Lesson 2: Comparing Positive and Negative Numbers

Let's compare numbers on the number line.

2.1: Which One Doesn't Belong: Inequalities

Which inequality doesn't belong?

- $\frac{5}{4} < 2$
- $8.5 > 0.95$
- $8.5 < 7$
- $10.00 < 100$

2.2: Comparing Temperatures

Here are the low temperatures, in degrees Celsius, for a week in Anchorage, Alaska.

day	Mon	Tues	Weds	Thurs	Fri	Sat	Sun
temperature	5	-1	-5.5	-2	3	4	0

1. Plot the temperatures on a number line. Which day of the week had the lowest low temperature?

2. The lowest temperature ever recorded in the United States was -62 degrees Celsius, in Prospect Creek Camp, Alaska. The average temperature on Mars is about -55 degrees Celsius.

    a. Which is warmer, the coldest temperature recorded in the USA, or the average temperature on Mars? Explain how you know.

    b. Write an inequality to show your answer.

3. On a winter day the low temperature in Anchorage, Alaska, was -21 degrees Celsius and the low temperature in Minneapolis, Minnesota, was -14 degrees Celsius.

    Jada said, "I know that 14 is less than 21, so -14 is also less than -21. This means that it was colder in Minneapolis than in Anchorage."

    Do you agree? Explain your reasoning.

Are you ready for more?

Another temperature scale frequently used in science is the *Kelvin scale*. In this scale, 0 is the lowest possible temperature of anything in the universe, and it is -273.15 degrees in the Celsius scale. Each 1 K is the same as 1°C, so 10 K is the same as $\text{-}263.15^\circ\text{C}$.

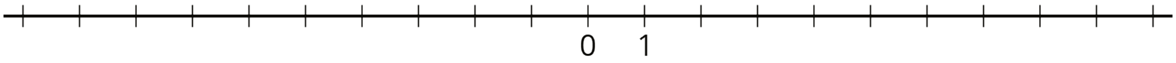
1. Water boils at 100°C. What is this temperature in K?

2. Ammonia boils at $\text{-}35.5^\circ\text{C}$. What is the boiling point of ammonia in K?

3. Explain why only positive numbers (and 0) are needed to record temperature in K.

2.3: Rational Numbers on a Number Line

1. Plot the numbers -2, 4, -7, and 10 on the number line. Label each point with its numeric value.



2. Decide whether each inequality statement is true or false. Be prepared to explain your reasoning.

   a. $-2 < 4$

   b. $-2 < -7$

   c. $4 > -7$

   d. $-7 > 10$

3. Andre says that $\frac{1}{4}$ is less than $-\frac{3}{4}$ because, of the two numbers, $\frac{1}{4}$ is closer to 0. Do you agree? Explain your reasoning.

4. Answer each question. Be prepared to explain how you know.

   a. Which number is greater: $\frac{1}{4}$ or $\frac{5}{4}$?

   b. Which is farther from 0: $\frac{1}{4}$ or $\frac{5}{4}$?

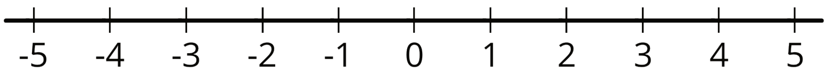
   c. Which number is greater: $-\frac{3}{4}$ or $\frac{5}{8}$?

   d. Which is farther from 0: $-\frac{3}{4}$ or $\frac{5}{8}$?

e. Is the number that is farther from 0 always the greater number? Explain your reasoning.

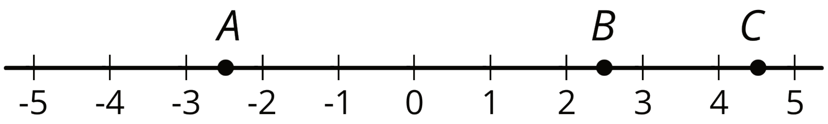
Lesson 2 Summary

Here is a number line labeled with positive and negative numbers. The number 4 is positive, so its location is 4 units to the right of 0 on the number line. The number -1.1 is negative, so its location is 1.1 units to the left of 0 on the number line.



We say that the *opposite* of 8.3 is -8.3, and that the *opposite* of $\frac{-3}{2}$ is $\frac{3}{2}$. Any pair of numbers that are equally far from 0 are called **opposites**.

Points A and B are opposites because they are both 2.5 units away from 0, even though A is to the left of 0 and B is to the right of 0.



A positive number has a negative number for its opposite. A negative number has a positive number for its opposite. The opposite of 0 is itself.

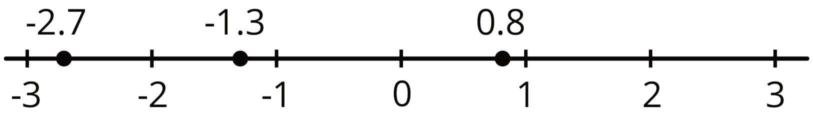
You have worked with positive numbers for many years. All of the positive numbers you have seen—whole and non-whole numbers—can be thought of as fractions and can be located on a the number line.

To locate a non-whole number on a number line, we can divide the distance between two whole numbers into fractional parts and then count the number of parts. For example, 2.7

can be written as $2\frac{7}{10}$. The segment between 2 and 3 can be partitioned into 10 equal parts or 10 tenths. From 2, we can count 7 of the tenths to locate 2.7 on the number line.

All of the fractions and their opposites are what we call **rational numbers**. For example, 4, -1.1, 8.3, -8.3, $\frac{-3}{2}$, and $\frac{3}{2}$ are all rational numbers.

We use the words *greater than* and *less than* to compare numbers on the number line. For example, the numbers -2.7, 0.8, and -1.3, are shown on the number line.



Because -2.7 is to the left of -1.3, we say that -2.7 is less than -1.3. We write:

$$-2.7 < -1.3$$

In general, any number that is to the left of a number n is less than n.

We can see that -1.3 is greater than -2.7 because -1.3 is to the right of -2.7. We write:

$$-1.3 > -2.7$$

In general, any number that is to the right of a number n is greater than n

We can also see that $0.8 > -1.3$ and $0.8 > -2.7$. In general, any positive number is greater than any negative number.