups of canned tomatoes. If Paul is tripling the recipe, how many cups of canned tomatoes will he need?

60. During a weekend in Redmond, the city recorded $3 \frac{2}{3}$ inches of snow on Saturday and $1 \frac{1}{2}$ inches of snow on Sunday. How many inches of snow did Redmond receive over the two-day weekend?
Lesson 6 ~ Adding and Subtracting Decimals

Find each sum or difference.

61. $5.3 + 2.58$
62. $23.25 − 0.8$
63. $8.7 − 0.53$
64. $14 + 7.39$
65. $11.3 + 5.81$
66. $7 − 2.43$
67. Ethan participates in a triathlon. It includes swimming, biking and running. The swimming portion is 0.8 miles. The biking portion of the triathlon is 12.25 miles.
   a. How far has Ethan gone after the swimming and biking portions?
   b. The entire triathlon is 15.6 miles. How long is the running portion?
68. A local news station hosted a three-day fundraiser for flood victims after a winter storm in Oregon. On the first day they received $1,405.62. On the second day they collected $912.44.
   a. How much did they raise in two days?
   b. They want to raise a total of $4,000 for the whole fund-raiser. How much do they need to receive on the third day?

Lesson 7 ~ Multiplying and Dividing Decimals

Find each product or quotient.

69. $7(5.4)$
70. $1.2 \div 13.2$
71. $4.96 ÷ 0.8$
72. $3.4(621)$
73. $10.5 ÷ 0.84$
74. $0.04(1.9)$
75. The price tag below the 8.5-ounce box of crackers at the grocery store says the crackers are $0.28 per ounce. How much does the box of crackers cost?
76. Jed bought 3.6 pounds of pears for $5.22. What was the cost of the pears per pound?

Tic-Tac-Toe ~ Decimals or Fractions?

Write a play with at least four characters. One character should be a fraction. Another character should be a decimal. In the play, the fraction and decimal argue about whom the easiest to work with is when performing the basic operations of adding, subtracting, multiplying and dividing. The characters should provide multiple reasons and examples for their way of thinking.
I am a professional chef. I do a wide variety of tasks in my job. I plan for events, prepare meals and clean up after an event is over. I also prepare budgets and decide how many staff I will need to make sure that an event goes as planned.

Math skills are important in all aspects of my daily duties. I use ratios and proportions to make sure I have the correct amount of food to prepare each dish. I need to know how many portions need to be prepared for a specific meal. I do not want to make too much and end up wasting food. I often use formulas to figure out how much to buy and prepare.

Another important part of being a chef is knowing different types of measurement. Some foods are weighed by ounces while others might be measured in gallons or pounds. I use percentages to calculate how much money to pay for items as well as how much to charge. My calculations have to be accurate to make sure people get just what they want and our company makes a good profit.

I went to a two-year training program in order to become a chef. There are many culinary programs available that do a good job preparing students for this field. I began working as a chef after getting my training. I have gained experience and different skills as I have worked over the years.

Salaries for chefs vary depending upon what type of restaurant or company you work for and how much experience you have. A chef can expect to make around $30,000 per year when they start their career. With experience and skill, chefs can earn much more than that.

I like my job because I enjoy creating meals that people enjoy. It is very rewarding to go through the whole process of buying raw products, preparing them and presenting them to customers. My job changes almost every day and I enjoy working with the other people on my culinary team.