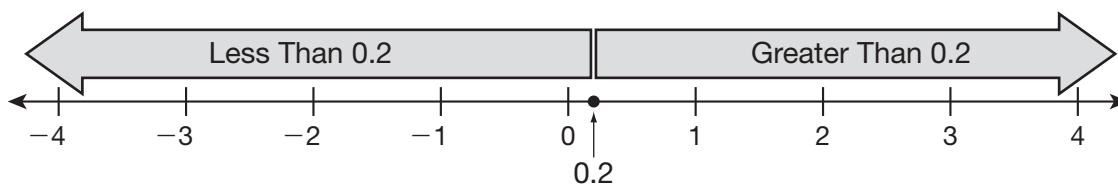


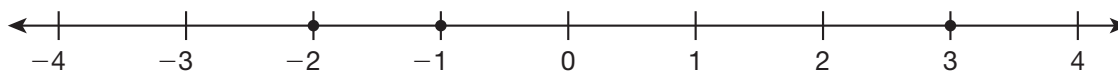
# Ordering Rational Numbers

## 1 GETTING THE IDEA

For any point on a horizontal number line, all points to the right of the point have a greater value. All points to the left have a lesser value.



Points are ordered on a number line from left to right, that is, from least to greatest. Words and symbols are also used to show the order of numbers and to compare them. The symbol " $<$ " means "is less than." The symbol " $>$ " means "is greater than."



### On the Number Line

$-2$  is to the left of  $-1$

$3$  is to the right of  $-1$

### Using Words

$-2$  is less than  $-1$

$3$  is greater than  $-1$

### Using Symbols

$-2 < -1$

$3 > -1$

## Example 1

Order the numbers from least to greatest.

$\frac{2}{5}$ ,  $0.36$ ,  $-0.5$

### Strategy

Use a number line.

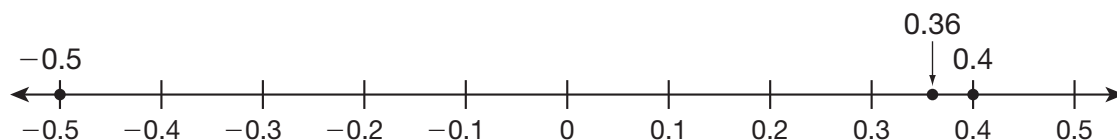
#### Step 1

Put the numbers in the same form.

Since two of the three numbers are decimals, write  $\frac{2}{5}$  as a decimal to make the numbers easier to order.

$$\frac{2}{5} = 0.4$$

**Step 2** Locate the decimals on a number line.



**Step 3** Read the points from left to right to order the decimals from least to greatest.

The point for  $-0.5$  is to the left of the point for  $0.36$ .

The point for  $0.36$  is to the left of the point for  $0.4$ .

So,  $-0.5$  is less than  $0.36$ , and  $0.36$  is less than  $0.4$ .

$$-0.5 < 0.36 < 0.4$$

To write the solution, remember to change  $0.4$  back to a fraction.

**Solution** The numbers in order from least to greatest are:  $-0.5, 0.36, \frac{2}{5}$ .

## Example 2

Order the numbers from greatest to least.

$$-\frac{7}{8}, \frac{1}{2}, -\frac{3}{4}$$

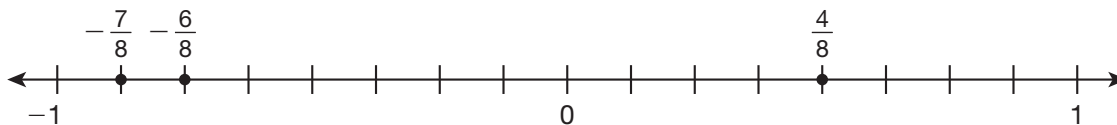
**Strategy** Use a number line.

**Step 1** To make the numbers easier to order, write the fractions so they have the same denominator.

The least common denominator for 2, 4, and 8 is 8.

$$-\frac{7}{8} = -\frac{7}{8} \qquad \frac{1}{2} = \frac{4}{8} \qquad -\frac{3}{4} = -\frac{6}{8}$$

**Step 2** Locate  $-\frac{7}{8}, \frac{4}{8}$ , and  $-\frac{6}{8}$  on the number line.



**Step 3** Read the fractions from right to left to order them from greatest to least.

The point for  $\frac{4}{8}$  is to the right of  $-\frac{6}{8}$ , and  $-\frac{6}{8}$  is to the right of  $-\frac{7}{8}$ .

$$\text{So, } \frac{4}{8} > -\frac{6}{8} > -\frac{7}{8}.$$

**Solution** The numbers in order from greatest to least are:  $\frac{1}{2} > -\frac{3}{4} > -\frac{7}{8}$ .

### Example 3

Three neighbors are comparing the depths of their wells. Nadal says that his well is 128.5 feet below ground level. Susan says that her well is 112 feet deep. Damien says that the bottom of his well is located 78.25 feet underground. Order the well depths from deepest to shallowest.

**Strategy** Write the depths as negative numbers. Compare the negative numbers.

#### Step 1

Write each depth as a negative number.

Ground level is zero. The greatest depth is the farthest distance below ground level, so the numbers should be ordered from least to greatest. Distance below ground level is shown as a negative quantity.

Nadal's well:  $-128.5$  feet

Susan's well:  $-112$  feet

Damien's well:  $-78.25$  feet

#### Step 2

Order the numbers.

Because we are dealing with depth below ground, think of where the numbers fall on a vertical number line. The lower the number, the deeper the well.

The depth  $-78.25$  has no digit in the hundreds place, so it is greater than  $-100$ .

This means that  $-78.25$  is above  $-100$  on the number line, and therefore closer to zero.

So, the well 78.25 feet deep is the shallowest well.

Both  $-112$  and  $-128.5$  have a 1 in the hundreds place.

Compare the digits in the tens places:  $-1 > -2$

Since  $-1 > -2$ , then  $-112$  is above  $-128.5$  on the number line.

So, the well that is 128.5 feet deep is deeper than the well that is 112 feet deep.

$-128.5 < -112 < -78.25$

### Solution

The wells from deepest to shallowest are: Nadal's well, Susan's well, Damien's well.

## Example 4

A boat is floating in the water at sea level. The top of a lighthouse is 40.8 meters above sea level. A fishing dock is 6 meters above sea level. A fish is swimming at 7.9 meters below sea level. Write each elevation as a rational number and order the elevations from greatest to least.

**Strategy** Write the elevations above sea level as positive numbers and the elevations below sea level as negative numbers. Then order the elevations from greatest to least.

### Step 1

Write the elevations as positive and negative rational numbers.

Elevation is measured from sea level. Sea level is 0 meters.

Boat	0 meters
Lighthouse	40.8 meters
Dock	6 meters
Fish	$-7.9$ meters

### Step 2

Order the numbers from greatest to least.

Positive numbers are greater than negative numbers. So, order the positive numbers first.

The number 40.8 has a digit in the tens place, so it is the greatest decimal.

The number 6 is greater than 0 but less than 40.8. So, 6 is between 40.8 and 0.

The number 0 is greater than any negative number, so 0 is greater than  $-7.9$ .

Finally,  $-7.9$  is the least decimal.

**Solution** The elevations in order from greatest to least are: 40.8 meters, 6 meters, 0 meters,  $-7.9$  meters.

## 2 COACHED EXAMPLE

The table below shows the temperatures for three neighboring towns one winter morning.

Town	Fairview	Williams	Lake Haven
Temperature (in °C)	0.5	−6.1	−3.3

Order the temperatures from coldest to warmest.

To order the temperatures from coldest to warmest, I will order them from \_\_\_\_\_ to \_\_\_\_\_.

There are two temperatures less than zero: \_\_\_\_\_ and \_\_\_\_\_.

The temperatures below zero are \_\_\_\_\_ than the temperature above zero.

I will compare the \_\_\_\_\_ digits of the temperatures below zero.

\_\_\_\_\_ < \_\_\_\_\_

The coldest temperature is \_\_\_\_\_. The middle temperature is \_\_\_\_\_.

The warmest temperature is \_\_\_\_\_.

From coldest to warmest, the temperatures are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

### 3 LESSON PRACTICE

- 1 The table below shows the elevations of some natural features at a state park.

Natural Feature	Elevation (in meters)
Ridge Rock	$12\frac{7}{10}$
Little's Cave	22.5
Diver's Playground	-10.3

List the natural features from highest to lowest elevation.

\_\_\_\_\_

- 2 Which numbers are between  $-7$  and  $2$  on a number line? Circle all that apply.

- A. 2.1
- B.  $-1$
- C. 0
- D.  $-7.5$
- E. 3.5
- F.  $-6.4$
- G.  $-8$

- 3 Lakshmi has a box of  $2\frac{1}{2}$ -inch screws, a box of  $1\frac{3}{4}$ -inch screws, a box of  $1\frac{5}{8}$ -inch screws, and a box of  $2\frac{1}{8}$ -inch screws. She wants to put the boxes on a shelf so that the screws are ordered from shortest to longest.

What is the order of the screws from shortest to longest?

\_\_\_\_\_

- 4 Four friends are hanging out at a swimming pool. Use numbers from the box to describe their elevations relative to the water level.

Amy and Troy are in the pool. Troy is deeper in the water than Amy.

Troy's elevation is \_\_\_\_\_ meter(s).

Amy's elevation is \_\_\_\_\_ meter(s).

Wally is on the diving board. His elevation is \_\_\_\_\_ meter(s).

Violet is floating on a raft in the pool. Her elevation is \_\_\_\_\_ meter(s).

The elevations in order from lowest to highest are \_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_.

−0.7

0

0.8

− $\frac{3}{4}$

- 5 Does the statement correctly describe the order of −1.7, 2.2, and 0.9? Select Yes or No.

- A. −1.7 is to the left of 2.2 on a number line ☐ Yes ☐ No
- B.  $0.9 < -1.7 < 2.2$  ☐ Yes ☐ No
- C. −1.7 is greater than 0.9 ☐ Yes ☐ No
- D.  $2.2 > 0.9 > -1.7$  ☐ Yes ☐ No

- 6 The table below shows Alec's scores playing his new video game. A lower score is better than a higher score. He needs a score of less than −100 to win.

Game	1	2	3	4
Score	18	−35	−212	−152

Which games did he win? \_\_\_\_\_

What were his winning scores in order from best to worst? \_\_\_\_\_

Did Alec's score improve each time he played the game? Explain.

\_\_\_\_\_

- 7 The table below shows the temperatures in four cities.

City	Yorkville	Kent	Amherst	Union City
Temperature (in °F)	−12.4	6.1	−6.1	3

Select True or False for each statement.

- A. It is warmer in Kent than in Yorkville. ☐ True ☐ False
- B. It is coldest in Union City. ☐ True ☐ False
- C. The temperature in Yorkville is the least. ☐ True ☐ False
- D. The temperature in Kent is less than the temperature in Amherst. ☐ True ☐ False

- 8 Select the numbers that make each inequality true.

$$-5\frac{3}{7} < \begin{array}{|c|} \hline -5\frac{2}{7} \\ \hline -5\frac{5}{7} \\ \hline -6 \\ \hline \end{array} < \begin{array}{|c|} \hline -5\frac{4}{7} \\ \hline -4\frac{1}{7} \\ \hline -5\frac{6}{7} \\ \hline \end{array}$$

$$6.2 > \begin{array}{|c|} \hline 8.7 \\ \hline 16.3 \\ \hline -5.5 \\ \hline \end{array} > \begin{array}{|c|} \hline -6.2 \\ \hline 0 \\ \hline 10.6 \\ \hline \end{array}$$

- 9 Jason plotted the point  $-4$  on a number line. Choose Left or Right to show the position of the given number on a number line relative to the point that Jason plotted.

- A.  $-3\frac{2}{3}$  ☐ Left ☐ Right
- B. zero ☐ Left ☐ Right
- C.  $-4.25$  ☐ Left ☐ Right
- D. 4 ☐ Left ☐ Right



- 10 Melody ordered  $5\frac{7}{8}$ ,  $-6.7$ , and  $-3.2$  from least to greatest.

$$-6.7 > 5\frac{7}{8} > -3.2$$

**Part A**

Describe her error.

**Part B**

Write the numbers in order from greatest to least. Explain your answer.