Numbers

MODULE **1**

Integers

TEKS 6.2.B, 6.2.C

MODULE **2**

Rational Numbers

TEKS 6.2.A, 6.2.B, 6.2.D, 6.2.E

CAREERS IN MATH

Climatologist A climatologist is a scientist who studies long-term trends in climate conditions. These scientists collect, evaluate, and interpret data and use mathematical models to study the dynamics of weather patterns and to understand and predict Earth's climate.

If you are interested in a career in climatology, you should study these mathematical subjects:
- Algebra
- Trigonometry
- Probability and Statistics
- Calculus

Research other careers that require the analysis of data and use of mathematical models.

Unit 1 Performance Task

At the end of the unit, check out how **climatologists** use math.

Vocabulary Preview

Use the puzzle to preview key vocabulary from this unit. Unscramble the circled letters within found words to answer the riddle at the bottom of the page.

```
E  R  (I) N  E  Q  U  A  L  I (T) Y  I  L  N
U  S  E  R  O  J  U  J  P  Z  Y  M  B (E) M
L  U  E  B  P  P  H  K  R  J  A  L  G  R  Z
(A) M  G  Z  M  Y  P  G  I  R  Y  A  R  A  D
V  K  B  E  D  U  G  O (G) C (T) K  W  G  X
E  D  M  F  S  L  N  A  S  I  J  J  H  Z  C
(T) B  K  H  V  M  I  L  V  I  Q  E  L  D  R
U  R (I) M  R (D) I  E (A) Y  T  Z  G  K  P
L  V  N  T (N) H  N  D  Y  N  L  E  F  T  H
O  X  T  N  K (U) K  Q  F  X  O  A  S  T  E
S  R (E) B  M  U  N  E (V) I  T  I  S  O  P
B  V  G  B  D  Z  A  F  E  A  X  Y (T) Y  A
A  D (E) P  X  N  V  I  U  B  V  S  T  A  A
O  R  R  V  R  R  X  I  R  G  L  V  B  U  R
S  X  S  M  I  Q  V  Y  N  L  N  P  S  S  I
```

- Any number that can be written as a ratio of two integers. (Lesson 2-1)
- Numbers greater than zero. (Lesson 1-1)
- A diagram used to show the relationship between two sets or groups. (Lesson 2-1)
- A mathematical statement that shows two quantities are not equal. (Lesson 1-2)
- The set of all whole numbers and their opposites. (Lesson 1-1)
- The distance of a number from zero on the number line. (Lesson 1-3)
- Numbers less than zero. (Lesson 1-1)

Q: Why did the integer get a bad evaluation at work?

A: He had a ___ ___ ___ ___ ___ ___ ___ ___
___ ___ ___ ___ ___ ___ ___ ___!

Integers

? ESSENTIAL QUESTION

How can you use integers to solve real-world problems?

Real-World Video

Integers can be used to describe the value of many things in the real world. The height of a mountain in feet may be a very great integer while the temperature in degrees Celsius at the top of that mountain may be a negative integer.

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Are YOU Ready?

Complete these exercises to review skills you will need for this chapter.

Compare Whole Numbers

EXAMPLE

3,564 ⬤ 3,528   Compare digits in the thousands place: $3 = 3$

3,564 ⬤ 3,528   Compare digits in the hundreds place: $5 = 5$

$3,564 > 3,528$ Compare digits in the tens place: $6 > 2$

Compare. Write $<$, $>$, or $=$.

1. 471 ◯ 468   **2.** 5,005 ◯ 5,050   **3.** 398 ◯ 389

4. 10,973 ◯ 10,999   **5.** 8,471 ◯ 9,001   **6.** 108 ◯ 95

Order Whole Numbers

EXAMPLE

356, 348, 59, 416   Compare digits. Find the greatest number.
356, 348, 59, 416   Find the next greatest number.
356, 348, 59, 416   Find the next greatest number.
356, 348, 59, 416   Find the least number.
$416 > 356 > 348 > 59$ Order the numbers.

Order the numbers from greatest to least.
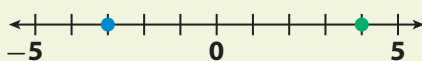
7. 156; 87; 177; 99   **8.** 591; 589; 603; 600

_____   _____

9. 2,650; 2,605; 3,056; 2,088   **10.** 1,037; 995; 10,415; 1,029

_____   _____
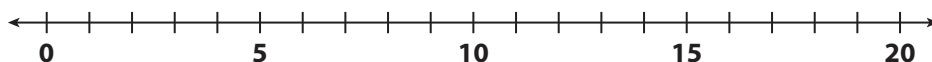
Locate Numbers on a Number Line

EXAMPLE

Graph $+4$ by starting at 0 and counting 4 units to the right.
Graph -3 by starting at 0 and counting 3 units to the left.

Graph each number on the number line.

11. 12   **12.** 20   **13.** 2   **14.** 9

Reading Start-Up

Visualize Vocabulary

Use the ✔ words to complete the chart. Write the correct vocabulary word next to the symbol.

Symbol

- → | < |
- → | > |
- → | = |
- → | + |
- → | − |

Understand Vocabulary

Complete the sentences using the preview words.

1. An _____ is a statement that two quantities are not equal.

2. The set of all whole numbers and their opposites are _____.

3. Numbers greater than 0 are _____. Numbers less

   than 0 are _____.

Vocabulary

Review Words
✔ equal *(igual)*
✔ greater than *(más que)*
✔ less than *(menos que)*
✔ negative sign *(signo negativo)*
   number line *(recta numérica)*
✔ plus sign *(signo más)*
   symbol *(símbolo)*
   whole number *(número entero)*

Preview Words
   absolute value *(valor absoluto)*
   inequality *(desigualdad)*
   integers *(enteros)*
   negative numbers *(números negativos)*
   opposites *(opuestos)*
   positive numbers *(números positivos)*

Active Reading

Key-Term Fold Before beginning the module, create a key-term fold to help you learn the vocabulary in this module. Write the highlighted vocabulary words on one side of the flap. Write the definition for each word on the other side of the flap. Use the key-term fold to quiz yourself on the definitions in this module.

Unpacking the TEKS

Understanding the TEKS and the vocabulary terms in the TEKS will help you know exactly what you are expected to learn in this module.

TEKS 6.2.B

Identify a number, its opposite, and its absolute value.

Key Vocabulary

integers *(enteros)*
The set of all whole numbers and their opposites.

opposites *(opuestos)*
Two numbers that are equal distance from zero on a number line.
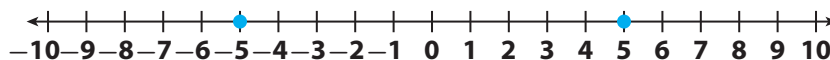
absolute value *(valor absoluto)*
A number's distance from 0 on the number line.

What It Means to You

You will learn that the absolute value of a number is its distance from 0.

UNPACKING EXAMPLE 6.2.B

Use the number line to determine the absolute values.

$$|-5| = 5 \qquad \text{because } -5 \text{ is 5 units from 0}$$
$$|5| = 5 \qquad \text{because 5 is 5 units from 0}$$

TEKS 6.2.C

Locate, compare, and order integers and rational numbers using a number line.

Key Vocabulary

rational number
(número racional)
Any number that can be expressed as a ratio of two integers.

What It Means to You

You can use a number line to order rational numbers.

UNPACKING EXAMPLE 6.2.C

At a golf tournament, David scored $+6$, Celia scored -16, and Xavier scored -4. One of these three players was the winner of the tournament. Who won the tournament?

The winner will be the player with the lowest score. Draw a number line and graph each player's score.
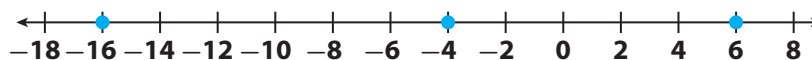
Celia's score, -16, is the farthest to the left, so it is the lowest score. Celia won the tournament.

Visit **my.hrw.com** to see all the **TEKS** unpacked.

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LESSON
1.1 Identifying Integers and Their Opposites

TEKS
Number and operations—6.2.B
Identify a number, its opposite, and its absolute value.

? ESSENTIAL QUESTION

How do you identify an integer and its opposite?

EXPLORE ACTIVITY 1 Real World TEKS 6.2.B

Positive and Negative Numbers

Positive numbers are numbers greater than 0. Positive numbers can be written with or without a plus sign; for example, 3 is the same as $+3$. **Negative numbers** are numbers less than 0. Negative numbers must always be written with a negative sign.

> The number 0 is neither positive nor negative.

$$-5 \; -4 \; -3 \; -2 \; -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5$$

Negative integers   **Positive integers**
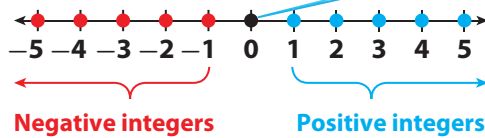
The elevation of a location describes its height above or below sea level, which has elevation 0. Elevations below sea level are represented by negative numbers, and elevations above sea level are represented by positive numbers.

A The table shows the elevations of several locations in a state park. Graph the locations on the number line according to their elevations.

Location	Little Butte A	Cradle Creek B	Dinosaur Valley C	Mesa Ridge D	Juniper Trail E
Elevation (ft)	5	−5	−9	8	−3

$$-10 \; -9 \; -8 \; -7 \; -6 \; -5 \; -4 \; -3 \; -2 \; -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10$$
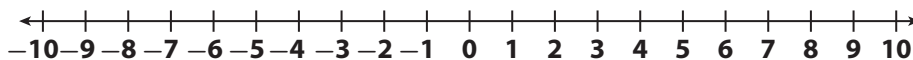
B What point on the number line represents sea level? _____

C Which location is closest to sea level? How do you know?

_____

D Which two locations are the same distance from sea level? Are these locations above or below sea level?

_____

E Which location has the least elevation? How do you know?

_____

Reflect

1. **Analyze Relationships** Morning Glory Stream is 7 feet below sea level. What number represents the elevation of Morning Glory Stream?
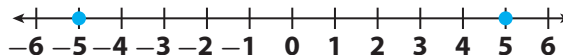
   _____

2. **Multiple Representations** Explain how to graph the elevation of Morning Glory Stream on a number line.

   _____

EXPLORE ACTIVITY 2 ⬤ **TEKS** 6.2.B

Opposites

Two numbers are **opposites** if, on a number line, they are the same distance from 0 but on different sides of 0. For example, 5 and −5 are opposites. 0 is its own opposite.

$$-6\ -5\ -4\ -3\ -2\ -1\ \ 0\ \ 1\ \ 2\ \ 3\ \ 4\ \ 5\ \ 6$$

Integers are the set of all whole numbers and their opposites.

> Remember, the set of whole numbers is 0, 1, 2, 3, 4, 5, 6, ...

On graph paper, use a ruler or straightedge to draw a number line. Label the number line with each integer from −10 to 10. Fold your number line in half so that the crease goes through 0. Numbers that line up after folding the number line are opposites.

A Use your number line to find the opposites of 7, −6, 1, and 9. _____

B How does your number line show that 0 is its own opposite?

_____

C What is the opposite of the opposite of 3? _____

Reflect

3. **Justify Reasoning** Explain how your number line shows that 8 and −8 are opposites.

   _____

4. **Multiple Representations** Explain how to use your number line to find the opposite of the opposite of −6.

   _____

   _____

   _____

Integers and Opposites on a Number Line

Positive and negative numbers can be used to represent real-world quantities. For example, 3 can represent a temperature that is 3°F above 0. −3 can represent a temperature that is 3°F below 0. Both 3 and −3 are 3 units from 0.

EXAMPLE 1 Real World   TEKS 6.2.B

**Sandy kept track of the weekly low temperature in her town for several weeks. The table shows the low temperature in °F for each week.**

Week	Week 1	Week 2	Week 3	Week 4
Temperature (°F)	−1	3	−4	2

A Graph the temperature from Week 3 and its opposite on a number line. What do the numbers represent?

STEP 1 Graph the value from Week 3 on the number line.
The value from Week 3 is −4.
Graph a point 4 units below 0.

STEP 2 Graph the opposite of −4.
Graph a point 4 units above 0.

The opposite of −4 is 4.

−4 represents a temperature that is 4°F below 0 and 4 represents a temperature that is 4°F above 0.
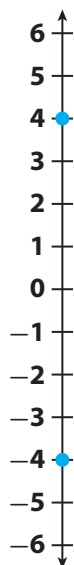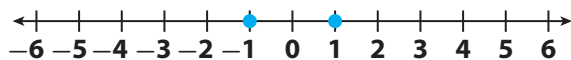
B The value for Week 5 is the opposite of the opposite of the value from Week 1. What was the low temperature in Week 5?

STEP 1 Graph the value from Week 1 on the number line.
The value from Week 1 is −1.

STEP 2 Graph the opposite of −1.
The opposite of −1 is 1.

STEP 3 Graph the opposite of 1.
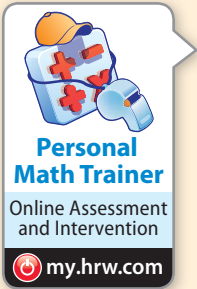*The opposite of 1 is −1.*

The opposite of the opposite of −1 is −1.
The low temperature in Week 5 was −1°F.

Reflect

5. **Analyze Relationships** Explain how you can find the opposite of the opposite of any number without using a number line.
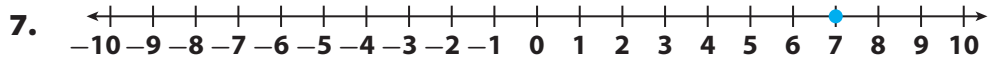
_____

YOUR TURN

Graph the opposite of the number shown on each number line.

6.

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10

7.

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10

Write the opposite of each number.

8. 10 _____   **9.** −5 _____   **10.** 0 _____

11. What is the opposite of the opposite of 6? _____

Math Talk
Mathematical Processes
Explain how you could use a number line to find the opposite of 8.

Guided Practice

1. Graph and label the following points on the number line.
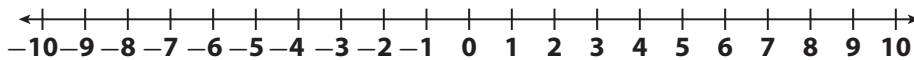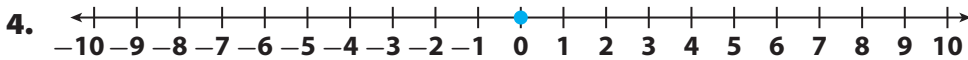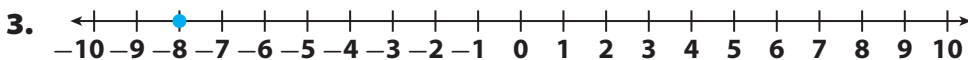(Explore Activity 1)

a. −2   **b.** 9   **c.** −8   **d.** −9   **e.** 5   **f.** 8

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10

Graph the opposite of the number shown on each number line.
(Explore Activity 2 and Example 1)

2.

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10

3.

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10

4.

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10
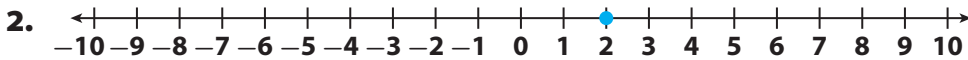
Write the opposite of each number. (Explore Activity 2 and Example 1)

5. 4 _____   **6.** −11 _____   **7.** 3 _____

8. −3 _____   **9.** 0 _____   **10.** 22 _____

? ESSENTIAL QUESTION CHECK-IN

11. Given an integer, how do you find its opposite?

_____

_____

1.1 Independent Practice

TEKS 6.2.B

12. **Chemistry** Atoms normally have an electric charge of 0. Certain conditions, such as static, can cause atoms to have a positive or a negative charge. Atoms with a positive or negative charge are called *ions*.

Ion	A	B	C	D	E
Charge	−3	+1	−2	+3	−1

a. Which ions have a negative charge?

_____

b. Which ions have charges that are opposites?

_____

c. Which ion's charge is not the opposite of another ion's charge?

_____

Name the integer that meets the given description.

13. the opposite of −17 _____

14. 4 units left of 0 _____

15. the opposite of the opposite of 2 _____

16. 15 units right of 0 _____

17. 12 units right of 0 _____

18. the opposite of −19 _____

19. **Analyze Relationships** Several wrestlers are trying to lose weight for a competition. Their change in weight since last week is shown in the chart.

Wrestler	Tino	Victor	Ramsey	Baxter	Luis
Weight Change (in pounds)	−2	6	2	5	−5

a. Did Victor lose or gain weight since last week? _____

b. Which wrestler's weight change is the opposite of Ramsey's? _____

c. Which wrestlers have lost weight since last week? _____

d. Frankie's weight change since last week was the opposite of Victor's.

What was Frankie's weight change? _____

e. Frankie's goal last week was to gain weight. Did he meet his goal? Explain.

_____

Find the distance between the given number and its opposite on a number line.

20. 6 _____

21. -2 _____

22. 0 _____

23. -7 _____

24. **What If?** Three contestants are competing on a trivia game show. The table shows their scores before the final question.

Contestant	Score Before Final Question
Timothy	-25
Shawna	18
Kaylynn	-14

    a. How many points must Shawna earn for her score to be the opposite of Timothy's score before the final question?_____

    b. Which person's score is closest to 0? _____

    c. Who do you think is winning the game before the final question? Explain.

_____

H.O.T.   **FOCUS ON HIGHER ORDER THINKING**

Work Area

25. **Communicate Mathematical Ideas** Which number is farther from 0 on a number line: -9 or 6? Explain your reasoning.

_____

_____

26. **Analyze Relationships** A number is k units to the left of 0 on the number line. Describe the location of its opposite.

_____

27. **Critique Reasoning** Roberto says that the opposite of a certain integer is -5. Cindy concludes that the opposite of an integer is always negative. Explain Cindy's error.

_____

_____

_____

28. **Multiple Representations** Explain how to use a number line to find the opposites of the integers 3 units away from -7.

_____

_____

_____

1.2 Comparing and Ordering Integers

? ESSENTIAL QUESTION

How do you compare and order integers?

**EXPLORE ACTIVITY** Real World **TEKS 6.2.C**

Comparing Positive and Negative Integers

The Westfield soccer league ranks its teams using a number called the "win/loss combined record." A team with more wins than losses will have a positive combined record, and a team with fewer wins than losses will have a negative combined record. The table shows the total win/loss combined record for each team at the end of the season.

Team	Sharks A	Jaguars B	Badgers C	Tigers D	Cougars E	Hawks F	Wolves G
Win/Loss Combined Record	0	4	−4	−6	2	−2	6

A Graph the win/loss combined record for each team on the number line.

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10
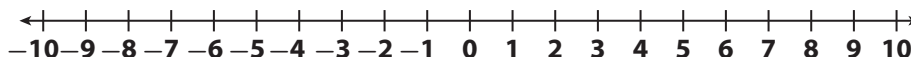
B Which team had the best record in the league? How do you know?

_____

C Which team had the worst record? How do you know?

_____

Reflect

1. **Analyze Relationships** Explain what the data tell you about the win/loss records of the teams in the league.

_____

_____

_____

_____

Ordering Positive and Negative Integers

When you read a number line from left to right, the numbers are in order from least to greatest.
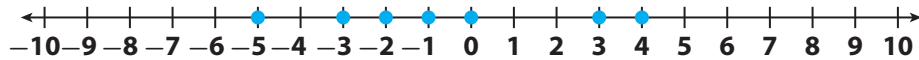
EXAMPLE 1

TEKS 6.2.C

Fred recorded the following golf scores during his first week at the golf academy. In golf, the player with the lowest score wins the game.

Day	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Score	4	−2	3	−5	−1	0	−3

Graph Fred's scores on the number line, and then list the numbers in order from least to greatest.

STEP 1 Graph the scores on the number line.

STEP 2 Read from left to right to list the scores in order from least to greatest.

The scores listed from least to greatest are −5, −3, −2, −1, 0, 3, 4.
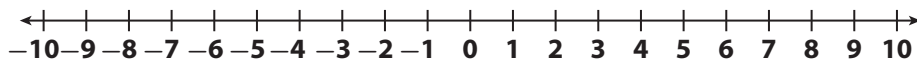
Math Talk
Mathematical Processes

What day did Fred have his best golf score? How do you know?

YOUR TURN

Graph the values in each table on a number line. Then list the numbers in order from greatest to least.
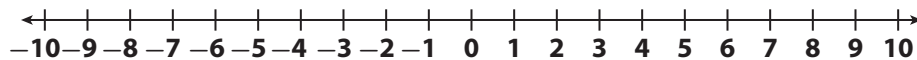
2.

Change in Stock Price ($)					
−5	4	0	−3	−6	2

_____

3.

Elevation (meters)							
9	−1	−6	2	−10	0	5	8

_____

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Writing Inequalities

An **inequality** is a statement that two quantities are not equal. The symbols $<$ and $>$ are used to write inequalities.

- The symbol $>$ means "is greater than."
- The symbol $<$ means "is less than."

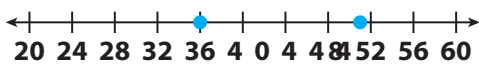You can use a number line to help write an inequality.

EXAMPLE 2   Real World   TEKS 6.2.C

A In 2005, Austin, Texas, received 51 inches in annual precipitation. In 2009, the city received 36 inches in annual precipitation. In which year was there more precipitation?

Graph 51 and 36 on the number line.

```
←+—+—+—+—+—●—+—+—+—●—+—+—→
 20 24 28 32 36 40 44 48 52 56 60
```

- 51 is to the *right* of 36 on the number line.

  This means that 51 is **greater than** 36.

  Write the inequality as $51 > 36$.

- 36 is to the *left* of 51 on the number line.

  This means that 36 is **less than** 51.

  Write the inequality as $36 < 51$.

  There was more precipitation in 2005.

B Write two inequalities to compare -6 and 7.
$-6 < 7; 7 > -6$

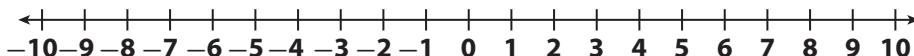**C** Write two inequalities to compare -9 and -4.
$-4 > -9; -9 < -4$

Math Talk
Mathematical Processes

Is there a greatest integer? Is there a greatest negative integer? Explain.

YOUR TURN

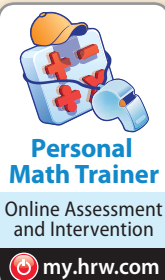Compare. Write $>$ or $<$. Use the number line to help you.

4. $-10 \bigcirc -2$ **5.** $-6 \bigcirc 6$ **6.** $-7 \bigcirc -8$

```
←+—+—+—+—+—+—+—+—+—+—+—+—+—+—+—+—+—+—+—+—→
-10 -9 -8 -7 -6 -5 -4 -3 -2 -1  0  1  2  3  4  5  6  7  8  9 10
```

7. Write two inequalities to compare -2 and -18. _____

8. Write two inequalities to compare 39 and -39. _____

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1a. Graph the temperature for each city on the number line. (Explore Activity)

City	A	B	C	D	E
Temperature (°F)	−9	10	−2	0	4

Number line from −10 to 10.
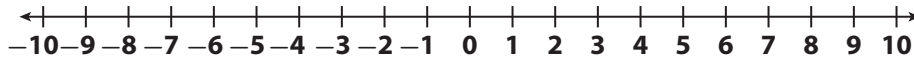
b. Which city was coldest? _____

c. Which city was warmest? _____

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

2. 4, −6, 0, 8, −9, 1, −3

_____

3. −65, 34, 7, −13, 55, 62, −7

_____

4. Write two inequalities to compare −17 and −22. _____

Compare. Write < or >. (Example 2)

5. −9 ◯ 2   **6.** 0 ◯ 6   **7.** 3 ◯ −7   **8.** 5 ◯ −10

9. −1 ◯ −3   **10.** −8 ◯ −4   **11.** −4 ◯ 1   **12.** −2 ◯ −6

13. Compare the temperatures for the following cities. Write < or >. (Example 2)

City	Alexandria	Redwood Falls	Grand Marais	Winona	International Falls
Average Temperature in March (°C)	−3	0	−2	2	−4

a. Alexandria and Winona _____

b. Redwood Falls and International Falls _____

? ESSENTIAL QUESTION CHECK-IN

14. How can you use a number line to compare and order numbers?

_____

_____

_____

1.2 Independent Practice

TEKS 6.2.C

15. Multiple Representations A hockey league tracks the plus-minus records for each player. A plus-minus record is the difference in even strength goals for and against the team when a player is on the ice. The following table lists the plus-minus values for several hockey players.

Player	A. Jones	B. Sutter	E. Simpson	L. Mays	R. Tomas	S. Klatt
Plus-minus	−8	4	9	−3	−4	3

a. Graph the values on the number line.
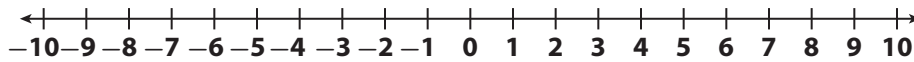
b. Which player has the best plus-minus record? _____

Astronomy The table lists the average surface temperature of some planets. Write an inequality to compare the temperatures of each pair of planets.

Planet	Average Surface Temperature (°C)
Mercury	167
Uranus	−197
Neptune	−200
Earth	15
Mars	−65
Jupiter	−110

16. Uranus and Jupiter _____

17. Mercury and Mars _____

**18.** Arrange the planets in order of average surface temperature from greatest to least. _____

_____

19. Represent Real-World Problems For a stock market project, five students each invested pretend money in one stock. They tracked gains and losses in the value of that stock for one week. In the following table, a gain is represented by a positive number and a loss is represented by a negative number.

Students	Andre	Bria	Carla	Daniel	Ethan
Gains and Losses ($)	7	−2	−5	2	4

Graph the students' results on the number line. Then list them in order from least to greatest.

a. Graph the values on the number line.
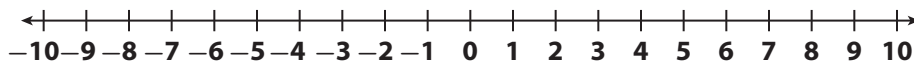
b. The results listed from least to greatest are _____ .

Geography The table lists the lowest elevation for several countries. A negative number means the elevation is below sea level, and a positive number means the elevation is above sea level. Compare the lowest elevation for each pair of countries. Write $<$ or $>$.

Country	Lowest Elevation (feet)
Argentina	-344
Australia	-49
Czech Republic	377
Hungary	249
United States	-281

20. Argentina and the United States _____

21. Czech Republic and Hungary _____

22. Hungary and Argentina _____

23. Which country in the table has the lowest elevation? _____

24. **Analyze Relationships** There are three numbers a, b, and c, where $a > b$ and $b > c$. Describe the positions of the numbers on a number line.

_____

_____

_____

_____

H.O.T. **FOCUS ON HIGHER ORDER THINKING**

Work Area

25. **Critique Reasoning** At 9 A.M. the outside temperature was $-3°$F. By noon, the temperature was $-12°$F. Jorge said that it was getting warmer outside. Is he correct? Explain.

_____

26. **Problem Solving** Golf scores represent the number of strokes above or below par. A negative score means that you hit a number below par while a positive score means that you hit a number above par. The winner in golf has the lowest score. During a round of golf, Angela's score was -5 and Lisa's score was -8. Who won the game? Explain.

_____

27. **Look for a Pattern** Order -3, 5, 16, and -10 from least to greatest. Then order the same numbers from closest to zero to farthest from zero. Describe how your lists are similar. Would this be true if the numbers were -3, 5, -16 and -10?

_____

_____

_____

_____

LESSON
1.3 Absolute Value

TEKS
Number and operations—
6.2.B Identify a number, its opposite, and its absolute value.
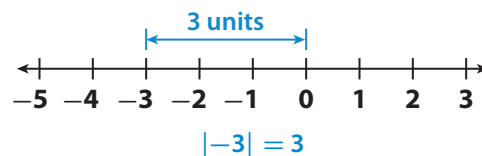
? ESSENTIAL QUESTION

How do you find and use absolute value?
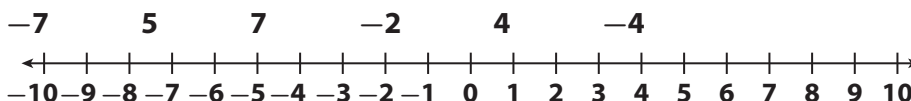
EXPLORE ACTIVITY 1   TEKS 6.2.B

Finding Absolute Value

The **absolute value** of a number is the number's distance from 0 on a number line. For example, the absolute value of -3 is 3 because -3 is 3 units from 0. The absolute value of -3 is written $|-3|$.

3 units

$$-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3$$

$$|-3| = 3$$

Because absolute value represents a distance, it is always nonnegative.

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

$$-7 \qquad 5 \qquad 7 \qquad -2 \qquad 4 \qquad -4$$

$$-10\;-9\;-8\;-7\;-6\;-5\;-4\;-3\;-2\;-1\;\;0\;\;1\;\;2\;\;3\;\;4\;\;5\;\;6\;\;7\;\;8\;\;9\;\;10$$

A $|-7| = $ _____   **B** $|5| = $ _____   **C** $|7| = $ _____

D $|-2| = $ _____   **E** $|4| = $ _____   **F** $|-4| = $ _____

Reflect

1. **Analyze Relationships** Which pairs of numbers have the same absolute value? How are these numbers related?

_____

_____

2. **Justify Reasoning** Negative numbers are less than positive numbers. Does this mean that the absolute value of a negative number must be less than the absolute value of a positive number? Explain.

_____

_____

_____

_____

Absolute Value In A Real-World Situation

In real-world situations, absolute values are often used instead of negative numbers. For example, if you use a $50 gift card to make a $25 purchase, the change in your gift card balance can be represented by −$25.
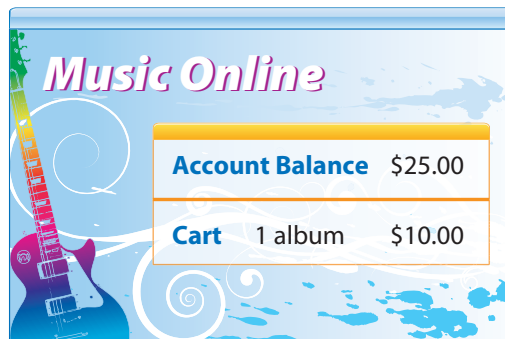
EXAMPLE 1 · Real World · TEKS 6.2.B

Jake uses his online music store gift card to buy an album of songs by his favorite band.

Find the negative number that represents the change in the balance on Jake's card after his purchase. Explain how absolute value would be used to express that number in this situation.

Music Online

Account Balance		$25.00
Cart	1 album	$10.00

STEP 1 Find the negative integer that represents the change in the balance.

−$10   *The balance decreased by $10, so use a negative number.*

STEP 2 Use the number line to find the absolute value of −$10.

−10 is 10 units from 0 on the number line.

10 units

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10
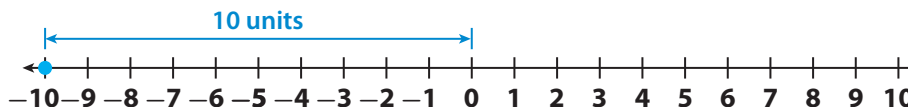
The absolute value of −$10 is $10, or $|-10| = 10$.

The balance on Jake's card decreased by $10.

Math Talk
Mathematical Processes

Explain why the price Jake paid for the album is represented by a negative number.
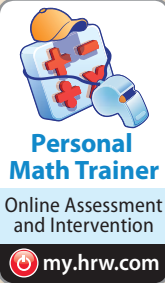
Reflect

3. Communicate Mathematical Ideas Explain why the absolute value of a number will never be negative.

_____

_____

_____

4. The temperature at night reached $-13\,°F$. Write an equivalent statement about the temperature using the absolute value of the number.

_____

Find each absolute value.

5. $|-12|$ _____

6. $|91|$ _____

7. $|-55|$ _____

8. $|0|$ _____

9. $|88|$ _____

10. $|1|$ _____

EXPLORE ACTIVITY 2   Real World   **TEKS** 6.2.B

Comparing Absolute Values

You can use absolute values to compare negative numbers in real-world situations.

Maria, Susan, George, and Antonio checked their credit card balances on their smartphones. The amounts owed are shown.

You owe:	$20
You owe:	$25
You owe:	$30
You owe:	$45

_____ _____ _____ _____

Answer the following questions. When you have finished, you will have enough clues to match each statement with the correct person.

Remember: When someone owes a positive amount of money, this means that he or she has a *negative* balance.

A Maria's credit card balance is less than $-\$30$. Does Maria owe more than $30 or less than $30? _____

B Susan's credit card balance is greater than $-\$25$. Does Susan owe more than $25 or less than $25? _____

C George's credit card balance is $5 less than Susan's balance. Does George owe more than Susan or less than Susan? _____

D Antonio owes $15 less than Maria owes. This means that Antonio's balance is _____ than Maria's balance.

**E** Write each person's name underneath his or her smartphone.

Reflect

11. **Analyze Relationships** Use absolute value to describe the relationship between a negative credit card balance and the amount owed.

_____

Guided Practice

1. **Vocabulary** If a number is _____, then the number is less than its absolute value. **(Explore Activity 1)**

2. If Ryan pays his car insurance for the year in full, he will get a credit of $28. If he chooses to pay a monthly premium, he will pay a $10 late fee for any month that the payment is late. **(Explore Activity 1, Example 1)**

   a. Which of these values could be represented with a negative number? Explain.

   _____

   _____

   b. Use the number line to find the absolute value of the amount from

   part a. _____

   $-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10$
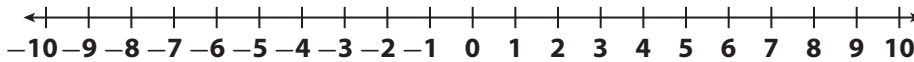
3. Leo, Gabrielle, Sinea, and Tomas are playing a video game. Their scores are described in the table below. **(Explore Activity 2)**

Name	Leo	Gabrielle	Sinea
Score	less than -100 points	20 more points than Leo	50 points less than Leo

   a. Leo wants to earn enough points to have a positive score. Does he need to earn more than 100 points or less than 100 points? _____

   b. Gabrielle wants to earn enough points to not have a negative score. Does she need to earn more points than Leo or less points than Leo? _____

   c. Sinea wants to earn enough points to have a higher score than Leo. Does she need to earn more than 50 points or less than 50 points? _____

? ESSENTIAL QUESTION CHECK-IN

4. When is the absolute value of a number equal to the number?

   _____

1.3 Independent Practice

TEKS 6.2.B

5. Financial Literacy Jacob earned $80 babysitting and deposited the money into his savings account. The next week he spent $85 on video games. Use integers to describe the weekly changes in Jacob's savings account balance.

_____

_____

6. Financial Literacy Sara's savings account balance changed by $34 one week and by −$67 the next week. Which amount represents the greatest

change? _____

7. Analyze Relationships Bertrand collects movie posters. The number of movie posters in his collection changes each month as he buys and sells posters. The table shows how many posters he bought or sold in the given months.

Month	January	February	March	April
Posters	Sold 20	Bought 12	Bought 22	Sold 28

a. Which months have changes that can be represented by positive numbers? Which months have changes that can be represented by negative numbers? Explain.

_____

_____

_____

_____

b. According to the table, in which month did the size of Bertrand's poster collection change the most? Use absolute value to explain your answer.

_____

_____

_____

8. Earth Science Death Valley has an elevation of −282 feet relative to sea level. Explain how to use absolute value to describe the elevation of Death Valley as a positive integer.

_____

_____

9. Communicate Mathematical Ideas Lisa and Alice are playing a game. Each player either receives or has to pay play money based on the result of their spin. The table lists how much a player receives or pays for various spins.

Red	Pay $5
Blue	Receive $4
Yellow	Pay $1
Green	Receive $3
Orange	Pay $2

a. Express the amounts in the table as positive and negative numbers.

_____

b. Describe the change to Lisa's amount of money when the spinner lands on red.

_____

_____

10. Financial Literacy Sam's credit card balance is less than $-\$36$. Does Sam owe more or less than $36? _____

11. Financial Literacy Emily spent $55 from her savings on a new dress. Explain how to describe the change in Emily's savings balance in two different ways.

_____

_____

_____

H.O.T. **FOCUS ON HIGHER ORDER THINKING**

12. Make a Conjecture Can two different numbers have the same absolute value? If yes, give an example. If no, explain why not.

_____

13. Communicate Mathematical Ideas Does $-|-4| = |-(-4)|$? Justify your answer.

_____

14. Critique Reasoning Angelique says that finding the absolute value of a number is the same as finding the opposite of the number. For example, $|-5| = 5$. Explain her error.

_____

_____
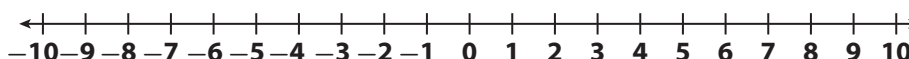
_____

_____

Work Area

Ready to Go On?
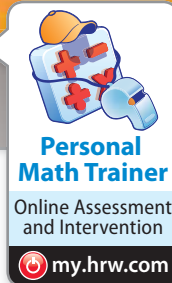
1.1 Identifying Integers and Their Opposites

1. The table shows the elevations in feet of several locations around a coastal town. Graph and label the locations on the number line according to their elevations.

Location	Post Office A	Library B	Town Hall C	Laundromat D	Pet Store E
Elevation (feet)	8	−3	−9	3	1

```
←+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+→
 −10 −9 −8 −7 −6 −5 −4 −3 −2 −1  0  1  2  3  4  5  6  7  8  9  10
```

Write the opposite of each number.

2. −22 _____

3. 0 _____

1.2 Comparing and Ordering Integers

List the numbers in order from least to greatest.

4. −2, 8, −15, −5, 3, 1 _____

Compare. Write < or >.

5. −3 ◯ −15

6. 9 ◯ −10

1.3 Absolute Value

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

```
←+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+→
 −10 −9 −8 −7 −6 −5 −4 −3 −2 −1  0  1  2  3  4  5  6  7  8  9  10
```
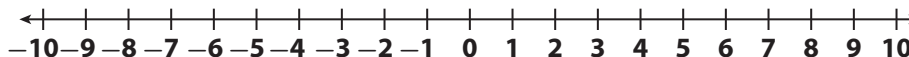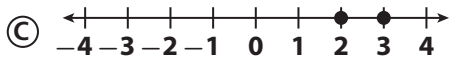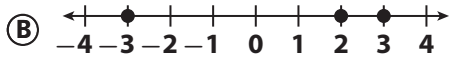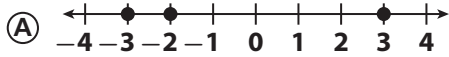
7. 2 _____

8. −8 _____

9. −5 _____

? ESSENTIAL QUESTION

10. How can you use absolute value to represent a negative number in a real-world situation?

_____

_____

Selected Response

1. Which number line shows 2, 3, and −3?

(A)
$$-4\ -3\ -2\ -1\ \ 0\ \ 1\ \ 2\ \ 3\ \ 4$$

(B)
$$-4\ -3\ -2\ -1\ \ 0\ \ 1\ \ 2\ \ 3\ \ 4$$

(C)
$$-4\ -3\ -2\ -1\ \ 0\ \ 1\ \ 2\ \ 3\ \ 4$$

(D)
$$-4\ -3\ -2\ -1\ \ 0\ \ 1\ \ 2\ \ 3\ \ 4$$
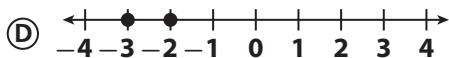
2. What is the opposite of −3?

(A) 3

(B) 0

(C) $-\frac{1}{3}$

(D) $\frac{1}{3}$

3. Darrel is currently 20 feet below sea level. Which correctly describes the opposite of Darrel's elevation?

(A) 20 feet below sea level

(B) 20 feet above sea level

(C) 2 feet below sea level

(D) At sea level

4. Which has the same absolute value as −55?

(A) 0

(B) −1

(C) 1

(D) 55

5. In Bangor it is −3°F, in Fairbanks it is −12°F, in Fargo it is −8°F, and in Calgary it is −15°F. In which city is it the coldest?

(A) Bangor

(B) Fairbanks

(C) Fargo

(D) Calgary

6. Which shows the integers in order from least to greatest?

(A) 20, 6, −2, −13

(B) −2, 6, −13, 20

(C) −13, −2, 6, 20

(D) 20, −13, 6, −2

7. How would you use a number line to put integers in order from greatest to least?

(A) Graph the integers, then read them from left to right.

(B) Graph the integers, then read them from right to left.

(C) Graph the absolute values of the integers, then read them from left to right.

(D) Graph the absolute values of the integers, then read them from right to left.

Gridded Response

8. The table shows the change in several savings accounts over the past month. Which value represents the least change?

Account	Change
A	$25
B	−$45
C	−$302
D	$108

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.

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Scan with your smart phone to jump directly to the online edition, video tutor, and more.

Animated Math
Interactively explore key concepts to see how math works.

Personal Math Trainer
Get immediate feedback and help as you work through practice sets.

Are YOU Ready?

Complete these exercises to review skills you will need for this chapter.

Write an Improper Fraction as a Mixed Number

EXAMPLE

$$\frac{11}{3} = \frac{3}{3} + \frac{3}{3} + \frac{3}{3} + \frac{2}{3}$$ Write as a sum using names for one plus a proper fraction.
                    Write each name for one as one.

$$= 1 + 1 + 1 + \frac{2}{3}$$

$$= 3 + \frac{2}{3}$$ Add the ones.

$$= 3\frac{2}{3}$$ 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

$$3\frac{3}{4} = 1 + 1 + 1 + \frac{3}{4}$$ Write the whole number as a sum of ones.

$$= \frac{4}{4} + \frac{4}{4} + \frac{4}{4} + \frac{3}{4}$$ Use the denominator of the fraction to write equivalent fractions for the ones.

$$= \frac{15}{4}$$ Add the numerators.

Write each mixed number as an improper fraction.

5. $2\frac{1}{2}$ _____   **6.** $4\frac{3}{5}$ _____   **7.** $3\frac{4}{9}$ _____   **8.** $2\frac{5}{7}$ _____

Find Common Denominators

EXAMPLE   Find a common denominator for $\frac{3}{10}$ and $\frac{7}{8}$.

10: 10, 20, 30, ⓐ40, 50, 60, 70, ⓐ80   List multiples of each denominator.

8: 8, 16, 24, 32, ⓐ40, 48, 56, 64, 72, ⓐ80   Circle common multiples.
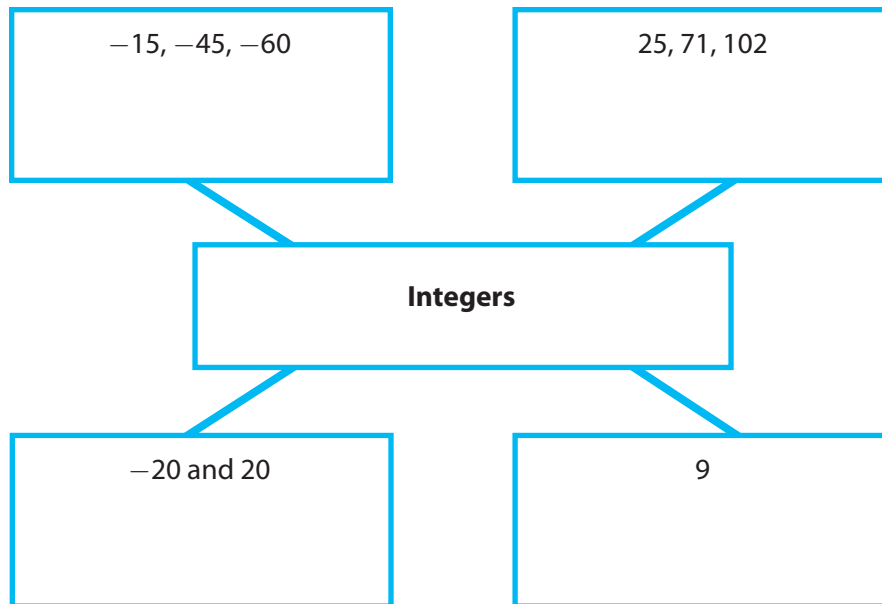
Least common denominator: 40

Find the least common denominator.

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

Reading Start-Up

Visualize Vocabulary

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

Vocabulary

Review Words
absolute value *(valor absoluto)*
decimal *(decimal)*
dividend *(dividendo)*
divisor *(divisor)*
fraction *(fracción)*
integers *(enteros)*
✔ negative numbers *(números negativos)*
✔ opposites *(opuestos)*
✔ positive numbers *(números positivos)*
✔ whole number *(número entero)*

Preview Words
rational number *(número racional)*
Venn diagram *(diagrama de Venn)*

−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. Use the third column to take notes on important concepts and vocabulary terms as you listen in class. Then complete the third column after studying the module.

Unpacking the TEKS

Understanding the TEKS and the vocabulary terms in the TEKS will help you know exactly what you are expected to learn in this module.

TEKS 6.2.A

Classify whole numbers, integers, and rational numbers using a visual representation such as a Venn diagram to describe relationships between sets of numbers.

Key Vocabulary

integer *(entero)*
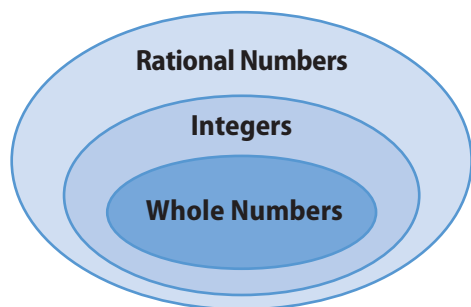A member of the set of whole numbers and their opposites.

Venn diagram
(diagrama de Venn)
A diagram used to show the relationship between groups of numbers.

What It Means to You

You can identify the type of number you are working with.

UNPACKING EXAMPLE 6.2.A

Rational Numbers

Integers

Whole Numbers

Classify the following numbers.

−3   an integer, which also makes it a rational number

130   a whole number, which also makes it an integer and a rational number

TEKS 6.2.D

Order a set of rational numbers arising from mathematical and real-world contexts.

Key Vocabulary

rational number
(número racional)
Any number that can be expressed as a ratio of two integers.

What It Means to You

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

UNPACKING EXAMPLE 6.2.D

The table shows the fraction of crude oil produced in the United States in 2011.
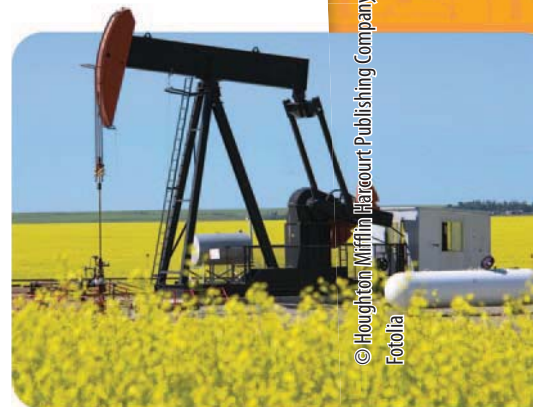
CA	$\frac{1}{100}$	TX	$\frac{9}{50}$
ND	$\frac{3}{50}$	AL	$\frac{3}{25}$

Which state produced the least oil?

$$CA = \frac{1}{100} \qquad TX = \frac{9}{50} = \frac{18}{100}$$
$$ND = \frac{3}{50} = \frac{6}{100} \qquad AL = \frac{3}{25} = \frac{12}{100}$$

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

Visit **my.hrw.com** to see all the **TEKS** unpacked.

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Classifying Rational Numbers

? ESSENTIAL QUESTION

How can you classify rational numbers?

EXPLORE ACTIVITY *Real World*   TEKS 6.2.E

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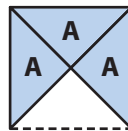
A The top faces of the 3 blocks of clay can be represented by squares. Use the model to show the part of each block that each friend will receive. Explain.

_____

_____

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.

A
A A
A

Alicia   Brittany   Kenji   Ellis

_____

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?

_____

_____

Reflect

1. **Communicate Mathematical Ideas** $3 \div 4$ can be written $\frac{3}{4}$. How are the dividend and divisor of a division expression related to the parts of a fraction?

_____

_____

2. **Analyze Relationships** How could you represent the division as a fraction if 5 people shared 2 blocks? if 6 people shared 5 blocks?

_____

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

TEKS 6.2.A

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. $-7 = \frac{-7}{1}$

Math Talk

Mathematical Processes

What division is represented by the fraction $\frac{34}{1}$?

YOUR TURN

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

3. -15 _____

4. 0.31 _____

5. $4\frac{5}{9}$ _____

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.
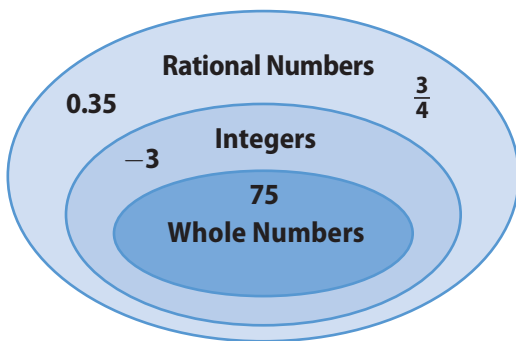
Rational Numbers

Integers

Whole Numbers

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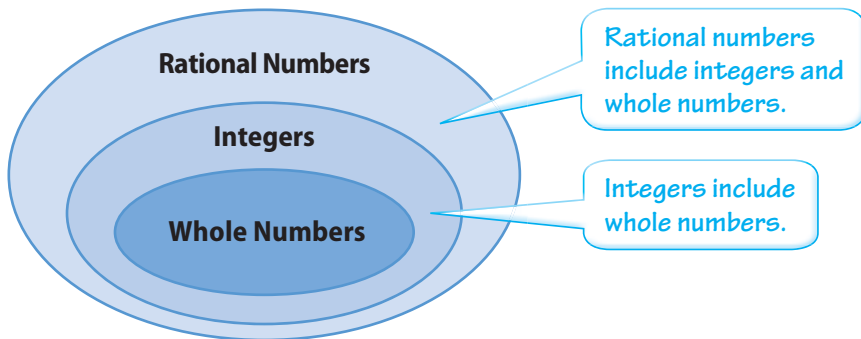
Integers include whole numbers.

EXAMPLE 2

TEKS 6.2.A

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

Rational Numbers

0.35

$\frac{3}{4}$

Integers

−3

75

Whole Numbers

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.

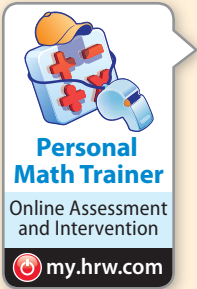**D** 0.35   The number 0.35 belongs in the set of rational numbers.

Reflect

7. **Analyze Relationships** Name two integers that are not also whole numbers.

_____

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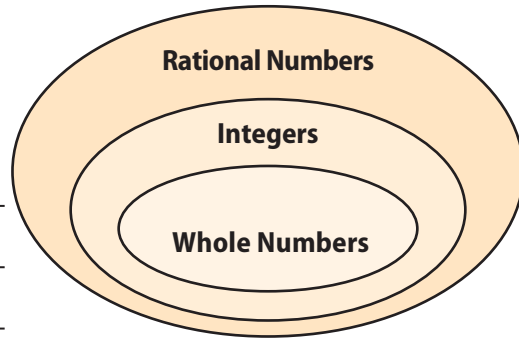
_____

_____

My Notes

Use this space to take notes as you listen in class.

YOUR TURN

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

Rational Numbers

Integers

Whole Numbers

9. 14.1 _____

10. $7\frac{1}{5}$ _____

11. -8 _____

12. 101 _____

Guided Practice

1. Sarah and four friends are decorating picture frames with ribbon. They have 4 rolls of ribbon to share evenly. **(Explore Activity)**

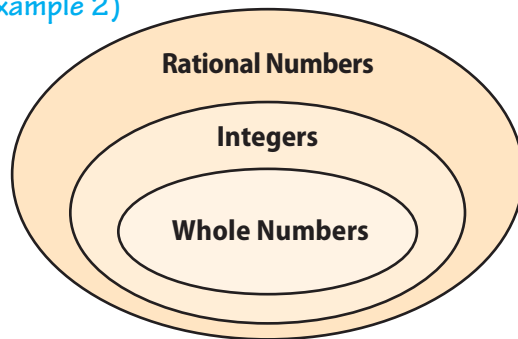   **a.** How does this situation represent division?

   _____

   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 each number belongs. (Example 2)

Rational Numbers

Integers

Whole Numbers

5. -15 _____

6. $5\frac{10}{11}$ _____

❓ ESSENTIAL QUESTION CHECK-IN

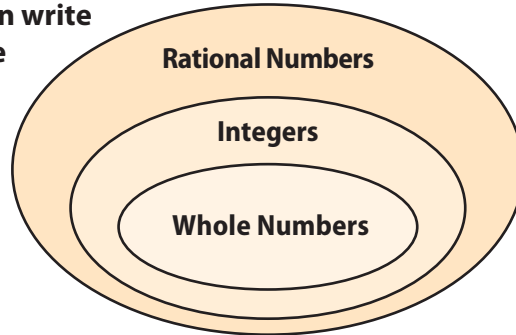**7.** How is a rational number that is not an integer different from a rational number that is an integer?

_____

_____

_____

2.1 Independent Practice

TEKS 6.2.A, 6.2.E

List two numbers that fit each description. Then write the numbers in the appropriate location on the Venn diagram.

Rational Numbers

Integers

Whole Numbers

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.

Member	Pieces of Fruit	Bottles of Water
Baxter	3	5
Hendrick	2	2
Mary	4	3
Kendra	5	7

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 is 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.

March Bills	
Water	$35
Gas	$14
Electric	$108

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.

_____

_____

Work Area

Identifying Opposites and Absolute Value of Rational Numbers

? ESSENTIAL QUESTION

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

EXPLORE ACTIVITY Real World

TEKS **6.2.B**

Positive and Negative Rational Numbers

Recall that positive numbers are greater than 0. They are located to the right of 0 on a number line. Negative 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.

Time	4 A.M. A	8 A.M. B	Noon C	4 P.M. D	8 P.M. E
Level (ft)	3.5	2.5	−0.5	−2.5	0.5

$$-5\ -4\ -3\ -2\ -1\ \ 0\ \ 1\ \ 2\ \ 3\ \ 4\ \ 5$$
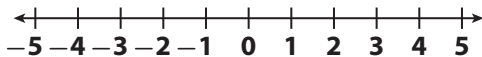
B How did you know where to graph −0.5? _____

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?
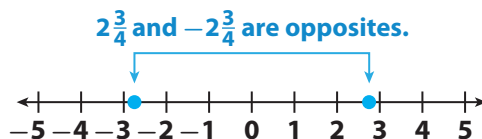
_____

Rational Numbers and Opposites on a Number Line

You can find the opposites of rational numbers 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.

$2\frac{3}{4}$ and $-2\frac{3}{4}$ are opposites.

$$-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5$$

EXAMPLE 1 Real World

TEKS 6.2.B

Until June 24, 1997, the New York Stock Exchange priced the value of a share of stock in eighths, such as $\$27\frac{1}{8}$ 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.

Day	Tuesday	Wednesday
Change in value ($)	$1\frac{5}{8}$	$-4\frac{1}{4}$

STEP 1 Graph the change in stock value for Wednesday on the number line.

The change in value for Wednesday is $-4\frac{1}{4}$.
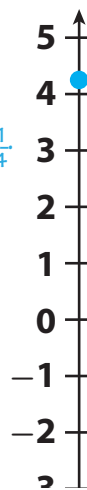
Graph a point $4\frac{1}{4}$ units below 0.

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 $4\frac{1}{4}$.

$-4\frac{1}{4}$ is between -4 and -5. It is closer to -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 also find the absolute value of a rational number 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 *Real World*

TEKS 6.2.B

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.

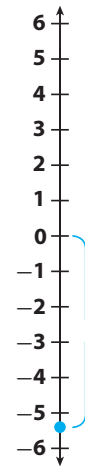| Year	2008	2009	2010	2011	2012
Temperature (°C)	−3.2	−5.4	−0.8	3.8	−2

My Notes

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?
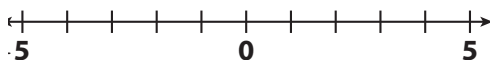
_____

_____

Math Talk
Mathematical Processes

How do you know where to graph −5.4?

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. $1\frac{1}{2}; \left|1\frac{1}{2}\right| = $ _____

6. $4; |4| = $ _____

7. $-3\frac{1}{4}; \left|-3\frac{1}{4}\right| = $ _____
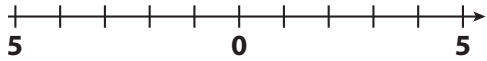
Personal Math Trainer

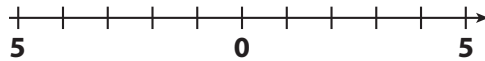Online Assessment and Intervention

my.hrw.com

Guided Practice

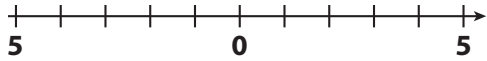**Graph each number and its opposite on a number line.** (Explore Activity and Example 1)
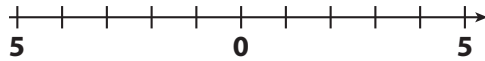
1. -2.8

```
+--+--+--+--+--+--+--+--+--+--+-->
5           0           5
```

2. 4.3

```
+--+--+--+--+--+--+--+--+--+--+-->
5           0           5
```

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

```
+--+--+--+--+--+--+--+--+--+--+-->
5           0           5
```

4. $1\frac{1}{3}$

```
+--+--+--+--+--+--+--+--+--+--+-->
5           0           5
```

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)

_____

_____

Find the absolute value of each number. (Example 2)

12. 5.23 _____

13. $-4\frac{2}{11}$ _____

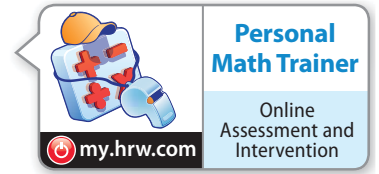**14.** 0 _____

15. $-6\frac{3}{5}$ _____

16. -2.12 _____

17. 8.2 _____

? ESSENTIAL QUESTION CHECK-IN

18. How do you identify the opposite and the absolute value of a rational number?

_____

_____

_____

_____

2.2 Independent Practice

TEKS 6.2.B

19. Financial Literacy A store's balance sheet represents the amounts customers owe as negative numbers and credits to customers as positive numbers.

Customer	Girardi	Lewis	Stein	Yuan	Wenner
Balance ($)	−85.23	20.44	−116.33	13.50	−9.85

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 and Jessie went on a vacation to Hawaii. 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 the given digits inside absolute value bars on a card. In the first round, each player will use the digits 3, 5, and 7 to fill in the card.

$$\left| -\ \underline{7}\ \underline{5}\ .\ \underline{3}\ \right|$$
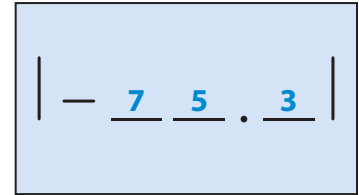
a. One student arranges the numbers on the card as shown. What was this student's mistake?

_____

_____

_____

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

Work Area

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.

-5 .... 0 5
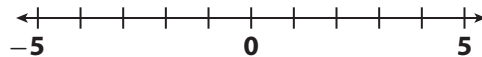
26. Draw Conclusions A number and its absolute value are equal. If you subtract 2 from the number, the new number and its absolute value are <u>not</u> equal. What do you know about the number? What is a possible number that satisfies these conditions?

_____

_____

Comparing and Ordering Rational Numbers
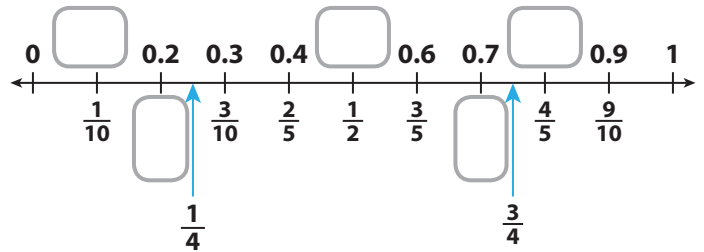
? ESSENTIAL QUESTION

How do you compare and order rational numbers?

EXPLORE ACTIVITY TEKS 6.2.D

Equivalent Fractions and Decimals

Fractions and decimals that represent the same value are *equivalent*. The number line shows 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.

_____

_____

A Explain how to use a number line to find a decimal equivalent to $1\frac{7}{10}$.

_____

_____

D Use the number line to complete each statement.

$0.2 =$ _____   _____ $= \frac{3}{10}$ $0.75 =$ _____ $1.25 =$ _____

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

TEKS 6.2.D

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.

$$\frac{1}{4} = 0.25 \qquad \frac{1}{2} = 0.5 \qquad \frac{3}{4} = 0.75$$

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.

> 60 is a multiple of the denominators of all three fractions.

$$0.35 = \frac{35}{100} = \frac{7}{20}$$

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

$$\overset{\times 5}{\frac{1}{12} = \frac{5}{60}}_{\times 5} \qquad \overset{\times 20}{\frac{2}{3} = \frac{40}{60}}_{\times 20} \qquad \overset{\times 3}{\frac{7}{20} = \frac{21}{60}}_{\times 3}$$

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, $\frac{7}{10}$ _____

Ordering Rational Numbers

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

EXAMPLE 2 · Real World · TEKS 6.2.D

Five friends completed a triathlon that included a 3-mile run, a 12-mile bike ride, and a $\frac{1}{2}$-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.
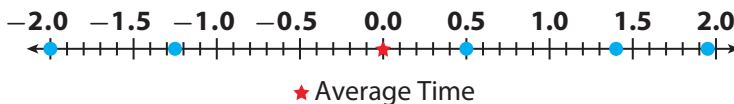
Runner	John	Sue	Anna	Mike	Tom
Time above or below average (minutes)	$\frac{1}{2}$	1.4	$-1\frac{1}{4}$	-2.0	1.95

Order the numbers from greatest to least.

STEP 1 Write the fractions as equivalent decimals.

$$\frac{1}{2} = 0.5 \qquad -1\frac{1}{4} = -1.25$$

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

$$-2.0 \quad -1.5 \quad -1.0 \quad -0.5 \quad 0.0 \quad 0.5 \quad 1.0 \quad 1.5 \quad 2.0$$

★ Average Time

$$1.95 > 1.4 > 0.5 > -1.25 > -2.0$$

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

Math Talk
Mathematical Processes

Who was the fastest runner? Explain.

Reflect

4. **Communicate Mathematical Ideas** Describe a different way to order the numbers.

_____

_____

_____

YOUR TURN

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.

Biker	John	Sue	Anna	Mike	Tom
Time above or below average (minutes)	-1.8	1	$1\frac{2}{5}$	$1\frac{9}{10}$	-1.25

Guided Practice

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

1. $0.6 = $ _____

2. $\frac{1}{4} = $ _____

3. $0.9 = $ _____

4. $0.1 = $ _____

5. $\frac{3}{10} = $ _____
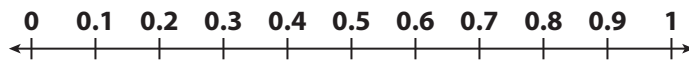
6. $1.4 = $ _____

7. $\frac{4}{5} = $ _____

8. $0.4 = $ _____

9. $\frac{6}{8} = $ _____

Use the number line to order the fractions and decimals from least to greatest. (Example 1)

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

```
 0   0.1  0.2  0.3  0.4  0.5  0.6  0.7  0.8  0.9   1
←+----+----+----+----+----+----+----+----+----+----+→
```

_____

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)

Lengths of Fish (cm)		
Emma	**Anne**	**Emily**
12.7	$12\frac{3}{5}$	$12\frac{3}{4}$

_____

List the fractions and decimals 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. Explain how to compare 0.7 and $\frac{5}{8}$.

_____

_____

_____

2.3 Independent Practice

TEKS 6.2.D

Personal
Math Trainer

Online
Assessment and
Intervention

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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. Use a number line to help you compare.

	Video games	Pizza
Rosa	0.4	$\frac{2}{5}$
Albert	$\frac{1}{2}$	0.25

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.

	Brenda	Claire	Jim	Micah	Peter
Weight (lb)	4.3	5.5	$6\frac{1}{6}$	$\frac{15}{4}$	$4\frac{3}{8}$

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. Last week, several gas stations in a neighborhood all charged the same price for a gallon of gas. The table below shows how much gas prices have changed from last week to this week.

Gas Station	Gas and Go	Samson Gas	Star Gas	Corner Store	Tip Top Shop
Change from last week (in cents)	-6.6	5.8	$-6\frac{3}{4}$	$\frac{27}{5}$	$-5\frac{5}{8}$

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

_____

b. Which gas station has the cheapest gas this week? _____

c. **Critical Thinking** Which gas station changed their price the least this week?

_____

Work Area

25. **Analyze Relationships** Explain how you would order from least to greatest three numbers that include a positive number, a negative number, and zero.

_____

_____

_____

26. **Critique Reasoning** Luke is making pancakes. The recipe calls for 0.5 quart of milk and 2.5 cups of flour. He has $\frac{3}{8}$ quart of milk and $\frac{18}{8}$ cups of flour. Luke makes the recipe with the milk and flour that he has. Explain his error.

_____

_____

_____

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.

_____

_____

_____

_____

Ready to Go On?
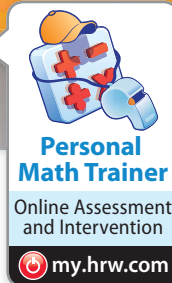
2.1 Classifying Rational Numbers

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 as $\frac{a}{b}$.
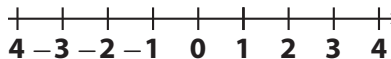
2. $5\frac{1}{6}$ _____

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. $\frac{7}{8}$ _____

2.2 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 opposite of $\frac{1}{3}$ and $-\frac{7}{12}$ _____

8. Find the absolute value of 9.8 and $-\frac{10}{3}$ _____

2.3 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.

_____

? **ESSENTIAL QUESTION**

10. How can you solve problems by ordering rational numbers from least to greatest?

_____

_____

Texas Test Prep

Selected Response

1. Suki split five dog treats equally among her six dogs. Which fraction represents this division?

(A) $\frac{6}{5}$ of a treat   (C) $\frac{1}{5}$ of a treat

(B) $\frac{5}{6}$ of a treat   (D) $\frac{1}{6}$ of a treat

2. Which set or sets does the number 15 belong to?

(A) whole numbers only

(B) rational numbers only

(C) integers and rational numbers only

(D) whole numbers, integers, and rational numbers

3. Which of the following statements about rational numbers is correct?

(A) All rational numbers are also whole numbers.

(B) All rational numbers are also integers.

(C) All rational numbers can be written in the form $\frac{a}{b}$.

(D) Rational numbers cannot be negative.

4. Which of the following shows the numbers in order from least to greatest?

(A) $-\frac{1}{5}, -\frac{2}{3}, 2, 0.4$

(B) $2, -\frac{2}{3}, 0.4, -\frac{1}{5}$

(C) $-\frac{2}{3}, 0.4, -\frac{1}{5}, 2$

(D) $-\frac{2}{3}, -\frac{1}{5}, 0.4, 2$

5. What is the absolute value of -12.5?

(A) 12.5   (C) -1

(B) 1   (D) -12.5

6. Which number line shows $-\frac{1}{4}$ and its opposite?
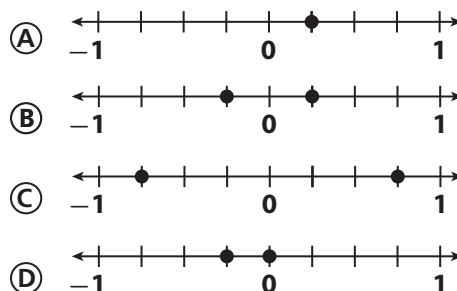
7. Horatio climbed to the top of a ladder that is 10 feet high. What is the opposite of Horatio's height on the ladder?

(A) -10 feet   (C) 0 feet

(B) 10 feet   (D) $\frac{1}{10}$ foot

Gridded Response

8. The heights of four students in Mrs. Patel's class are $5\frac{1}{2}$ feet, 5.35 feet, $5\frac{4}{10}$ feet, and 5.5 feet. What is the height in feet of the shortest student written as a decimal?

Study Guide Review

MODULE 1 Integers

Key Vocabulary
absolute value *(valor absoluto)*
inequality *(desigualdad)*
integers *(entero)*
negative numbers *(número negativo)*
opposites *(opuestos)*
positive numbers *(número positivo)*

? **ESSENTIAL QUESTION**

How can you use integers to solve real-world problems?

EXAMPLE 1

James recorded the temperature at noon in Fairbanks, Alaska, over a week in January.

Day	Mon	Tues	Wed	Thurs	Fri
Temperature	3	2	7	−3	−1

Graph the temperatures on the number line, and then list the numbers in order from least to greatest.

Graph the temperatures on the number line.

Read from left to right to list the temperatures in order from least to greatest.

The temperatures listed from least to greatest are −3, −1, 2, 3, 7.

EXAMPLE 2

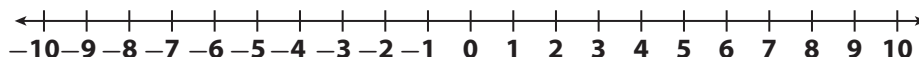**Graph the following numbers on the number line. Then use the number line to find each absolute value.**

−4   0   2   −1

$|-4| = $ _____ $|0| = $ _____

$|2| = $ _____ $|-1| = $ _____

EXERCISES

1. Graph each number on the number line. **(Lesson 1.1)**
7, −2, 5, 1, −1

Write the opposite of each number . (Lesson 1.1)

2. 8 _____

3. −3 _____

List the numbers from least to greatest. (Lesson 1.2)

4. 4, 0, −2, 3

_____

5. −3, −5, 2, −2

_____

Use a number line to help you compare the numbers. Use $<$ or $>$. (Lesson 1.2)

6. 4 ◯ 1

7. −2 ◯ 2

8. −3 ◯ −5

9. −7 ◯ 2

Find each absolute value. (Lesson 1.3)

10. $|6|$ _____

11. $|-2|$ _____

MODULE 2 **Rational Numbers**

How can you use rational numbers to solve real-world problems?
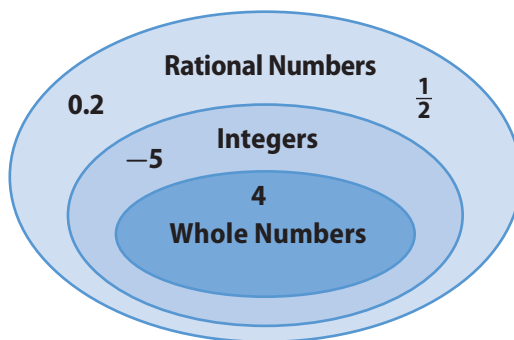
Key Vocabulary

rational number *(número racional)*

Venn digram *(diagrama de Venn)*

EXAMPLE 1

Use the Venn diagram to determine in which set or sets each number belongs.


A. $\frac{1}{2}$ The number $\frac{1}{2}$ belongs in the set of rational numbers.

B. −5   The number −5 belongs in the sets of integers and rational numbers.

C. 4   The number 4 belongs in the sets of whole numbers, integers, and rational numbers.

D. 0.2   The number 0.2 belongs in the set of rational numbers.

EXAMPLE 2

A. Order $\frac{1}{10}$, 0.9, 0.2, $\frac{3}{5}$, and 0.35 from least to greatest.

Write the fractions as equivalent decimals. $\frac{1}{10} = 0.1$ $\frac{3}{5} = 0.6$

Use the number line to write the decimals in order.
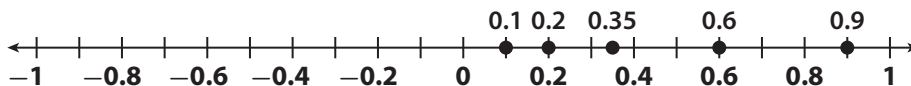
$0.1 < 0.2 < 0.35 < 0.6 < 0.9$

The numbers in order from least to greatest are $\frac{1}{10}$, 0.2, 0.35, $\frac{3}{5}$, 0.9.

B. Order $\frac{2}{5}$, 0.2, and $\frac{4}{15}$ from greatest to least.

Write the decimal as an equivalent fraction. $0.2 = \frac{2}{10} = \frac{1}{5}$

Find equivalent fractions with 15 as the common denominator.

$\frac{2 \times 3}{5 \times 3} = \frac{6}{15}$ $\frac{1 \times 3}{5 \times 3} = \frac{3}{15}$ $\frac{4}{15} = \frac{4}{15}$

Order fractions with common denominators by comparing the numerators.

$6 > 4 > 3$ $\frac{6}{15} > \frac{4}{15} > \frac{3}{15}$

The numbers in order from greatest to least are $\frac{2}{5}$, $\frac{4}{15}$, 0.2.

EXERCISES

Classify each number by indicating in which set or sets it belongs.
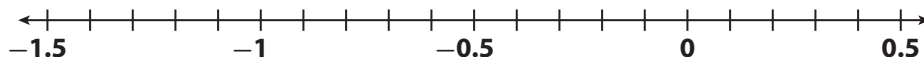**(Lesson 2.1)**

1. 8 _____

2. 0.25 _____

Find the absolute value of each rational number. (Lesson 2.2)

3. $|3.7|$ _____   **4.** $\left|-\frac{2}{3}\right|$ _____

Graph each set of numbers on the number line and order the numbers from greatest to least. (Lesson 2.1, 2.3)

5. $-0.5, -1, -\frac{1}{4}, 0$

_____

1. **CAREERS IN MATH** **Climatologist** Each year a tree is alive, it adds a layer of growth, called a tree ring, between its core and its bark. A climatologist measures the width of tree rings of a particular tree for different years:

Year	1900	1910	1920	1930	1940
Width of ring (in mm)	$\frac{14}{25}$	$\frac{29}{50}$	$\frac{53}{100}$	$\frac{13}{20}$	$\frac{3}{5}$

The average temperature during the growing season is directly related to the width of the ring, with a greater width corresponding to a higher average temperature.
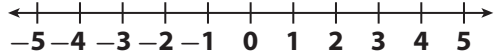
a. List the years in order of increasing ring width.

_____

b. Which year was hottest? How do you know?

_____

c. Which year was coldest? How do you know?

_____

2. A parking garage has floors above and below ground level. For a scavenger hunt, Gaia's friends are given a list of objects they need to find on the third and fourth level below ground, the first and fourth level above ground, and ground level.

a. If ground level is 0 and the first level above ground is 1, which integers can you use to represent the other levels where objects are hidden? Explain your reasoning.

_____

_____

b. Graph the set of numbers on the number line.

$$\begin{array}{ccccccccccc} -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 \end{array}$$

c. Gaia wants to start at the lowest level and work her way up. List the levels in the order that Gaia will search them.

_____

d. If she takes the stairs, how many flights of stairs will she have to climb? How do you know?

_____

_____

Selected Response

1. What is the opposite of -9?

(A) 9

(B) $-\dfrac{1}{9}$

(C) 0

(D) $\dfrac{1}{9}$

2. Kyle is currently 60 feet above sea level. Which correctly describes the opposite of Kyle's elevation?

(A) 60 feet below sea level

(B) 60 feet above sea level

(C) 6 feet below sea level

(D) At sea level

3. What is the absolute value of 27?

(A) -27

(B) 0

(C) 3

(D) 27

4. In Albany it is $-4°F$, in Chicago it is $-14°F$, in Minneapolis it is $-11°F$, and in Toronto it is $-13°F$. In which city is it the coldest?

(A) Albany

(B) Chicago

(C) Minneapolis

(D) Toronto

5. Which shows the integers in order from greatest to least?

(A) $18, 4, 3, -2, -15$

(B) $-2, 3, 4, -15, 18$

(C) $-15, -2, 3, 4, 18$

(D) $18, -15, 4, 3, -2$

6. Joanna split three pitchers of water equally among her eight plants. What fraction of a pitcher did each plant get?

(A) $\dfrac{1}{8}$ of a pitcher

(B) $\dfrac{1}{3}$ of a pitcher

(C) $\dfrac{3}{8}$ of a pitcher

(D) $\dfrac{8}{3}$ of a pitcher

7. Which set or sets does the number -22 belong to?

(A) Whole numbers only

(B) Rational numbers only

(C) Integers and rational numbers only

(D) Whole numbers, integers, and rational numbers

8. Carlos swam to the bottom of a pool that is 12 feet deep. What is the opposite of Carlos's elevation relative to the surface?

(A) -12 feet

(B) 0 feet

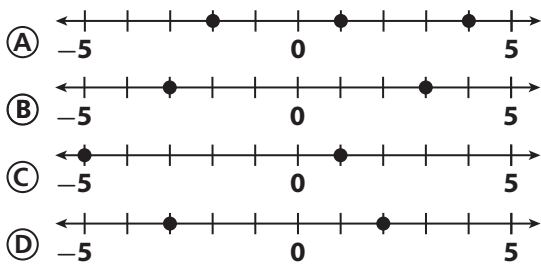(C) 12 feet

(D) $\dfrac{1}{12}$ foot

9. Which number line shows $\frac{1}{3}$ and its opposite?

Ⓐ

Ⓑ

Ⓒ

Ⓓ
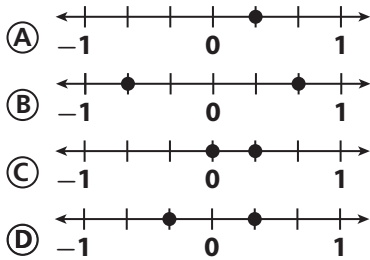
10. Which of the following shows the numbers in order from least to greatest?

Ⓐ $-\frac{2}{3}, -\frac{3}{4}, 0.7, 0$

Ⓑ $0.7, 0, -\frac{2}{3}, -\frac{3}{4},$

Ⓒ $-\frac{2}{3}, -\frac{3}{4}, 0, 0.7$

Ⓓ $-\frac{3}{4}, -\frac{2}{3}, 0, 0.7$

11. Which number line shows an integer and its opposite?

Ⓐ

Ⓑ

Ⓒ

Ⓓ

Gridded Response

12. Which is the greatest out of $\frac{1}{3}, -1.2, 0.45,$ and $-\frac{4}{5}$?

13. As part of a research team, Ryanne climbed into a cavern to an elevation of -117.6 feet. What is the absolute value of Ryanne's elevation, in feet?

Hot Tip! **These grids do not allow you to give an answer that is negative. If you get a negative value, you likely made an error. Check your work!**

14. Melvin has a certain number of files on his computer. The opposite of this number is -653. How many files are on Melvin's computer?