LESSON 25

Dear Family,

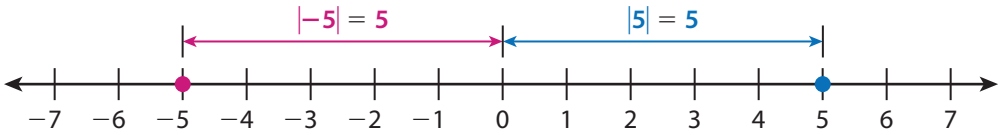
This week your student is learning about absolute value. The **absolute value** of a number is its distance from 0 on the number line.

The symbol $|5|$ is read as *the absolute value of 5*.

$|5| = 5$ because the distance from 5 to 0 is 5 units.

$|-5| = 5$ because the distance from -5 to 0 is 5 units.

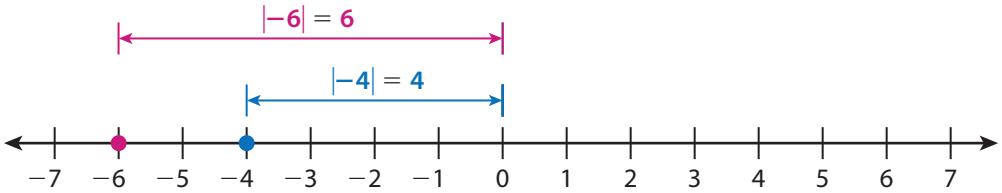
} This means $|5| = |-5|$.



Your student will be comparing absolute values such as the ones below.

Use $<$, $>$, or $=$ to compare the absolute values of -6 and -4.

➤ **ONE WAY** to compare absolute values is by using a number line.



It is a greater distance from -6 to 0 than it is from -4 to 0.

$|-6| > |-4|$

➤ **ANOTHER WAY** is to interpret the absolute values in a real-world situation.

Think of -6 and -4 as representing debts of \$6 and \$4.

Since $|-6| = 6$ and $|-4| = 4$, the absolute values of -6 and -4 represent the amounts owed, \$6 and \$4.

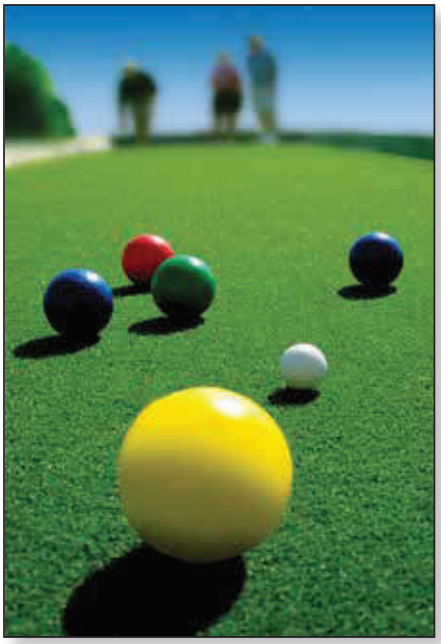
A person with a debt of \$6 owes more money than a person with a debt of \$4.

$|-6| > |-4|$

Using either model, you can see that $|-6| > |-4|$.

Use the next page to start a conversation about absolute value.

Activity Thinking About Absolute Value Around You



➤ **Do this activity together to investigate absolute value in the real world.**

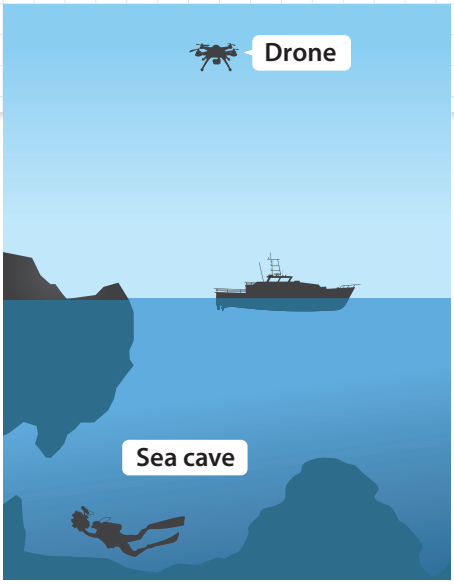
Bocce is a game where players throw bocce balls to get as close to a smaller target ball as possible. It does not matter if your bocce ball rolls past the target ball or if it stops before. Either way, you measure the distance from your bocce ball to the target ball.

In this way, playing bocce is like using absolute value. You can think about the target ball as the 0 point on a number line. It does not matter if your bocce ball ends up past the target ball at $+5$ or in front of the target ball at -5, because the distance from the target ball is still 5.

? Where else do you see absolute value in the world around you?

UNDERSTAND: What is the absolute value of a number?

Explore Absolute Value



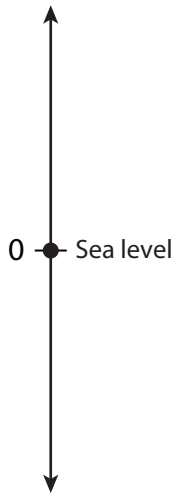
Model It

➤ **Complete the problems about distance from 0.**

1 A scientist standing on the deck of a boat uses a drone, and a scuba diver uses a camera to explore a sea cave. The table shows the elevations of four objects relative to sea level.

Object	Camera	Cave floor	Drone	Boat deck
Elevation	−20 ft	−30 ft	20 ft	5 ft

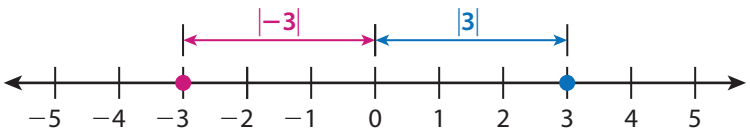
a. Use the number line to show the elevations of the objects from the table. Label each object at its elevation.



b. Are any of the objects the same distance from sea level? If so, how far from sea level are they?

c. Another object is 3 ft from sea level. Is the object's elevation *positive*, *negative*, or could it be *either*? Explain.

2 The **absolute value** of a number is its distance from 0. The notation $|-3|$ is read as *the absolute value of* -3 and represents the distance of -3 from 0.



$|3|$ = _____ because the distance from 0 to 3 is _____ units.

$|-3|$ = _____ because the distance from 0 to -3 is _____ units.

DISCUSS IT

Ask: How is absolute value related to zero on the number line?

Share: I think two numbers will have the same absolute value when . . .

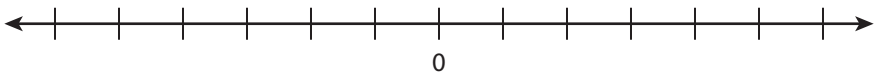
Learning Targets SMP 2, SMP 3, SMP 7

- Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.
- Distinguish comparisons of absolute value from statements about order.

Model It

➤ **Complete the problems about absolute value.**

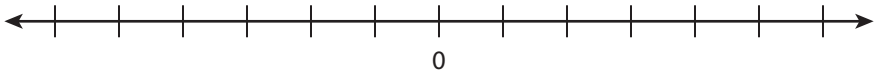
3 **a.** Plot and label the numbers 3, 4, 5, and 6 on the number line. Do the values of the numbers *increase* or *decrease* as the numbers go from 3 to 6?



b. Write the absolute value of each number. Do the absolute values of the numbers *increase* or *decrease* the numbers go from 3 to 6?

$|3| =$ _____ $|4| =$ _____ $|5| =$ _____ $|6| =$ _____

4 **a.** Plot and label the numbers -3, -4, -5, and -6 on the number line. Do the values of the numbers *increase* or *decrease* as the numbers go from -3 to -6?



b. Write the absolute value of each number. Do the absolute values of the numbers *increase* or *decrease* as the numbers go from -3 to -6?

$|-3| =$ _____ $|-4| =$ _____ $|-5| =$ _____ $|-6| =$ _____

DISCUSS IT

Ask: How are distance and absolute value related?

Share: I think the absolute value of 0 is . . . because . . .

5 Write *lesser* or *greater* to complete each statement.

a. The farther a number is from 0, the _____ the number's absolute value.

b. The closer a number is to 0, the _____ the number's absolute value.

6 **Reflect** Is the absolute value of a number ever negative? Explain your reasoning.

 Name:

Prepare for Understanding Absolute Value

1 Think about what you know about opposite numbers. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

In My Own Words

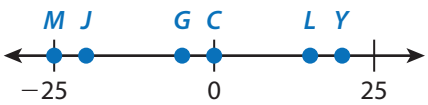
My Illustrations

opposite numbers

Examples

Non-Examples

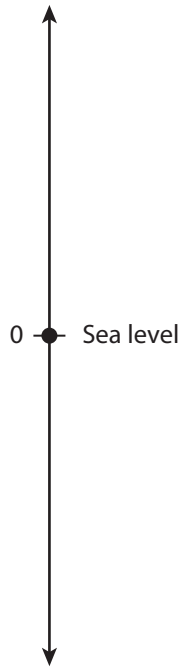
2 Look at the number line. Which pair of points appears to show a pair of opposite numbers? Explain your reasoning.



➤ **Complete problems 3–5.**

3 The table shows the elevations of four objects relative to sea level.

Object	Elevation (km)
Mountain cabin	2
Submarine	−10
Sunken ship	−6
Airplane	10



a. Use the number line to show the elevations of the four objects. Label each object at its elevation.

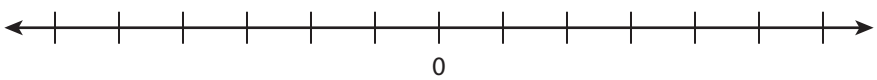
b. Circle the two objects on your number line that are the same distance from 0.

4 The notation $|40|$ means *the absolute value of 40*.

a. $|40| =$ _____ because the distance from 0 to 40 is _____.

b. $|-40| =$ _____ because the distance from 0 to −40 is _____.

5 **a.** Plot and label the numbers −2, −4, −6, and −8 on the number line. Do the values of the numbers *increase* or *decrease* as the numbers go from −2 to −8?



b. Find the absolute value of each number. Do the absolute values of the numbers *increase* or *decrease* as the numbers go from −2 to −8?

$|-2| =$ _____ $|-4| =$ _____ $|-6| =$ _____ $|-8| =$ _____

Vocabulary

absolute value

a number's distance from 0 on the number line. Absolute value is never negative.

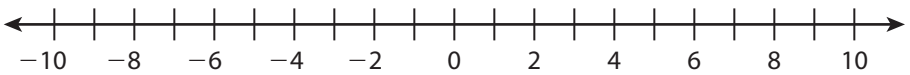
UNDERSTAND: What is the absolute value of a number?

Develop Understanding of Absolute Value

Model It: Compare Absolute Values

➤ **Try these two problems about comparing absolute values.**

1 Use the number line to help you compare the numbers and compare their absolute values. Write $<$, $>$, or $=$ in each circle to make a true statement. Explain how you know.

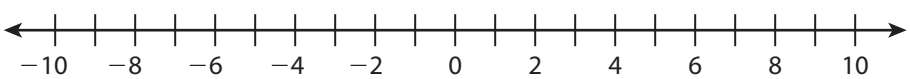


a. $-9 \bigcirc 5$ $\quad |-9| \bigcirc |5|$

b. $-1 \bigcirc 2$ $\quad |-1| \bigcirc |2|$

c. $-8 \bigcirc 8$ $\quad |-8| \bigcirc |8|$

2 Plot and label points for two numbers a and b so that $a < b$ and $|a| > |b|$. Explain your thinking.



DISCUSS IT

Ask: How does a number line help you determine which absolute value is greater?

Share: I think that when you compare two numbers and then compare their absolute values, the inequality symbols can be different because . . .

Model It: Interpret Absolute Value

➤ **Try these two problems about interpreting absolute value.**

3 The absolute value of a number may be used to describe the size, or magnitude, of a real-world quantity. Complete each equation and sentence.

a. $|-20| =$ _____ $-\$20$ means you owe \$_____.

b. $|+10| =$ _____ A score of $+10$ points means you win _____ points.

c. $|-10| =$ _____ A score of -10 points means you _____ points.

4 In each turn of a game, a player either wins or loses points. After the first turn, Jacob's score is -250 points and Indira's score is -300 points. Circle the inequality that makes a correct comparison. Then write a sentence to tell what the inequality means in this situation.

a. $-300 > -250$ $-300 < -250$

b. $|-300| > |-250|$ $|-300| < |-250|$

DISCUSS IT

Ask: How would you interpret the absolute value of a negative temperature?

Share: I think you can use positive numbers to describe negative quantities because . . .

CONNECT IT

➤ **Complete the problems below.**

5 A whale starts at an elevation of -200 ft relative to sea level and then swims to an elevation of -150 ft. Write an inequality using absolute value notation to compare the distances below sea level. Explain your reasoning.

6 Luis says $|4|$ is greater than $|-5|$ because 4 is positive, -5 is negative, and any positive number is greater than any negative number. Do you agree? Explain.

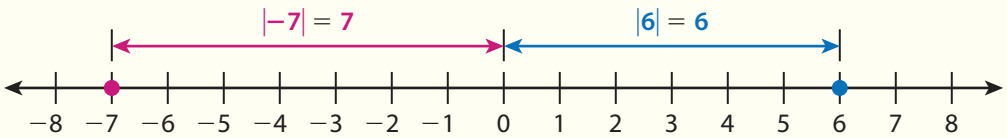
 Name:

Practice Comparing Absolute Values

➤ **Study how the Example shows comparing two numbers and their absolute values. Then solve problems 1–5.**

Example

Use the numbers −7 and 6. Which number has the greater value? Which number has the greater absolute value?



6 is to the right of −7 on the number line, so 6 is greater than −7.

−7 is 7 units from 0.

6 is 6 units from 0.

So, −7 has the greater absolute value.

$-7 < 6$ and $|-7| > |6|$.

1 Choose a number less than −2 that is on the number line in the Example. Is your number's absolute value *greater than 2* or *less than 2*? Explain how you know.

2 Use the number line from the Example to help you compare the numbers and compare their absolute values. Write <, >, or = in each circle to make a true statement. Explain how you know.

a. −3 ◯ 5 $\quad |-3| \bigcirc |5|$

b. 4 ◯ −4 $\quad |4| \bigcirc |-4|$

Vocabulary

absolute value

a number's distance from 0 on the number line. Absolute value is never negative.

3 Sophia, Malcolm, and Oren are playing a money game. Their bank balances are shown in the table. Complete the table by writing the absolute value of each bank balance to show how much each player owes. Who owes the greatest amount?

Player	Bank Balance	Amount Owed
Sophia	−$150	
Malcolm	−$325	
Oren	−$275	

4 The temperature on Monday is −24°C. The temperature on Tuesday is −21°C. Circle the inequality that makes a correct comparison. Then write a sentence to tell what the inequality means in this situation.

a. $-24 < -21$ $-24 > -21$

b. $|-24| < |-21|$ $|-24| > |-21|$

5 Plot and label points for two numbers c and d so that $c < d$ and $|c| > |d|$. Explain your thinking.

UNDERSTAND: What is the absolute value of a number?

Refine Ideas About Absolute Value

Apply It

Math Toolkit number lines

➤ **Complete problems 1–5.**

1. **Deduce** Jia is thinking of a number. She gives three clues about the number: the number is even, the number is less than -12, and the absolute value of the number is between 9 and 15. What is Jia's number? Explain how you know.

2. **Analyze** Ian says that if $x < y$, then $|x| < |y|$. Is Ian's statement *always true, sometimes true,* or *never true?* Use a model to help explain your thinking.

3. **Apply** Mrs. Shen writes the expression $|-5| + |3|$ on the board. Show or explain why the sum $|-5| + |3|$ is the distance between -5 and 3 on a number line.

4 A tour group is going sea diving. The ocean floor is at −18 ft relative to sea level. One diver is already at −11 ft. The tour guide is keeping watch on a platform 5 ft above sea level, directly above the diver.

PART A Draw a model of the situation.

PART B Write an absolute value inequality comparing the distances of the tour guide and the diver to sea level. Who is closer to sea level? Explain how you know.

5 **Math Journal** Order the numbers 5, −7, −9, and −2 from least to greatest. Then order the absolute values $|5|$, $|-7|$, $|-9|$, and $|-2|$ from least to greatest. Explain how absolute value affects which values are lesser and which values are greater.

End of Lesson Checklist

☐ **INTERACTIVE GLOSSARY** Find the entry for *absolute value*. Explain why the absolute value of −4 is greater than the absolute value of 3.