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ISBN 978-0-8454-7912-4

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# 19 Comparing and Ordering Rational Numbers

**LESSON 19** Comparing and Ordering Rational Numbers CC.6.NS.7.a, b

**1 Introduction**

Use a number line to compare numbers or order numbers. When you **compare** numbers, you decide which one is greater than the other. You can use symbols to show how numbers are related.

- is greater than ( $>$ )
- is greater than or equal to ( $\geq$ )
- is less than ( $<$ )
- is less than or equal to ( $\leq$ )
- is equal to ( $=$ )

What does the statement  $-1 < 3$  tell you about the locations of these numbers on a number line?

The  $<$  symbol means "is less than," so  $-1 < 3$  means  $-1$  is less than  $3$ .

If  $-1$  is less than  $3$ , then  $-1$  must be to the left of  $3$  on a number line.

A number is less than a number to its right on the number line. A number is greater than a number to its left on a number line.

When you **order** numbers, you list them so that the numbers increase or decrease in value.

Use the number line to order  $-1$ ,  $0$ ,  $5$ ,  $-4$ , and  $3$  from least to greatest.

Plot each number on the number line. Then read them from left to right.

More than one  $<$  or more than one  $>$  can be used in a single inequality statement.

$-4 < -1 < 0 < 3 < 5$   
 $5 > 3 > 0 > -1 > -4$

In order from least to greatest, these numbers are  $-4$ ,  $-1$ ,  $0$ ,  $3$ , and  $5$ .

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## Objective

To compare and order rational numbers on and off of a number line

## 1 Introduction

Review inequality symbols  $<$  and  $>$  and discuss the symbols  $\leq$  and  $\geq$  and how they differ. Discuss how to locate points on a number line and how numbers to the left on a number line are always less than numbers to the right.

## Think About It

Students should show understanding of negative and positive numbers on a number line. Since  $4$  is to the left of  $5$  on a number line, it is less than  $5$ . However,  $-4$  is to the right of  $-5$ , which makes it closer to  $0$  than  $-5$  and so it is greater than  $-5$ .

**Think About It**

Explain why  $4 < 5$ , but  $-4 > -5$ .

---

**2 Focused Instruction**

Comparing and ordering numbers can help you understand situations in real life.

► A group of people from cities around the United States recorded the high temperature in degrees Celsius ( $^{\circ}\text{C}$ ) on one day. The high temperatures are listed below.

• Portland: $15^{\circ}\text{C}$	• Dallas: $22^{\circ}\text{C}$
• Minneapolis: $-2^{\circ}\text{C}$	• Denver: $-3^{\circ}\text{C}$
• Boston: $3^{\circ}\text{C}$	• Chicago: $-12^{\circ}\text{C}$
• New York: $6^{\circ}\text{C}$	• Miami: $34^{\circ}\text{C}$
• Salt Lake City: $-8^{\circ}\text{C}$	• Buffalo: $0^{\circ}\text{C}$
• Cleveland: $4^{\circ}\text{C}$	• Philadelphia: $1^{\circ}\text{C}$

How can you plot the temperatures on the number line at the right?

For the temperatures that are not on a tick mark, find the approximate location between the temperatures that are closest.

Plot and label the values on the number line.

What does the  $<$  symbol mean? *is less than*

When you use the  $<$  symbol, what is true about the number to the left of the symbol?

*It is less than the number to the right of the symbol.*

Compare the temperatures in Buffalo and Boston using the  $<$  symbol.

$0 < 3$

Compare the temperatures in Denver and Buffalo using the  $<$  symbol.

$-3 < 0$

Positive values are always greater than negative values.

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## Common Core Learning Standards

**6.NS.7** Understand ordering and absolute value of rational numbers.

- Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
- Write, interpret, and explain statements of order for rational numbers in real-world contexts.

## Vocabulary

**compare:** to decide if one number is greater than or less than another number

**order:** to list numbers from greatest to least or from least to greatest

**2 Focused Instruction**

First, students will utilize the vertical number line to plot points showing the temperatures listed. Students must recognize that some temperatures are negative numbers and are therefore below 0 on the number line. Display a thermostat along with a vertical number line to help students make the real-life connection. Next, students should recognize that negative numbers show a loss and positive numbers show a profit in the given real-life situation. Students should be able to locate numbers on the number line and then compare the profits and losses.

Conclude the Focused Instruction section by having students compare and order given rational numbers.

**3 Guided Practice**

Students should complete the Guided Practice section on their own. Offer assistance as needed, pointing out the reminder and hint boxes along the right side of the page.

**Connections to Standards for Mathematical Practice**

- Make sense of problems and persevere in solving them.
- Model with mathematics.
- Attend to precision.

**2 Focused Instruction** Lesson 19

Compare the temperatures in Denver, Boston, and Buffalo using the  $<$  symbol.  
 $-3 < 0 < 3$

Order the temperatures from least to greatest.  $-12, -8, -3, -2, 1, 3, 4, 6, 15, 22, 34$

► A local flower shop recorded profits and losses for each month during the year. The numbers are listed in the table.

Month	Profit or Loss	Month	Profit or Loss
January	\$180	July	-\$410
February	\$460	August	\$240
March	-\$250	September	-\$525
April	-\$575	October	-\$390
May	\$331	November	\$108
June	\$585	December	\$260

Which type of numbers shows a loss for the month? negative

Which type of numbers shows a profit for the month? positive

Plot the profits and losses on the number line.

What was the shop's greatest profit? \$585

What was the shop's greatest loss? -\$575

**Use what you know about comparing and ordering numbers to answer these questions.**

- Write an inequality to compare 2.75 and 2.678.  $2.75 > 2.678$  or  $2.678 < 2.75$
- Order -2.34, -2.9, -1.06, and -1.8 from least to greatest.  
 $-2.9, -2.34, -1.8, -1.06$

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**3 Guided Practice** Lesson 19

Solve the following problems.

- Write an integer that is greater than -53 but less than -49.  
**Answer** Accept -52, -51, or -50.

► The balance amounts in a small business bank account for the month of May are shown in the table below.

Day	Balance (\$)
May 1	-83
May 3	-235
May 4	55
May 6	-181
May 13	-64
May 20	-152
May 24	-40
May 26	225

**Part A** Which days had a balance greater than on May 1?  
**Answer** May 4, 13, 24, and 26

**Part B** For the days May 20, May 24, and May 26, list the balance amounts, in dollars, in order from greatest to least. Explain how you can use the number line below to help you find your answer.

$-152 < -40 < 225$ ; I can label the number line to include values less than -152 and greater than 225. Then I can place the balance for each of the three days on the number line to order the balances.

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**4 Independent Practice** Lesson 19

Solve the following problems.

1 Abby scored  $-4$  in a game. Trudy scored  $3$ , Melanie scored  $-5$ , and Gia scored  $-2$ . Who received the score with the lowest value? **DOK 2**  
**6.NS.7.b**  
 A Abby  
 B Trudy  
 C Melanie  
 D Gia

2 Use this number line to help answer the question. **DOK 2**  
**6.NS.7.a**

Which inequality statement is true?  
 A  $-7 < -4 < -2$   
 B  $-7 > -4 > -2$   
 C  $-4 < -7 < -2$   
 D  $-4 > -7 > -2$

3 The temperature at 1:00 was  $-7^\circ$ . At 4:00, it was  $-12^\circ$ . At 6:00, it was  $-9^\circ$ . Which statement is true? **DOK 2**  
**6.NS.7.b**  
 A It was warmer at 1:00 than at 4:00.  
 B It was warmer at 4:00 than at 6:00.  
 C It was colder at 1:00 than at 4:00.  
 D It was colder at 6:00 than at 4:00.

4 Why is it true that  $20.6 > 10.9$ , but  $-20.6 < -10.9$ ? Explain. **DOK 3**  
**6.NS.7.a**  
*20.6 is farther to the right than 10.9, and -20.6 is farther to the left than -10.9. To compare numbers, compare where they are on a number line; do not compare their distance from 0.*

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**4 Independent Practice** Lesson 19

5 Which of the following are true comparisons of two numbers? Select **all** that apply. **DOK 2**  
**6.NS.7.a**  
 A  $3.6 < -4.1$   
 B  $-3.72 < -8$   
 C  $8.39 > 1.46$   
 D  $5 > -1.22$   
 E  $-6.82 > -2.99$   
 F  $7.55 < 4.013$

6 Which sets of integers are ordered from least to greatest? Select **all** that apply. **DOK 2**  
**6.NS.7.a**  
 A  $-5, 4, -3, 1, 0$   
 B  $0, -1, 3, -4, 6$   
 C  $7, 4, 0, -3, -5$   
 D  $-1, 0, 2, 5, 8$   
 E  $5, 4, -3, -6, -9$   
 F  $-8, -7, 0, 2, 5$

7 Write the following numbers in their proper places in the table below. **DOK 2**  
**6.NS.7.a**

-5	-12	7	0	-8
6	3	-1	4	9
Greater Than -3			Less Than -3	
9, 7, 6, 3, 0, -1			-12, -8, -5, -4	

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**4 Independent Practice Answer Rationales**

- Negative numbers are always less than positive numbers, so compare the negative numbers to find the lowest value:  $-5 < -4 < -2$ . Since  $-5$  is the lowest score and Melanie had  $-5$ , Melanie had the lowest score.
- The number line shows the correct location of the points. Points to the left on a number line are less than points to the right. For these values,  $-7 < -4 < -2$  or  $-2 > -4 > -7$ . The only one of these comparisons that is an option is in choice A. Choice A is correct.
- Warmer temperatures are the higher values. Compare these temperatures:  $-7^\circ > -9^\circ > -12^\circ$ . So it was warmest at 1:00 and coldest at 4:00. The temperature at 6:00 was colder than at 1:00 but warmer than at 4:00. The statement in choice A is correct.
- When comparing negative numbers, the number that is closer to 0 is greater. When comparing positive numbers, the number closer to 0 is smaller.
- A positive number is always greater than a negative number, so choice A is not correct and choice D is correct. When comparing negative numbers, the numbers closer to 0 are greater than the numbers farther from 0. So choices B and E are not correct. To compare positive numbers, the number that is farther from 0 is greater than the number that is closer to 0. So choice C is correct and choice F is not correct.
- Choice A is ordered from greatest to least according to absolute value, so it is not correct. Choice B is ordered from least to greatest for absolute values, but not real value, so it is not correct. Choices C and E are in order from greatest to least, so they are not correct. The values in choices D and F are in order from least to greatest; they are the correct answers.
- First, look for numbers greater than  $-3$ . All positive numbers and 0 are greater than  $-3$ . So 7, 0, 6, 3, and 9 go in the first column. Since  $-1$  is closer to 0 than  $-3$  is, it is also greater than  $-3$ . Second, look for numbers less than  $-3$ . These are numbers that are farther to the left on a number line than  $-3$ :  $-5, -12, -8, \text{ and } -4$ .

- 8 First, look at the positive numbers and 0, since they are greater than the negative numbers. Write them in order from greatest to least:  $5^{\circ}\text{F}$ ,  $4^{\circ}\text{F}$ ,  $2^{\circ}\text{F}$ ,  $0^{\circ}\text{F}$ . Then compare the negative numbers:  $-3^{\circ}\text{F} > -6^{\circ}\text{F} > -8^{\circ}\text{F}$ . So, in order from greatest to least, the temperatures are  $5^{\circ}\text{F}$ ,  $4^{\circ}\text{F}$ ,  $2^{\circ}\text{F}$ ,  $0^{\circ}\text{F}$ ,  $-3^{\circ}\text{F}$ ,  $-6^{\circ}\text{F}$ ,  $-8^{\circ}\text{F}$ .
- 9 Since all the animals are below sea level, the one with the greatest elevation is the one that is closest to the surface of the water and the one with the lowest elevation is the one that is deepest in the water. In order of greatest elevation to lowest elevation, the animals are butterflyfish, seahorse, sea anemone, and clownfish.

Lesson 19

**4 Independent Practice**

8 The daily low temperatures in a Montana town one week during the winter are listed below. **DOK 2**  
**6.NS.7.b**

$-8^{\circ}\text{F}$     $5^{\circ}\text{F}$     $-3^{\circ}\text{F}$     $2^{\circ}\text{F}$     $0^{\circ}\text{F}$     $-6^{\circ}\text{F}$     $4^{\circ}\text{F}$

List these temperatures in order from greatest to least.

**Answer**    $5^{\circ}\text{F}, 4^{\circ}\text{F}, 2^{\circ}\text{F}, 0^{\circ}\text{F}, -3^{\circ}\text{F}, -6^{\circ}\text{F}, -8^{\circ}\text{F}$

9 Iris went scuba diving. She recorded the depths of some interesting animals that she saw. **DOK 2**  
**6.NS.7.b**

- sea anemone:  $-11.6$  m
- butterflyfish:  $-8.2$  m
- clownfish:  $-13.4$  m
- seahorse:  $-10.8$  m

Place the elevations of the sea animals in the order from greatest to least by writing the name of each animal in the correct order.

**Greatest Elevation**

butterflyfish

seahorse

sea anemone

clownfish

**Least Elevation**

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### Extension Activity

Write random numbers between  $-50$  and  $50$  on index cards and give each student a card. Call on two students to come to the front of the classroom with their numbers. The two students must compare their numbers and place themselves with the smaller number on the left and the larger on the right. Repeat the activity calling different students to the front. Continue the activity by calling groups of 3–4 students to the front and having them order themselves from least to greatest or from greatest to least using their numbers.