# Lesson 4: Comparing and Ordering Rational Numbers

Rational numbers can be compared using a number line. As you move from left to right on a horizontal number line, or from bottom to top on a vertical number line, the numbers are ordered from least to greatest. All numbers to the left of 0 or below 0 will be negative. You can compare or order numbers using the less than symbol, $<$, or the greater than symbol, $>$.

The number line below shows that $-2\frac{1}{2}$ is to the left of -1. Therefore, $-2\frac{1}{2}$ is less than -1. You can represent this inequality with the less than symbol, $<$: $-2\frac{1}{2} < -1$. You can also represent this inequality with the greater than symbol, $>$: $-1 > -2\frac{1}{2}$.
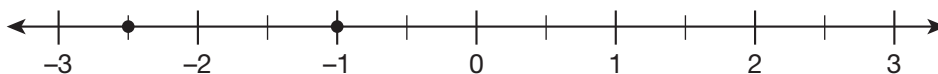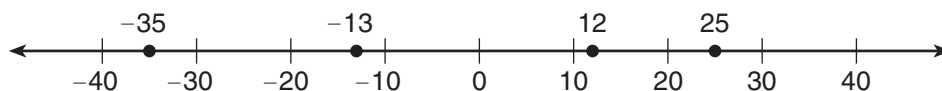

▶ Example

Write the following numbers in order from **greatest** to **least**. Then compare them using $<$, $>$, or $=$.

12   -13 -35 25

First, find the position of the numbers on a number line.

Then, look at where the numbers are located in relation to each other on the number line. 25 is the farthest to the right. It is therefore the greatest number. Moving left, the next greatest number is 12. The next number to the left is -13, then -35.

The numbers in order from **greatest** to **least** are 25, 12, -13, and -35.

Now that the order of the numbers is known, use the comparison symbols to compare the numbers: $25 > 12 > -13 > -35$. This means that 25 is to the right of 12, 12 is to the right of -13, and -13 is to the right of -35.

You can also compare and order rational numbers without a number line. To compare fractions with the same denominator, compare the numerators. To compare fractions with different denominators, you need to multiply each fraction by the other fraction's denominator. Then the denominators will be the same and you can compare the numerators.

▷ Example

Compare the rational numbers and order them from **greatest** to **least.** Then compare them using $<$, $>$, or $=$.

$$\frac{1}{8} \qquad \frac{7}{8} \qquad -\frac{3}{8} \qquad \frac{5}{8}$$

Because the fractions have the same denominator, you can compare the numerators. The numerators are 1, 7, -3, and 5. The fraction with the greatest numerator is the greatest fraction. 7 is the largest number, so $\frac{7}{8}$ is the largest fraction. The next greatest numerator is 5, so $\frac{5}{8}$ is the next largest fraction. -3 is less than 0, so 1 is greater than -3.

In order from greatest to least, the fractions are $\frac{7}{8}$, $\frac{5}{8}$, $\frac{1}{8}$, and $-\frac{3}{8}$

Now that the order of the numbers is known, use the comparison symbols to compare the numbers: $\frac{7}{8} > \frac{5}{8} > \frac{1}{8} > -\frac{3}{8}$.

▷ Example

Compare the numbers from **least** to **greatest** using $<$, $>$, or $=$.

$$\frac{4}{5} \qquad \frac{3}{4}$$

The fractions have different denominators, so multiply each fraction by the other fraction's denominator.

$$\frac{4}{5} = \frac{4 \times 4}{5 \times 4} = \frac{16}{20} \qquad\qquad \frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{20}$$

Now that the fractions have the same denominator, you can compare the numerators. Because 16 is greater than 15, $\frac{4}{5}$ is greater than $\frac{3}{4}$.

$$\frac{4}{5} > \frac{3}{4}$$

◇ **TIP:** The top number in a fraction is the numerator. The bottom number is the denominator. One way to remember those terms is to think of a word that starts with N, like **n**umerator, that makes you think of the top, such as **N**orth Pole. Then think of a word that starts with D, like **d**enominator, that makes you think of the bottom, such as **d**own.

▷ Example

The lowest recorded temperature in Florida was $-2°$F. The lowest recorded temperature in Mississippi was $-19°$F. The lowest recorded temperature in Hawaii was $12°$F. The lowest recorded temperature in Louisiana was $-16°$F. Compare the low temperatures and order them using $<$, $>$, or $=$.

To compare the temperatures, you can plot them on a number line.

Mississippi	Louisiana		Florida		Hawaii	
-20		-10	0	10		20

The numbers in order from **least** to **greatest** are -19 for Mississippi, -16 for Louisiana, -2 for Florida, and then 12 for Hawaii. Now that the order of the numbers is known, use the comparison symbols to compare the numbers: $-19 < -16 < -2 < 12$.

▷ Example

A supermarket sells two packages of rice. Package A is listed as $\frac{2}{3}$ pounds. Package B is listed as $\frac{3}{5}$ pounds. Compare the sizes of the packages using the comparison symbols $<$ or $>$.

The fractions have different denominators, so multiply both fractions by the other fraction's denominator.

$$\frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$$

$$\frac{3}{5} = \frac{3 \times 3}{5 \times 3} = \frac{9}{15}$$

Now that the fractions have the same denominator, you can compare the numerators. Because 10 is greater than 9, $\frac{2}{3}$ is greater than $\frac{3}{5}$; $\frac{2}{3} > \frac{3}{5}$.