Essential Question
How are operations with rational numbers related to operations with integers?

What Will You Learn?
Place a checkmark (√) in each row that corresponds with how much you already know about each topic before starting this module.

<table>
<thead>
<tr>
<th>KEY</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>— I don’t know.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— I’ve heard of it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>— I know it!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adding and subtracting integers
Finding the distance between two integers on a number line
Multiplying and dividing integers
Simplifying expressions using the order of operations
Evaluating algebraic expressions involving integers
Writing fractions as decimals
Writing repeating decimals as fractions and mixed numbers
Adding and subtracting rational numbers
Multiplying and dividing rational numbers
Simplifying expressions involving rational numbers using the order of operations
Evaluating algebraic expressions involving rational numbers

Foldables Cut out the Foldable and tape it to the Module Review at the end of the module. You can use the Foldable throughout the module as you learn about operations with rational numbers.
What Vocabulary Will You Learn?

Check the box next to each vocabulary term that you may already know.

- ☐ absolute value
- ☐ Additive Inverse Property
- ☐ additive inverses
- ☐ bar notation
- ☐ Distributive Property
- ☐ Multiplicative Identity Property
- ☐ multiplicative inverses
- ☐ Multiplicative Property of Zero
- ☐ opposites
- ☐ order of operations
- ☐ rational number
- ☐ repeating decimal
- ☐ terminating decimal

Are You Ready?

Study the Quick Review to see if you are ready to start this module. Then complete the Quick Check.

**Quick Review**

**Example 1**

Write an equivalent fraction.

Write a fraction that is equivalent to \( \frac{25}{100} \).

\[
\frac{25}{100} = \frac{1}{4}
\]

An equivalent fraction to \( \frac{25}{100} \) is \( \frac{1}{4} \).

**Example 2**

Graph mixed numbers on a number line.

Graph \( 3\frac{2}{3} \) on a number line.

Find the two whole numbers between which \( 3\frac{2}{3} \) lies.

\( 3 < 3\frac{2}{3} < 4 \)

Because the denominator is 3, divide each space into 3 sections.

Draw a dot at \( 3\frac{2}{3} \).

**Quick Check**

1. Write a fraction that is equivalent to \( \frac{24}{36} \).

2. Write a fraction that is equivalent to \( \frac{45}{50} \).

3. Graph \( 1\frac{1}{4} \) on a number line.

**How Did You Do?**

Which exercises did you answer correctly in the Quick Check? Shade those exercise numbers at the right.

126 Module 3 - Operations with Integers and Rational Numbers
Add and Subtract Rational Numbers

I Can... find the additive inverse of a rational number and add and subtract rational numbers.

Learn Rational Numbers and Additive Inverses

Two rational numbers are opposites if they are represented on a number line by points that are the same distance but on opposite sides from zero.

Two points, $\frac{3}{4}$ and $-\frac{3}{4}$, are graphed. They are opposites because they are both $\frac{3}{4}$-unit from zero.

The sum of a number and its opposite, or additive inverse, is zero. The number line shows $-\frac{3}{4} + \frac{3}{4} = 0$.

Example 1 Find Additive Inverses

Find the additive inverse of $-\frac{7}{8}$.

Graph and label a point that is the same distance from zero as $-\frac{7}{8}$.

So, the additive inverse of $-\frac{7}{8}$ is $\boxed{\frac{7}{8}}$. 
Check
Find the additive inverse of \(-\frac{1}{8}\).

Example 2 Find Additive Inverses
Annalise earned $36.82 at her part time job, and she earned $18.50 babysitting.

Find the total amount she earned, the additive inverse, and describe a situation so that Annalise ends the week with zero dollars.

Part A Find the total amount she earned.
If \(p\) is the amount of money Annalise earned at her part time job, \(b\) is the amount of money Annalise earned while babysitting, and \(t\) is the total amount of money earned, then
\[
t = p + b = $36.82 + $18.50 = $

Part B Find the additive inverse.
Annalise ended the week with $0. What number could you add to $55.32 that would result in a sum of $0?

Part C Describe a situation so Annalise ends the week with zero dollars.
Circle the situations that represent \(-$55.32\).

丢失 $55.32  
得到$55.32的礼物
找到$55.32  
赚$55.32
捐赠$55.32  
花费$55.32
Check

Zoey spent $12 on a video and $25.82 on a poster at the music store. Find the total amount she spent, the additive inverse, and describe a situation so that Zoey ends the week with zero dollars.

Part A  What was the total amount?

Part B  What is the additive inverse of the total?

Part C  Which describes a situation so that Zoey ends the week with zero dollars?

A  Zoey earned $37.82 at her lemonade stand.
B  Zoey spent $37.82 on dinner and a movie with friends.
C  Zoey and a friend split the cost of a video game that cost $37.82.
D  Zoey got a $35 gift card for her birthday.

Go Online  You can complete an Extra Example online.

Learn  Add Rational Numbers

The rules that apply to adding fractions and decimals also apply to rational numbers. The rules for adding integers also apply to positive and negative rational numbers.

Use the chart to see some strategies for how to add rational numbers written in different forms.

<table>
<thead>
<tr>
<th>Words</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Terminating Decimals</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-\frac{1}{4}, \frac{3}{8}, \frac{7}{10}...)</td>
</tr>
<tr>
<td>If the fractions are decimals</td>
<td>(\frac{1}{5} + 0.8 = \frac{-1}{5} + \frac{4}{5}) or</td>
</tr>
<tr>
<td>that terminate, use decimals</td>
<td>(-\frac{1}{5} + 0.8 = -0.2 + 0.8)</td>
</tr>
<tr>
<td>or fractions to add.</td>
<td></td>
</tr>
<tr>
<td><strong>Non-Terminating Decimals</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-\frac{1}{9}, \frac{2}{3}, \frac{11}{15}...)</td>
</tr>
<tr>
<td>If the fractions are decimals</td>
<td>(\frac{1}{3} + (-0.25) = \frac{1}{3} + (-\frac{1}{4}))</td>
</tr>
<tr>
<td>that repeat nonzero digits,</td>
<td></td>
</tr>
<tr>
<td>use fractions to add.</td>
<td></td>
</tr>
</tbody>
</table>

When a fraction is negative, the sign may be applied to the fraction, the numerator, or the denominator.

\[ -\frac{2}{3} = -\frac{2}{3} = -\frac{2}{3} \]

When you are adding two fractions with negative signs, the sign is usually applied to the numerator.
Example 3 Add Rational Numbers

Find $-3\frac{5}{9} + 1\frac{2}{9}$. Write in simplest form.

Rewrite the mixed numbers as improper fractions.

$$-3\frac{5}{9} + 1\frac{2}{9} = \frac{-32}{9} + \frac{11}{9}$$

Add the numerators. Assign any negative signs to the numerator.

$$= \frac{-32 + 11}{9}$$

Add.

$$= \frac{-21}{9}$$

Simplify and rename as a mixed number.

$$= \frac{-7}{3} \text{ or } -2\frac{1}{3}$$

So, the sum of $-3\frac{5}{9} + 1\frac{2}{9}$ is _______ or _______.

Check

Find $-3\frac{1}{6} + (-2\frac{5}{6})$.

Think About It!

Because the signs are different, what do you need to do to the mixed numbers before adding them?

Talk About It!

Why is it important when adding rational numbers to rewrite mixed numbers as improper fractions?

Go Online You can complete an Extra Example online.

Example 4 Add Rational Numbers

Find $-\frac{2}{5} + 2.3$.

Because the addends are written in different forms, you can first write them in the same form. The decimal form of $-\frac{2}{5}$ is a terminating decimal. So you can either write the addends as fractions or as decimals.

Method 1 Write both addends as decimals.

$$-\frac{2}{5} + 2.3 = \quad + \quad 2.3$$

Rewrite $-\frac{2}{5}$ as a decimal.

$$= \quad$$

Simplify.

(continued on next page)
Method 2  Write both addends as fractions.

Go Online  Watch the animation to see how to add the two numbers by writing them both as fractions.

\[-\frac{2}{5} + 2.3 = -\frac{2}{5} + \frac{23}{10}\]

Rewrite the decimal as a mixed number.

\[= -\frac{4}{10} + \frac{23}{10}\]

The LCD of 5 and 10 is 10.

\[= -\frac{4 + 23}{10}\]

Add the numerators. Assign the negative sign to the numerator.

\[= \frac{19}{10} \text{ or } 1\frac{9}{10}\]

Add and rename as a mixed number.

So, the sum of \(-\frac{2}{5} + 2.3\) is \(\frac{19}{10}\) or \(1\frac{9}{10}\).

Check

Find \(\frac{2}{5} + (-0.75)\).

Go Online  You can complete an Extra Example online.

Learn  Add Rational Numbers

When adding three or more rational numbers, use the Commutative Property to group numbers by signs or forms.

Grouping numbers with the same form can help simplify the expression.

\[\frac{1}{2} + 0.75 + (-2\frac{1}{3}) + (-3.7)\]

Write the expression.

\[\frac{1}{2} + 0.75 + (-2\frac{1}{3}) + (-3.7)\]

Identify each number's form as either a fraction or a decimal.

\[\frac{1}{2} + (-2\frac{1}{3}) + 0.75 + (-3.7)\]

Rewrite the expression, grouping the numbers by their form.

Talk About It!

In Method 1, you wrote both addends as decimals before adding. Give an example of when Method 1 is not the best method to use. Explain your reasoning.

Talk About It!

How does grouping numbers by like forms help in simplifying an addition expression?
**Example 5  Add Rational Numbers**

The lowest recorded elevation in the contiguous United States, 282 feet below sea level, is in Death Valley. Suppose you began a hike in the parking area near Badwater Basin at 266 feet below sea level. The stopping points of the hike and the elevation traveled are shown in the table.

**What is the elevation of your stopping point?**

<table>
<thead>
<tr>
<th>Stop</th>
<th>Elevation Traveled (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-12.5</td>
</tr>
<tr>
<td>2</td>
<td>26 3/5</td>
</tr>
<tr>
<td>3</td>
<td>-3 1/2</td>
</tr>
<tr>
<td>4</td>
<td>397.3</td>
</tr>
</tbody>
</table>

Because the denominators of the mixed numbers are 2 and 5, it is easy to convert those to decimals. Write all of the numbers as decimals.

\[
-266 + (-12.5) + 26 \frac{3}{5} + (-3 \frac{1}{2}) + 397.3
\]

Write the expression.

\[
= -266 + (-12.5) + 26.6 + (-3.5) + 397.3
\]

Write fractions as decimals.

\[
= -266 + (-12.5) + (-3.5) + 26.6 + 397.3
\]

Commutative Property

\[
= [-266 + (-12.5) + (-3.5)] + [26.6 + 397.3]
\]

Associative Property

\[
= -282 + 423.9
\]

Simplify.

\[
= 141.9
\]

Add.

So, your elevation at the end of the hike is 141.9 feet above sea level.

**Think About It!**

How will you represent the starting point of the hike in the expression?

**Talk About It!**

If the starting point was a rational number, such as \(-266\frac{1}{9}\), would it have changed how you found the sum?
Check

During the annual Hot Air Balloon Rally, hot air balloon pilots need to track their altitude as they travel. During a flight that began at 98.1 meters above sea level, one pilot tracked and recorded her altitude every half hour.

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>Altitude Change (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>226.86</td>
</tr>
<tr>
<td>1</td>
<td>-66 4/8</td>
</tr>
<tr>
<td>1 1/2</td>
<td>-15.32</td>
</tr>
<tr>
<td>2</td>
<td>172 3/4</td>
</tr>
</tbody>
</table>

What is her altitude, in meters, after two hours?

Learn Subtract Rational Numbers

To subtract rational numbers in different forms, write the numbers in the same form.

Go Online Watch the animation to see how to subtract a mixed number and a decimal.

The animation shows how to rewrite a problem using decimals. This method works if the mixed number can be rewritten as a terminating decimal.

Rewrite Using Decimals

<table>
<thead>
<tr>
<th>Steps</th>
<th>Example</th>
</tr>
</thead>
</table>
| 1. Write the mixed number or fraction as a decimal. | \( \frac{2}{5} - 6.55 = \frac{2}{5} - 6.55 \) \\
| | = 2.4 - 6.55 \\
| | = -4.15 |
| 2. Subtract the decimals. | \( 2.4 + (-6.55) \) \\
| | = -4.15 |

(continued on next page)
The animation also shows how to rewrite a problem using fractions or mixed numbers. This method works when the fraction or mixed number cannot be written as a terminating decimal.

### Rewrite Using Fractions or Mixed Numbers

<table>
<thead>
<tr>
<th>Steps</th>
<th>Example</th>
</tr>
</thead>
</table>
| 1. Write the decimal as a fraction or mixed number. | \[4.6 - 2 \frac{2}{3} = 4 \frac{6}{10} - 2 \frac{2}{3}\]  
| | = 4 \frac{3}{5} - 2 \frac{2}{3}  
| | = 4\frac{9}{15} - 2\frac{10}{15}  
| 2. Rewrite fractions with a common denominator. | = \frac{24}{15} + \left(-\frac{10}{15}\right)  
| | = 1\frac{14}{15}  
| 3. Subtract the fractions or mixed numbers. |  
| 4. Simplify if necessary. | 

Use the chart below to find out how to subtract rational numbers written in different forms.

<table>
<thead>
<tr>
<th>Words</th>
<th>Example</th>
</tr>
</thead>
</table>
| Terminating Decimals \( \left(-\frac{1}{4}, \frac{3}{8}, \frac{7}{8} \ldots\right) \) | \(-0.90 - \frac{1}{10} = -\frac{9}{10} - \frac{1}{10} \)  
| | or  
| | = -0.9 - 0.1  
| Non-Terminating Decimals \( \left(-\frac{1}{9}, \frac{2}{3}, \frac{11}{15} \ldots\right) \) | \(-\frac{1}{6} - 0.125 = -\frac{1}{6} - \frac{1}{8} \)  

#### Pause and Reflect

When adding or subtracting rational numbers, how can you use inverse operations to check your work?

Talk About It!
How does knowing how to add rational numbers help you to subtract rational numbers?
Example 6 Subtract Rational Numbers

Find \(-3.27 - (-6.7)\).

Use the same rules to subtract positive and negative decimals as subtracting integers.

<table>
<thead>
<tr>
<th>Integers</th>
<th>Rational Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-3 - (-6))</td>
<td>(-3.27 - (-6.7))</td>
</tr>
<tr>
<td>(-3 + 6)</td>
<td>(-3.27 + 6.7)</td>
</tr>
<tr>
<td>3</td>
<td>3.43</td>
</tr>
</tbody>
</table>

So, because \(|6.7| > |-3.27|\), the sum will have the same sign as 6.7, positive.
So, \(-3.27 - (-6.7)\) is ______.

Check

Find \(-4.2 - 3.57\).

Go Online You can complete an Extra Example online.

Example 7 Subtract Rational Numbers

Find \(\frac{5}{3} - \left(-\frac{5}{9}\right)\). Write in simplest form.

\[
\frac{5}{3} - \left(-\frac{5}{9}\right) = \frac{16}{3} - \left(-\frac{41}{9}\right)
\]

Write the mixed numbers as improper fractions.

\[
= 48 + 41
\]

The LCD of 3 and 9 is 9.
Add using the additive inverse.

\[
= \frac{89}{9} \text{ or } 9\frac{8}{9}
\]

Simplify.

So, the difference of \(\frac{5}{3} - \left(-\frac{5}{9}\right)\) is \(\frac{89}{9}\) or \(9\frac{8}{9}\).

Check

Find \(\frac{3}{2} - \left(-\frac{3}{10}\right)\). Write in simplest form.

Go Online You can complete an Extra Example online.
**Example 8 Evaluate Expressions**

Evaluate \( x - y \) if \( x = -2\frac{4}{5} \) and \( y = 1.4 \).

Determine if the mixed number is a decimal that terminates. Because \( -2\frac{4}{5} \) terminates, you can use either decimals or fractions to subtract.

**Method 1** Evaluate using decimals.

\[
x - y = -2\frac{4}{5} - 1.4 \quad \text{(Replace } x \text{ with } -2\frac{4}{5} \text{ and } y \text{ with 1.4.)}
\]

\[
= -2.8 - 1.4 \quad \text{(Rewrite } -2\frac{4}{5} \text{ as a decimal.)}
\]

\[
= -2.8 + (-1.4) \quad \text{(Add the additive inverse of 1.4.)}
\]

\[
= -4.2 \quad \text{(Simplify.)}
\]

**Method 2** Evaluate using fractions.

\[
x - y = -2\frac{4}{5} - 1.4 \quad \text{(Replace } x \text{ with } -2\frac{4}{5} \text{ and } y \text{ with 1.4.)}
\]

\[
= -2\frac{4}{5} - 1\frac{2}{5} \quad \text{(Rewrite 1.4 as a mixed number.)}
\]

\[
= -2\frac{4}{5} - 1\frac{2}{5} \quad \text{(Write mixed numbers as improper fractions.)}
\]

\[
= -\frac{14}{5} + \left( -\frac{7}{5} \right) \quad \text{(Add the additive inverse of } \frac{7}{5} \text{.)}
\]

\[
= -\frac{21}{5} \quad \text{or} \quad -4\frac{1}{5} \quad \text{(Add.)}
\]

So, when \( x = -2\frac{4}{5} \) and \( y = 1.4 \), \( x - y = \) or \( \) .

**Check**

Evaluate \( x - y \) if \( x = 3\frac{3}{4} \) and \( y = -4.2 \). Write in simplest form.

**Go Online** You can complete an Extra Example online.

**Foldables** It’s time to update your Foldable, located in the Module Review, based on what you learned in this lesson. If you haven't already assembled your Foldable, you can find the instructions on page FL1.
Apply Animal Care

A veterinarian measures the changes in a cat's weight over four months. If the cat weighed 17.25 pounds at its first visit, what is the cat's weight after its last visit?

<table>
<thead>
<tr>
<th>Month</th>
<th>Change from Previous Month (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>−0.5</td>
</tr>
<tr>
<td>2</td>
<td>−2(\frac{1}{5})</td>
</tr>
<tr>
<td>3</td>
<td>(\frac{3}{10})</td>
</tr>
<tr>
<td>4</td>
<td>0.35</td>
</tr>
</tbody>
</table>

1 What is the task?
Make sure you understand exactly what question to answer or problem to solve. You may want to read the problem three times. Discuss these questions with a partner.

First Time Describe the context of the problem, in your own words.
Second Time What mathematics do you see in the problem?
Third Time What are you wondering about?

2 How can you approach the task? What strategies can you use?

3 What is your solution?
Use your strategy to solve the problem.

4 How can you show your solution is reasonable?

Write About It! Write an argument that can be used to defend your solution.
Check

A local forest that covers \( \frac{4727}{10} \) acres has gone through periods of growth and loss over the past four years. In some years, firefighters started a controlled burn that burns part of the forest in order to encourage new growth. Each year they track the changes in the area of the forest. Find the area of the forest after the four years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Change in Area (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( \frac{34}{5} )</td>
</tr>
<tr>
<td>2</td>
<td>( -\frac{11}{2} )</td>
</tr>
<tr>
<td>3</td>
<td>( -7.9 )</td>
</tr>
<tr>
<td>4</td>
<td>( \frac{22}{5} )</td>
</tr>
</tbody>
</table>

Pause and Reflect

Think about scenarios, when adding or subtracting rational numbers, where it would be beneficial to change all the numbers to decimals, or all to fractions. Give examples.
Practice

Find the additive inverse of each rational number. (Example 1)

1. \(-\frac{1}{2}\)  
2. 0.25  
3. \(\frac{9}{10}\)  
4. \(-0.4\)

5. Quinn earned $24.50 dog-sitting and $12.70 for recycling cans. Find the total amount he earned and describe a situation in which Quinn ends the week with zero dollars. (Example 2)

Add or Subtract. Write in simplest form. (Examples 3, 4, 6, 7)

6. \(3\frac{5}{6} + \left(-\frac{11}{16}\right)\)  
7. \(-\frac{2}{3} + 2\frac{3}{8}\)  
8. \(-3.7 + \frac{1}{4}\)

9. \(\frac{1}{3} + 4.1\)  
10. \(-1\frac{1}{4} + 0.75 + 0.45\)  
11. \(-2.45 - (-3.9)\)

12. \(5.47 - (-2.8)\)  
13. \(7\frac{5}{12} - \left(-3\frac{3}{4}\right)\)  
14. \(-\frac{7}{8} - \frac{1}{6}\)

15. Marlee is making jewelry for a class craft show. She began with 115 inches of wire. She used 25.75 inches for rings. Then her teacher gave her 30\(\frac{1}{4}\) inches of wire to make more jewelry. She then used 38\(\frac{1}{2}\) inches for the bracelets and 60.2 inches for necklaces. How much wire does Marlee have left? (Example 5)

16. Equation Editor  Evaluate \(a - b\) if \(a = -2.5\) and \(b = \frac{2}{5}\). Write your answer in simplest form.
Apply

17. Jada measures the changes in her dog’s weight over the entire year. She weighs her dog every 3 months and records the results. If Jada’s dog weighed 55.75 pounds at the beginning of the year, what is the dog’s weight at the end of the year?

<table>
<thead>
<tr>
<th>Months</th>
<th>Difference from Previous Weight (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January–March</td>
<td>+2.125</td>
</tr>
<tr>
<td>April–June</td>
<td>−3(\frac{1}{4})</td>
</tr>
<tr>
<td>July–September</td>
<td>−(\frac{1}{2})</td>
</tr>
<tr>
<td>October–December</td>
<td>+0.875</td>
</tr>
</tbody>
</table>

18. A local petting zoo allows visitors to feed the goats food pellets. The petting zoo starts the month with 525.25 pounds of food pellets. Each week, the workers track the amount of food pellets given out and any food pellet deliveries. Use the table to determine the number of pounds of food pellets the petting zoo will have at the end of the month.

<table>
<thead>
<tr>
<th>Week</th>
<th>Change in Food Pellets (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>−164(\frac{1}{2})</td>
</tr>
<tr>
<td>2</td>
<td>−189.75</td>
</tr>
<tr>
<td>3</td>
<td>355(\frac{7}{8})</td>
</tr>
<tr>
<td>4</td>
<td>−200(\frac{3}{16})</td>
</tr>
</tbody>
</table>

19. Write an addition problem with unlike mixed numbers and a least common denominator of 16. Find the sum in simplest form.

20. Suppose you use 8 instead of 4 as a common denominator when finding \(7\frac{1}{2} - (−3\frac{1}{4})\). How will that change the process for finding the difference?

21. **Find the Error** A student is adding 1\(\frac{2}{9}\), 3\(\frac{1}{3}\), and −4\(\frac{5}{6}\). The first step the student performs is to find the common denominator of 9, 3, and 6. Find the student’s mistake and correct it.

The least common denominator of 9, 3, and 6 is 18 because you can divide 18 by all of these numbers without getting a remainder.

22. **Use a Counterexample** Is the following statement true or false? If false, provide a counterexample.

The difference between a positive mixed number and negative mixed number is never positive.
Module 3 • Operations with Integers and Rational Numbers

**Foldables** Use your Foldable to help review the module.

**Rate Yourself!**

Complete the chart at the beginning of the module by placing a checkmark in each row that corresponds with how much you know about each topic after completing this module.

<table>
<thead>
<tr>
<th>Write about one thing you learned.</th>
<th>Write about a question you still have.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Module 3 • Operations with Integers and Rational Numbers** 215
Reflect on the Module
Use what you learned about operations with integers and rational numbers to complete the graphic organizer.

Essential Question
How are operations with rational numbers related to operations with integers?

Operations with Integers and Rational Numbers

- Add
- Subtract
- Multiply
- Divide
Test Practice

1. Open Response Christine is finding the sum 28 + (−15) + 22. (Lesson 1)
   A. What property of addition could she use to write the integers in a different order? Explain why she might want to do this.

   B. Find the sum of 28 + (−15) + 22.

2. Equation Editor The table shows the high temperature on the moon during the day and the overnight low temperature. (Lesson 2)

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day</td>
<td>253°F</td>
</tr>
<tr>
<td>Night</td>
<td>−387°F</td>
</tr>
</tbody>
</table>

   What is the range between the moon’s minimum and maximum temperature in degrees Fahrenheit?

3. Equation Editor Find \(ab^2c\) if \(a = -3, b = -2,\) and \(c = 6.\) (Lesson 3)

4. Table Item Determine whether the quotient of each expression will be positive or negative. (Lesson 4)

<table>
<thead>
<tr>
<th>positive</th>
<th>negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-14 \div (-2))</td>
<td>(64 \div 4)</td>
</tr>
</tbody>
</table>
   | 1,256 \div 8 | |}

5. Open Response The equation \(C = \frac{5(F - 32)}{9}\) can be used to convert temperatures in degrees Fahrenheit to degrees Celsius. (Lesson 5)

<table>
<thead>
<tr>
<th>State of Water</th>
<th>Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freezing Point</td>
<td>32</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>212</td>
</tr>
</tbody>
</table>

   Find the freezing point and boiling point of water in degrees Celsius.

6. Multiple Choice Which of the following is the decimal representation of the rational number \(-\frac{5}{12}\)? (Lesson 6)

   A. −0.41\(\bar{6}\)
   B. 0.41\(\bar{6}\)
   C. −0.41\(\bar{6}\)
   D. 0.41\(\bar{6}\)
7. **Open Response** The manager of Happy Puppy dog boarding company begins the month with 85.4 pounds of dog food and tracks the weekly use, along with the supply delivery received in the middle of the month. (Lesson 7)

<table>
<thead>
<tr>
<th>Week</th>
<th>Weekly Dog Food Use (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-28.4</td>
</tr>
<tr>
<td>2</td>
<td>-21 5/8</td>
</tr>
<tr>
<td>3</td>
<td>97 2/4</td>
</tr>
<tr>
<td>4</td>
<td>-30.25</td>
</tr>
</tbody>
</table>

How much dog food does the company have on hand at the end of the month?

8. **Equation Editor** At the beginning of the day, Meredith has 85.4 pounds of apples to sell at a farmer's market. The table shows the hourly change in the amount of apples she has after the first several hours. (Lesson 7)

<table>
<thead>
<tr>
<th>Hour</th>
<th>Change in Apples (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-8.5</td>
</tr>
<tr>
<td>2</td>
<td>-12 2/3</td>
</tr>
<tr>
<td>3</td>
<td>-16 1/5</td>
</tr>
<tr>
<td>4</td>
<td>-10.2</td>
</tr>
</tbody>
</table>

After 4 hours, about how many pounds of apples does Meredith have left?

9. **Multiple Choice** What is the result when \(-\frac{7}{8}\) is multiplied by \(-3.5\)? (Lesson 8)

A 3 1/16  
B 2 11/16  
C \(-\frac{11}{16}\)  
D \(-\frac{3}{16}\)

10. **Equation Editor** Find \(-\frac{11}{12} ÷ \left(-\frac{2}{3}\right)\). Express your answer as a fraction or mixed number in simplest form. (Lesson 8)

11. **Open Response** Nathaniel has 132 DVDs in his collection. Each DVD case has the dimensions shown. He plans to buy shelves for the collection that are 31.5 inches wide and cost $15.75 each. How much will it cost Nathaniel to shelve his DVD collection? Explain how you found your answer. (Lesson 9)
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CONTENTS

VOLUME 1
MODULE 1  PROPORTIONAL RELATIONSHIPS
MODULE 2  SOLVE PERCENT PROBLEMS
MODULE 3  OPERATIONS WITH INTEGERS AND RATIONAL NUMBERS
MODULE 4  EXPONENTS AND SCIENTIFIC NOTATION
MODULE 5  REAL NUMBERS
MODULE 6  ALGEBRAIC EXPRESSIONS
MODULE 7  EQUATIONS AND INEQUALITIES

VOLUME 2
MODULE 8  LINEAR RELATIONSHIPS AND SLOPE
MODULE 9  PROBABILITY
MODULE 10  SAMPLING AND STATISTICS
MODULE 11  GEOMETRIC FIGURES
MODULE 12  AREA, SURFACE AREA, AND VOLUME
MODULE 13  TRANSFORMATIONS, CONGRUENCE, AND SIMILARITY

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