Rational Numbers

ESSENTIAL QUESTION
How can you use rational numbers to solve real-world problems?

Real-World Video
In sports like baseball, coaches, analysts, and fans keep track of players’ statistics such as batting averages, earned run averages, and runs batted in. These values are reported using rational numbers.

MODULE 3
LESSON 3.1
Classifying Rational Numbers
6.NS.6

LESSON 3.2
Identifying Opposites and Absolute Value of Rational Numbers
6.NS.6, 6.NS.6a, 6.NS.6c, 6.NS.7, 6.NS.7c

LESSON 3.3
Comparing and Ordering Rational Numbers
6.NS.7, 6.NS.7a, 6.NS.7b

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Interactively explore key concepts to see how math works.

Get immediate feedback and help as you work through practice sets.
Complete these exercises to review skills you will need for this module.

**Write an Improper Fraction as a Mixed Number**

**EXAMPLE**

\[
\frac{11}{3} = \frac{3}{3} + \frac{3}{3} + \frac{2}{3} = 1 + 1 + \frac{2}{3} = 3 + \frac{2}{3} = 3\frac{2}{3}
\]

Write as a sum using names for one plus a proper fraction. Write each name for one as one. Add the ones. Write the mixed number.

Write each improper fraction as a mixed number.

1. \(\frac{7}{2}\)  
2. \(\frac{12}{5}\)  
3. \(\frac{11}{7}\)  
4. \(\frac{15}{4}\)

**Write a Mixed Number as an Improper Fraction**

**EXAMPLE**

\[
3\frac{3}{4} = 1 + 1 + 1 + \frac{3}{4} = \frac{4}{4} + \frac{4}{4} + \frac{4}{4} + \frac{3}{4} = \frac{15}{4}
\]

Write the whole number as a sum of ones. Use the denominator of the fraction to write equivalent fractions for the ones. Add the numerators.

Write each mixed number as an improper fraction.

5. \(\frac{21}{2}\)  
6. \(\frac{43}{5}\)  
7. \(\frac{34}{9}\)  
8. \(\frac{25}{7}\)

**Compare and Order Decimals**

**EXAMPLE** Order from least to greatest: 7.32, 5.14, 5.16.

7.32 is greatest. 5.14 < 5.16 The order is 5.14, 5.16, 7.32.

Use place value to compare numbers, starting with ones, then tenths, then hundredths.

Compare the decimals.

9. 8.86 _____ 8.65  
10. 0.732 _____ 0.75  
11. 0.22 _____ 0.022

12. Order 0.98, 0.27, and 0.34 from greatest to least. __________________________
Visualize Vocabulary

Use the ✔️ words to complete the web. You may put more than one word in each box.

-15, -45, -60

25, 71, 102

Integers

-20 and 20

9

Understand Vocabulary

Fill in each blank with the correct term from the preview words.

1. A _______________________ is any number that can be written as a ratio of two integers.

2. A _______________________ is used to show the relationships between groups.

Active Reading

Tri-Fold Before beginning the module, create a tri-fold to help you learn the concepts and vocabulary in this module. Fold the paper into three sections. Label the columns “What I Know,” “What I Need to Know,” and “What I Learned.” Complete the first two columns before you read. After studying the module, complete the third column.
### Rational Numbers

#### What It Means to You

You can order rational numbers to understand relationships between values in the real world.

#### EXAMPLE 6.NS.7B

The fraction of crude oil produced in the United States by four states in 2011 is shown.

<table>
<thead>
<tr>
<th>State</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>1/100</td>
</tr>
<tr>
<td>TX</td>
<td>9/50</td>
</tr>
<tr>
<td>ND</td>
<td>3/50</td>
</tr>
<tr>
<td>AL</td>
<td>3/25</td>
</tr>
</tbody>
</table>

Which state produced the least oil?

CA = \( \frac{1}{100} \)

TX = \( \frac{9}{50} = \frac{18}{100} \)

ND = \( \frac{3}{50} = \frac{6}{100} \)

AL = \( \frac{3}{25} = \frac{12}{100} \)

California (CA) produced the least crude oil in 2011.

### What It Means to You

You can use absolute value to describe a number’s distance from 0 on a number line and compare quantities in real-world situations.

#### EXAMPLE 6.NS.7C

Use the number line to determine the absolute values of \(-4.5^\circ F\) and \(-7.5^\circ F\) and to compare the temperatures.

\[ |\ -4.5\ | = 4.5 \quad \text{The absolute value of} \ -4.5 \text{is} \ 4.5. \]

\[ |\ -7.5\ | = 7.5 \quad \text{The absolute value of} \ -7.5 \text{is} \ 7.5. \]

\(-7.5\) is farther to the left of 0 than \(-4.5\), so \(-7.5 < -4.5\) and \(-7.5^\circ F\) is colder than \(-4.5^\circ F\).
EXPLORE ACTIVITY

Representing Division as a Fraction

Alicia and her friends Brittany, Kenji, and Ellis are taking a pottery class. The four friends have to share 3 blocks of clay. How much clay will each of them receive if they divide the 3 blocks evenly?

A. The top faces of the 3 blocks of clay can be represented by squares. Use the model to show the part of each block that each friend will receive. Explain your method.

B. Each piece of one square is equal to what fraction of a block of clay?

C. Explain how to arrange the pieces to model the amount of clay each person gets. Sketch the model.

D. What fraction of a square does each person’s pieces cover? Explain.

E. How much clay will each person receive?

F. Multiple Representations How does this situation represent division?
Rational Numbers

A **rational number** is any number that can be written as \( \frac{a}{b} \), where \( a \) and \( b \) are integers and \( b \neq 0 \).

**EXAMPLE 1**

Write each rational number as \( \frac{a}{b} \).

A \( 3 \frac{2}{5} \) Convert the mixed number to a fraction greater than 1.

\[
3 \frac{2}{5} = \frac{17}{5}
\]

B 0.6 The decimal is six tenths. Write as a fraction.

\[
0.6 = \frac{6}{10}
\]

C 34 Write the whole number as a fraction with a denominator of 1.

\[
34 = \frac{34}{1}
\]

D \(-7\) Write the integer as a fraction with a denominator of 1.

\[
-7 = -\frac{7}{1}
\]

**YOUR TURN**

Write each rational number as \( \frac{a}{b} \).

3. \(-15\)

4. 0.31

5. \(\frac{45}{9}\)

6. 62
Classifying Rational Numbers

A Venn diagram is a visual representation used to show the relationships between groups. The Venn diagram below shows how rational numbers, integers, and whole numbers are related.

![Venn Diagram]

Rational numbers include integers and whole numbers.
Integers include whole numbers.

EXAMPLE 2

Place each number in the Venn diagram. Then classify each number by indicating in which set or sets each number belongs.

A 75 The number 75 belongs in the sets of whole numbers, integers, and rational numbers.
B \(-3\) The number \(-3\) belongs in the sets of integers and rational numbers.
C \(\frac{3}{4}\) The number \(\frac{3}{4}\) belongs in the set of rational numbers.
D 0.35 The number 0.35 belongs in the set of rational numbers.

Reflect

7. Analyze Relationships Describe how the Venn diagram models the relationship between rational numbers, integers, and whole numbers.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
Guided Practice

1. Sarah and four friends are decorating picture frames with ribbon. They have 4 rolls of ribbon to share evenly. (Explore Activity 1)
   a. How does this situation represent division?
   b. How much ribbon does each person receive?

Write each rational number in the form \( \frac{a}{b} \), where \( a \) and \( b \) are integers. (Example 1)

2. 0.7
3. \(-29\)
4. \(8\frac{1}{3}\)

Place each number in the Venn diagram. Then classify each number by indicating in which set or sets it belongs. (Example 2)

5. \(-15\)
6. \(5\frac{10}{11}\)

7. How is a rational number that is not an integer different from a rational number that is an integer?
List two numbers that fit each description. Then write the numbers in the appropriate location on the Venn diagram.

8. Integers that are not whole numbers
   _______________________

9. Rational numbers that are not integers
   _______________________

10. **Multistep** A nature club is having its weekly hike. The table shows how many pieces of fruit and bottles of water each member of the club brought to share.

<table>
<thead>
<tr>
<th>Member</th>
<th>Pieces of Fruit</th>
<th>Bottles of Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baxter</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Hendrick</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Mary</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Kendra</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

a. If the hikers want to share the fruit evenly, how many pieces should each person receive?
   _______________________

b. Which hikers received more fruit than they brought on the hike?
   _______________________

c. The hikers want to share their water evenly so that each member has the same amount. How much water does each hiker receive?
   _______________________

11. Sherman has 3 cats and 2 dogs. He wants to buy a toy for each of his pets. Sherman has $22 to spend on pet toys. How much can he spend on each pet? Write your answer as a fraction and as an amount in dollars and cents.
   _______________________

12. A group of 5 friends are sharing 2 pounds of trail mix. Write a division problem and a fraction to represent this situation.
   _______________________

13. **Vocabulary** A _______ diagram can represent set relationships visually.
Financial Literacy  For 14–16, use the table. The table shows Jason’s utility bills for one month. Write a fraction to represent the division in each situation. Then classify each result by indicating the set or sets to which it belongs.

14. Jason and his 3 roommates share the cost of the electric bill evenly.

15. Jason plans to pay the water bill with 2 equal payments.

16. Jason owes $15 for last month’s gas bill also. The total amount of the two gas bills is split evenly among the 4 roommates.

17. Lynn has a watering can that holds 16 cups of water, and she fills it half full. Then she waters her 15 plants so that each plant gets the same amount of water. How many cups of water will each plant get?

H.O.T. FOCUS ON HIGHER ORDER THINKING

18. Critique Reasoning  DaMarcus says the number $\frac{24}{6}$ belongs only to the set of rational numbers. Explain his error.

19. Analyze Relationships  Explain how the Venn diagrams in this lesson show that all integers and all whole numbers are rational numbers.

20. Critical Thinking  Is it possible for a number to be a rational number that is not an integer but is a whole number? Explain.
LESSON 3.2 Identifying Opposites and Absolute Value of Rational Numbers

ESSENTIAL QUESTION
How do you identify opposites and absolute value of rational numbers?

EXPLORE ACTIVITY
Positive and Negative Rational Numbers
All rational numbers can be represented as points on a number line. Positive rational numbers are greater than 0. They are located to the right of 0 on a number line. Negative rational numbers are less than 0. They are located to the left of 0 on a number line.

Water levels with respect to sea level, which has elevation 0, may be measured at beach tidal basins. Water levels below sea level are represented by negative numbers.

A The table shows the water level at a tidal basin at different times during a day. Graph the level for each time on the number line.

<table>
<thead>
<tr>
<th>Time</th>
<th>4 A.M. A</th>
<th>8 A.M. B</th>
<th>Noon C</th>
<th>4 P.M. D</th>
<th>8 P.M. E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level (ft)</td>
<td>3.5</td>
<td>2.5</td>
<td>-0.5</td>
<td>-2.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

B How did you know where to graph -0.5? _______________________________________________________________________

C At what time or times is the level closest to sea level? How do you know?
__________________________________________________________________________

D Which point is located halfway between -3 and -2? ________________

E Which point is the same distance from 0 as D? ______________________

Reflect
1. Communicate Mathematical Ideas How would you graph -2.25? Would it be left or right of point D?
__________________________________________________________________________

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Rational Numbers and Opposites on a Number Line

You can find the opposites of rational numbers that are not integers the same way you found the opposites of integers. Two rational numbers are opposites if they are the same distance from 0 but on different sides of 0.

\[ 2\frac{3}{4} \text{ and } -2\frac{3}{4} \text{ are opposites.} \]

EXAMPLE 1

Until June 24, 1997, the New York Stock Exchange priced the value of a share of stock in eighths, such as \$27\frac{1}{8}\text{ or at }\$41\frac{3}{4}. The change in value of a share of stock from day to day was also represented in eighths as a positive or negative number.

The table shows the change in value of a stock over two days. Graph the change in stock value for Wednesday and its opposite on a number line.

<table>
<thead>
<tr>
<th>Day</th>
<th>Tuesday</th>
<th>Wednesday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in value ($)</td>
<td>(1 \frac{5}{8})</td>
<td>(-4 \frac{1}{4})</td>
</tr>
</tbody>
</table>

**STEP 1**

Graph the change in stock value for Wednesday on the number line.

The change in value for Wednesday is \(-4 \frac{1}{4}\).

Graph a point \(4 \frac{1}{4}\) units below 0.

**STEP 2**

Graph the opposite of \(-4 \frac{1}{4}\).

The opposite of \(-4 \frac{1}{4}\) is the same distance from 0 but on the other side of 0.

The opposite of \(-4 \frac{1}{4}\) is \(4 \frac{1}{4}\).

The opposite of the change in stock value for Wednesday is \(4 \frac{1}{4}\).

YOUR TURN

2. What are the opposites of 7, \(-3.5\), 2.25, and \(9 \frac{1}{3}\)?

______________________
Absolute Values of Rational Numbers

You can find the absolute value of a rational number that is not an integer the same way you found the absolute value of an integer. The absolute value of a rational number is the number’s distance from 0 on the number line.

**EXAMPLE 2**

The table shows the average low temperatures in January in one location during a five-year span. Find the absolute value of the average January low temperature in 2009.

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
<td>−3.2</td>
<td>−5.4</td>
<td>−0.8</td>
<td>3.8</td>
<td>−2</td>
</tr>
</tbody>
</table>

**STEP 1** Graph the 2009 average January low temperature.

The 2009 average January low is −5.4 °C.

Graph a point 5.4 units below 0.

**STEP 2** Find the absolute value of −5.4.

−5.4 is 5.4 units from 0.

| −5.4 | = 5.4

**Reflect**

3. **Communicate Mathematical Ideas** What is the absolute value of the average January low temperature in 2011? How do you know?

**YOUR TURN**

Graph each number on the number line. Then use your number line to find each absolute value.

4. −4.5; | −4.5 | =

5. $\frac{1}{2}$; $|\frac{1}{2}| =$

6. 4; | 4 | =

7. $-3\frac{1}{4}$; $|-3\frac{1}{4}| =$
Graph each number and its opposite on a number line. (Explore Activity and Example 1)

1. \(-2.8\)
2. \(4.3\)
3. \(-3\frac{4}{5}\)
4. \(1\frac{1}{3}\)

Find the opposite of each number. (Example 1)

5. \(3.78\)
6. \(-7\frac{5}{12}\)
7. \(0\)
8. \(4.2\)
9. \(12.1\)
10. \(2.6\)

11. **Vocabulary** Explain why 2.15 and \(-2.15\) are opposites. (Example 1)

12. \(5.23\)
13. \(-4\frac{2}{11}\)
14. \(0\)
15. \(-6\frac{3}{5}\)
16. \(-2.12\)
17. \(8.2\)

18. Use absolute value to write a definition of the opposite of a nonzero rational number. Give an example.
19. **Financial Literacy** A store’s balance sheet represents the amounts customers owe as negative numbers and credits to customers as positive numbers.

<table>
<thead>
<tr>
<th>Customer</th>
<th>Girardi</th>
<th>Lewis</th>
<th>Stein</th>
<th>Yuan</th>
<th>Wenner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance ($)</td>
<td>-85.23</td>
<td>20.44</td>
<td>-116.33</td>
<td>13.50</td>
<td>-9.85</td>
</tr>
</tbody>
</table>

a. Write the opposite of each customer’s balance.

b. Mr. Yuan wants to use his credit to pay off the full amount that another customer owes. Which customer’s balance does Mr. Yuan have enough money to pay off?

c. Which customer’s balance would be farthest from 0 on a number line? Explain.

20. **Multistep** Trina went scuba diving and reached an elevation of -85.6 meters, which is below sea level. Jessie went hang-gliding and reached an altitude of 87.9 meters, which is above sea level.

a. Who is closer to the surface of the ocean? Explain.

b. Trina wants to hang-glide at the same number of meters above sea level as she scuba-dived below sea level. Will she fly higher than Jessie did? Explain.

21. **Critical Thinking** Carlos finds the absolute value of -5.3, and then finds the opposite of his answer. Jason finds the opposite of -5.3, and then finds the absolute value of his answer. Whose final value is greater? Explain.
22. **Explain the Error** Two students are playing a math game. The object of the game is to make the least possible number by arranging given digits inside absolute value bars on a card. In the first round, each player will use the digits 3, 5, and 7.

a. One student arranges the numbers on the card as shown. What was this student’s mistake?

b. What is the least possible number the card can show?

23. **Analyze Relationships** If you plot the point $-8.85$ on a number line, would you place it to the left or right of $-8.8$? Explain.

24. **Make a Conjecture** If the absolute value of a negative number is 2.78, what is the distance on the number line between the number and its absolute value? Explain your answer.

25. **Multiple Representations** The deepest point in the Indian Ocean is the Java Trench, which is 25,344 feet below sea level. Elevations below sea level are represented by negative numbers.

a. Write the elevation of the Java Trench.

b. A mile is 5,280 feet. Between which two integers is the elevation in miles?

c. Graph the elevation of the Java Trench in miles.

26. **Draw Conclusions** A number and its absolute value are equal. If you subtract 2 from the number, the new number and its absolute value are not equal. What do you know about the number? What is a possible number that satisfies these conditions?
Lesson 3.3

Comparing and Ordering Rational Numbers

ESSENTIAL QUESTION

How do you compare and order rational numbers?

EXPLORE ACTIVITY

Equivalent Fractions and Decimals

Fractions and decimals that represent the same value are equivalent. The number line shows some equivalent fractions and decimals from 0 to 1.

A. Complete the number line by writing the missing decimals or fractions.

B. Use the number line to find a fraction that is equivalent to 0.25. Explain.

C. Explain how to find a decimal equivalent to 1 7/10.

D. Use the number line to complete each statement.

0.2 = _____ _____ = 3/10 0.75 = _____ 1.25 = _____

Reflect

1. Communicate Mathematical Ideas How does a number line represent equivalent fractions and decimals?

2. Name a decimal between 0.4 and 0.5.
Ordering Fractions and Decimals

You can order fractions and decimals by rewriting the fractions as equivalent decimals or by rewriting the decimals as equivalent fractions.

**EXAMPLE 1**

A Order $0.2, \frac{3}{4}, 0.8, \frac{1}{2}, \frac{1}{4}$, and $0.4$ from least to greatest.

**STEP 1** Write the fractions as equivalent decimals.

\[
\frac{1}{4} = 0.25 \quad \frac{1}{2} = 0.5 \quad \frac{3}{4} = 0.75
\]

**STEP 2** Use the number line to write the decimals in order.

\[0.2 < 0.25 < 0.4 < 0.5 < 0.75 < 0.8\]

The numbers from least to greatest are $0.2, \frac{1}{4}, 0.4, \frac{1}{2}, \frac{3}{4}, 0.8$.

B Order $\frac{1}{12}, \frac{2}{3}$, and $0.35$ from least to greatest.

**STEP 1** Write the decimal as an equivalent fraction.

\[
0.35 = \frac{35}{100} = \frac{7}{20}
\]

**STEP 2** Find equivalent fractions with $60$ as the common denominator.

\[
\begin{align*}
\frac{1}{12} & \times \frac{5}{5} = \frac{5}{60} \\
\frac{2}{3} & \times \frac{20}{20} = \frac{40}{60} \\
\frac{7}{20} & \times \frac{3}{3} = \frac{21}{60}
\end{align*}
\]

**STEP 3** Order fractions with common denominators by comparing the numerators.

\[5 < 21 < 40\]

The fractions in order from least to greatest are $\frac{5}{60}, \frac{21}{60}, \frac{40}{60}$.

The numbers in order from least to greatest are $\frac{1}{12}, 0.35, \frac{2}{3}$.

**YOUR TURN**

Order the fractions and decimals from least to greatest.

3. $0.85, \frac{3}{5}, 0.15, \frac{7}{10}$
Comparing and Ordering Rational Numbers

You can use a number line to compare and order positive and negative rational numbers.

**EXAMPLE 2** Real World

Five friends completed a triathlon that included a 3-mile run, a 12-mile bike ride, and a 1 1/2-mile swim. To compare their running times they created a table that shows the difference between each person’s time and the average time, with negative numbers representing times less than the average.

<table>
<thead>
<tr>
<th>Runner</th>
<th>John</th>
<th>Sue</th>
<th>Anna</th>
<th>Mike</th>
<th>Tom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time above or below average (minutes)</td>
<td>1/2</td>
<td>1.4</td>
<td>-1 1/4</td>
<td>-2.0</td>
<td>1.95</td>
</tr>
</tbody>
</table>

Use a number line to order the numbers from greatest to least.

**STEP 1** Write the fractions as equivalent decimals.

\[ \frac{1}{2} = 0.5 \quad -1 \frac{1}{4} = -1.25 \]

**STEP 2** Use the number line to write the decimals in order.

\[ -2.0, -1.5, -1.0, -0.5, 0.0, 0.5, 1.0, 1.5, 2.0 \]

The numbers in order from greatest to least are 1.95, 1.4, \( \frac{1}{2}, -1 \frac{1}{4}, -2.0 \).

Reflect

4. **Communicate Mathematical Ideas** Explain how you can use the number line to compare the rational numbers for Anna and Mike.

5. To compare their bike times, the friends created a table that shows the difference between each person’s time and the average bike time. Order the bike times from least to greatest.

<table>
<thead>
<tr>
<th>Biker</th>
<th>John</th>
<th>Sue</th>
<th>Anna</th>
<th>Mike</th>
<th>Tom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time above or below average (minutes)</td>
<td>-1.8</td>
<td>1</td>
<td>1 2/5</td>
<td>9/10</td>
<td>-1.25</td>
</tr>
</tbody>
</table>
Guided Practice

Find the equivalent fraction or decimal for each number.
(Explore Activity 1)

1. $0.6 = \underline{\quad}$
2. $\frac{1}{4} = \underline{\quad}$
3. $0.9 = \underline{\quad}$

4. $0.1 = \underline{\quad}$
5. $\frac{3}{10} = \underline{\quad}$
6. $1.4 = \underline{\quad}$

7. $\frac{4}{5} = \underline{\quad}$
8. $0.4 = \underline{\quad}$
9. $\frac{6}{8} = \underline{\quad}$

Use the number line to order the rational numbers from least to greatest. (Example 1)

10. $0.75, \frac{1}{2}, 0.4, \text{ and } \frac{1}{5}$


11. The table shows the lengths of fish caught by three friends at the lake last weekend. Write the lengths in order from greatest to least. (Example 1)

<table>
<thead>
<tr>
<th>Lengths of Fish (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emma</td>
</tr>
<tr>
<td>12.7</td>
</tr>
</tbody>
</table>

List the rational numbers in order from least to greatest.
(Example 1, Example 2)

12. $2.3, 2\frac{4}{5}, 2.6$

13. $0.5, \frac{3}{16}, 0.75, \frac{5}{48}$

14. $0.5, \frac{1}{5}, 0.35, \frac{12}{25}, \frac{4}{5}$

15. $\frac{3}{4}, -\frac{7}{10}, -\frac{3}{4}, \frac{8}{10}$

16. $-\frac{3}{8}, \frac{5}{16}, -0.65, \frac{2}{4}$

17. $-2.3, -2\frac{4}{5}, -2.6$

18. $-0.6, -\frac{5}{8}, -\frac{7}{12}, -0.72$

19. $1.45, 1\frac{1}{2}, 1\frac{1}{3}, 1.2$

20. $-0.3, 0.5, 0.55, -0.35$

ESSENTIAL QUESTION CHECK-IN

21. Identify a temperature colder than $-7.2$ °F. Write an inequality that relates the temperatures. Describe their positions on a horizontal number line.
22. Rosa and Albert receive the same amount of allowance each week. The table shows what part of their allowance they each spent on video games and pizza one week.

<table>
<thead>
<tr>
<th></th>
<th>Video games</th>
<th>Pizza</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosa</td>
<td>0.4</td>
<td>$\frac{2}{5}$</td>
</tr>
<tr>
<td>Albert</td>
<td>$\frac{1}{2}$</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**a.** Who spent more of their allowance on video games? Write an inequality to compare the portion spent on video games.

**b.** Who spent more of their allowance on pizza? Write an inequality to compare the portion spent on pizza.

**c.** **Draw Conclusions** Who spent the greater part of their total allowance? How do you know?

23. A group of friends is collecting aluminum for a recycling drive. Each person who donates at least 4.25 pounds of aluminum receives a free movie coupon. The weight of each person’s donation is shown in the table.

<table>
<thead>
<tr>
<th>Weight (lb)</th>
<th>Brenda</th>
<th>Claire</th>
<th>Jim</th>
<th>Micah</th>
<th>Peter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.3</td>
<td>5.5</td>
<td>$6\frac{1}{6}$</td>
<td>$15\frac{4}{8}$</td>
<td>$4\frac{3}{8}$</td>
</tr>
</tbody>
</table>

**a.** Order the weights of the donations from greatest to least.

**b.** Which of the friends will receive a free movie coupon? Which will not?

**c.** **What If?** Would the person with the smallest donation win a movie coupon if he or she had collected $\frac{1}{2}$ pound more of aluminum? Explain.
24. The table shows how the birth weights of five kittens compare to the average birth weight of a kitten. A negative number represents a weight that is below the average.

<table>
<thead>
<tr>
<th>Kitten</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight above or below average (ounces)</td>
<td>−0.75</td>
<td>(\frac{7}{8})</td>
<td>3.1</td>
<td>−(\frac{1}{8})</td>
<td>(2\frac{1}{2})</td>
</tr>
</tbody>
</table>

a. Order the numbers in the table from least to greatest.

b. Which kitten weighed the least?

c. Critical Thinking Which kitten’s birth weight differed the most from the average?

25. Communicate Mathematical Ideas Explain how you would order from least to greatest three numbers that include a positive number, a negative number, and zero.

26. Analyze Relationships Luke and Lena’s parents allow them to borrow against their allowances. The inequality \(-$11.50 < -$10.75\) compares the current balances they have with their parents. Luke has a greater debt with his parents than Lena has. How much does Luke owe his parents? Explain.

27. Communicate Mathematical Ideas If you know the order from least to greatest of 5 negative rational numbers, how can you use that information to order the absolute values of those numbers from least to greatest? Explain.
3.1 Classifying Rational Numbers

1. Five friends divide three bags of apples equally between them. Write the division represented in this situation as a fraction. 

Write each rational number in the form \( \frac{a}{b} \), where \( a \) and \( b \) are integers.

2. \( 5 \frac{1}{6} \)

3. \( -12 \)

Determine if each number is a whole number, integer, or rational number. Include all sets to which each number belongs.

4. \( -12 \)

5. \( \frac{7}{8} \)

3.2 Identifying Opposites and Absolute Value of Rational Numbers

6. Graph \( -3, 1 \frac{3}{4}, -0.5, \) and 3 on the number line.

7. Find the opposites of \( \frac{1}{3} \) and \( -\frac{7}{12} \).

8. Find the absolute values of 9.8 and \( -\frac{10}{3} \).

3.3 Comparing and Ordering Rational Numbers

9. Over the last week, the daily low temperatures in degrees Fahrenheit have been \( -4, 6.2, 18 \frac{1}{2}, -5.9, 21, -\frac{1}{4}, \) and 1.75. List these numbers in order from greatest to least.

10. How can you order rational numbers from least to greatest?
1. Ms. Fortes asked her class to place sets of rational numbers in order. Select Yes or No if the numbers are in order from least to greatest.

   A. \(-\frac{1}{5}, \frac{-2}{3}, 2, 0.4\)  
      \(\bigcirc\) Yes  \(\bigcirc\) No

   B. \(-\frac{1}{3}, -0.25, 0.2, 1\)  
      \(\bigcirc\) Yes  \(\bigcirc\) No

   C. \(-0.5, | -1 |, 1.5, 5.0\)  
      \(\bigcirc\) Yes  \(\bigcirc\) No

2. The following statements are about rational numbers. Choose True or False for each statement.

   A. The opposite of a rational number is always negative.  
      \(\bigcirc\) True  \(\bigcirc\) False

   B. The opposite of the opposite of a rational number is always the number itself.  
      \(\bigcirc\) True  \(\bigcirc\) False

   C. The absolute value of a number is sometimes equal to the number itself.  
      \(\bigcirc\) True  \(\bigcirc\) False

3. Kaia rewrote the sum 96 + 12 as 12(8 + 1). She used the same method to rewrite the sum 95 + 15 as 5(19 + 3). Describe her method and tell whether she can use it to rewrite the sum 38 + 11. Explain.

4. The temperature at which water freezes is 0 \(^\circ\)C, but water with salt has a lower freezing temperature. Liz measured the temperature of several samples of water with salt. Explain how Liz can use a number line to tell which sample is coldest and which is warmest. Which sample's temperature is closest to the freezing temperature for water?

<table>
<thead>
<tr>
<th>Sample</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature ((^\circ)C)</td>
<td>1.2</td>
<td>-1.1</td>
<td>-0.1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

   Liz can use a number line to compare the temperatures. The sample with the temperature closest to 0 \(^\circ\)C is sample D, with a temperature of 0.5 \(^\circ\)C.