

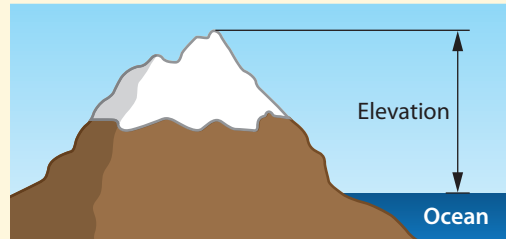
Absolute Value and Ordering Numbers

Use What You Know

In Lesson 12, you learned how to locate positive and negative numbers on a number line. In this lesson you will learn how to compare the numbers and find their absolute value. Take a look at this problem.

The elevation of an object tells you its distance above or below sea level. Negative numbers are used to represent objects below sea level. Positive numbers are used to represent objects above sea level.

The table below shows the elevations of four objects. Graph their locations on a number line. Describe the distances of the objects above or below sea level.

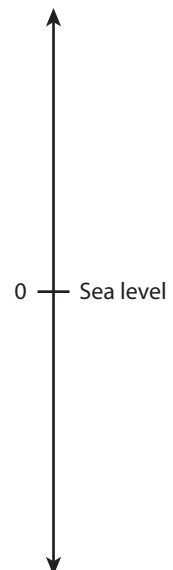


Object	Mountain	Fish	Sunken Ship	Airplane
Elevation (in km)	2	-1	-4	4

Use the math you already know to solve the problem.

- Sea level is marked and labeled on the number line. Mark and label the elevation of the objects listed in the table above on the number line.
- How far above sea level is the mountain? _____
- How far below sea level is the school of fish? _____
- Is the airplane above or below sea level? _____
- What two objects are the same distance from sea level? Explain how you know. _____

- Explain how you could find the distances of the objects from sea level.



➤ Find Out More

When you answered how far each object is from sea level, you found the absolute value of a number.

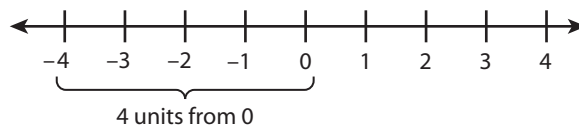
The **absolute value** of a number is its distance from 0 on the number line.

$|-4|$ means the absolute value of -4 .

-4 is 4 units from 0.

$$|-4| = 4$$

The absolute value of -4 is 4 because -4 is 4 units from 0 on the number line.



Absolute value represents distance, so its value is always greater than or equal to 0.

The absolute value of 0 is 0, or $|0| = 0$.

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

In real-world situations, the absolute value of a number is often used to describe the situation. The elevation of the fish is -1 km, but you could also say that the fish is 1 km below sea level. The elevation of the sunken ship is -4 km, but you could also say that the sunken ship is 4 km below sea level.

▶ Reflect

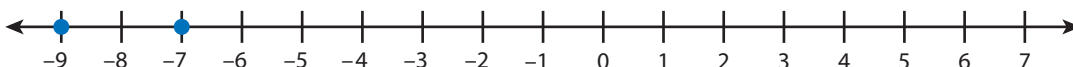
- 1 Look at your number line on the previous page. Which pair of numbers have the same absolute value? How are the numbers related? Explain.

Learn About**Comparing Positive and Negative Numbers**

Read the problem below. Then explore how to use a number line to compare positive and negative numbers.

One morning it was -9°F in Columbus, Ohio and -7°F in Pittsburgh, Pennsylvania. Was it warmer in Columbus or Pittsburgh?

Picture It You can graph the numbers on a number line.



Model It You can use the number line to write an inequality to compare the numbers.

-9 is to the left of -7 on the number line.
This means that -9 is less than -7 .

You can use symbols to compare the numbers.
The symbol $<$ means *is less than*.
 $-9 < -7$

Model It You can use the number line to write a second inequality to compare the numbers.

-7 is to the right of -9 on the number line.
This means that -7 is greater than -9 .

You can use symbols to compare the numbers.
The symbol $>$ means *is greater than*.
 $-7 > -9$

▶ **Connect It** Now use the number line and the comparison statements to solve the problem.

2 Look at the number line in *Picture It*.

Where is -9 located? _____

Where is -7 located? _____

3 From left to right, does the number line show numbers from least to greatest or greatest to least? _____

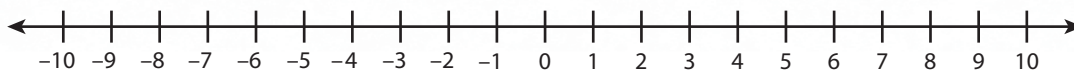
4 Which is the warmer temperature, -9°F or -7°F ? _____

Which city was warmer? _____

5 *Model It* shows that you can write two inequalities to compare -9 and -7 . Write two inequalities to compare -6 and 5 . Tell how you decided.

6 Explain how you can use a number line to compare any two numbers.

▶ **Try It** Use what you just learned to compare the numbers below. Use the number line to help if needed. Show your work on a separate sheet of paper.



7 Write two inequalities to compare -5 and -3 . _____

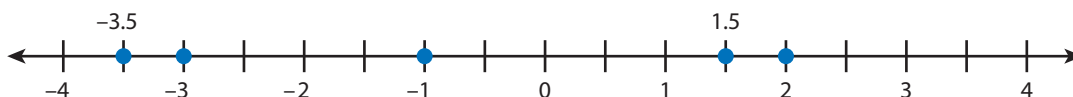
8 Write two inequalities to compare 9 and -9 . _____

Learn About **Ordering Positive and Negative Numbers**

Read the problem below. Then explore how to use a number line to order positive and negative numbers.

Five friends played a game where you earn positive and negative points. Their final scores were -3.5 , 2 , -3 , -1 , 1.5 . What was the highest score? What was the lowest score?

Picture It You can graph the numbers on a number line.



Model It You can compare the positions of the numbers on the number line.

-3.5 is to the left of -3 .

-3 is to the left of -1 .

-1 is to the left of 1.5 .

1.5 is to the left of 2 .

Model It You can compare the positions of the numbers on the number line in another way.

2 is to the right of 1.5 .

1.5 is to the right of -1 .

-1 is to the right of -3 .

-3 is to the right of -3.5 .

Connect It Now use the number line to order the numbers and solve the problem.

9 Look at the first *Model It*. Order the numbers from least to greatest.

10 Look at the second *Model It*. Order the numbers from greatest to least.

11 What was the lowest score? How do you know? _____

12 What was the highest score? How do you know? _____

13 Explain how to use a number line to order numbers. _____

Try It Use what you just learned about ordering numbers to solve these problems. Use a number line to help if needed. Show your work on a separate sheet of paper.

14 Order the numbers from least to greatest.

a. $-8, -6, -5, -7$ _____

b. $-8.2, 6, -3.5, 8.2, -5$ _____

15 Order the numbers from greatest to least.

a. $-\frac{3}{4}, -1, \frac{5}{4}, 2$ _____

b. $-0.5, 1.5, 0, -5, 1.25$ _____

Practice **Finding Absolute Value and Ordering Numbers**

Study the example below. Then solve problems 16–18.

Example

A 6th grade class is studying transportation in New York City. They collected this data about the heights above ground and depths below ground of different structures. Write the names of these structures in order from lowest elevation to highest elevation.

Verrazano Narrows Bridge 70 m

Holland Tunnel -25 m

George Washington Bridge 60 m

Lincoln Tunnel -30 m



Solution Lincoln Tunnel, Holland Tunnel, George Washington Bridge, Verrazano Narrows Bridge



The student graphed the numbers on a number line to order them from least to greatest.

**Pair/Share**

Are positive numbers always greater than negative numbers?

- 16** Eyeglass prescriptions use positive and negative numbers to describe vision. In general, the farther away from zero the number on a prescription is, the more vision correction you need. Negative numbers mean you are nearsighted, positive numbers mean you are farsighted. The table below shows prescription numbers for five patients.

Patient	A	B	C	D	E
Prescription	-2.25	1.00	-1.50	3.25	-3.00

Which patients are nearsighted?

Which patients are farsighted?

Which patient is the most nearsighted?

Which patient is the most farsighted?

Solution _____



Will graphing the numbers on a number line help?

**Pair/Share**

How do you compare negative numbers?

- 17 Which number is greater, -7 or 6 ? Which number has the greater absolute value, -7 or 6 ? Explain your thinking. Use comparison symbols and absolute value symbols when you write your answer.



What does absolute value mean?

Solution _____



Pair/Share

Can a negative number have a greater absolute value than a positive number?

- 18 The table below shows elevations of different locations in the world. List the elevations in order from greatest to least. Circle the letter of the correct answer.

Location	Caspian Sea	Mekong Delta	Lake Eyre	Senegal River	Iron Gate
Elevation (in ft)	-98	230	-52	75	92



Are negative numbers always less than positive numbers?

- A** $-52, -98, 75, 92, 230$
B $-98, -52, 75, 92, 230$
C $230, 92, 75, -52, -98$
D $230, 92, 75, -98, -52$

Randy chose **B** as the correct answer. How did he get that answer?



Pair/Share

How can you tell that Randy's answer can't be correct by looking at one number's position in his answer?

Practice**Finding Absolute Value and Ordering Numbers****Solve the problems.**

- 1** The lowest temperatures ever recorded in five of Earth's continents are shown in the table below.

Continent	South America	North America	Antarctica	Europe	Asia
Temperature (in °C)	−39	−66.1	−89.2	−58.1	−68

Which continent has a lower recorded temperature than Asia?

- A** South America
- B** North America
- C** Europe
- D** Antarctica

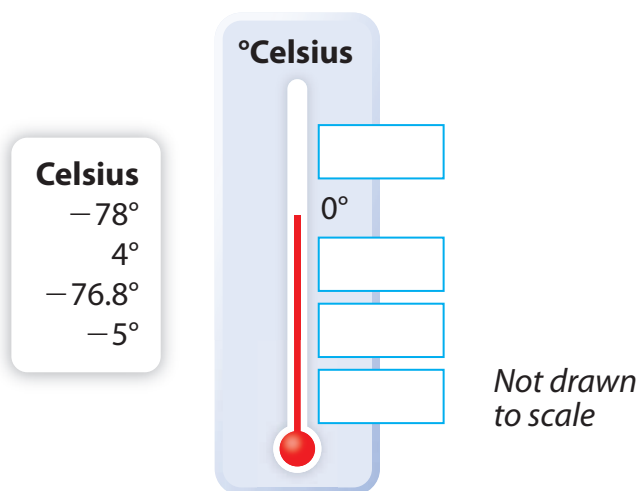
- 2** On February 17, 1936, the following temperatures were recorded:

City	Temperature
McIntosh, SD	−58°F
Duluth, MN	−26°F
Miami, FL	78°F

Choose *True* or *False* for each statement.

- a.** Duluth, MN was colder than both the other cities. ☐ True ☐ False
- b.** Duluth, MN was warmer than McIntosh, SD. ☐ True ☐ False
- c.** The temperature in McIntosh, SD was farther from 0°F than the temperature in Miami, FL was. ☐ True ☐ False
- d.** The temperature in McIntosh, SD was farther from 0°F than the temperature in Duluth, MN was. ☐ True ☐ False

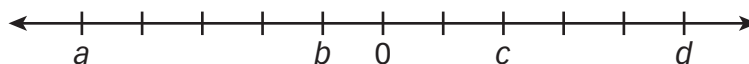
- 3 From the list on the left, write in the correct temperature along the thermometer.



- 4 A tour group is going sea diving. Sea level is 0 feet. The ocean floor is -18 feet. One diver is already at -11 feet. The tour guide is keeping watch on the deck at 5 feet above sea level directly above the diver. What is the distance from the tour guide to the diver? Draw and label a number line to justify your answer.

Answer _____ feet

- 5 Look at the number line below. The letters a , b , c , and d all represent integers.



- a. Write two inequalities to compare a and b . _____ How do you know?

- b. Write two inequalities to compare b and 0. _____ How do you know?

- c. If $|a| = |d|$, what can you say about a and d ?

Self Check Go back and see what you can check off on the Self Check on page 51.