Name: _____   Date: _____

Student Exploration: Rational Numbers, Opposites, and Absolute Values

Vocabulary: absolute value, inequality, number line, opposite, rational number
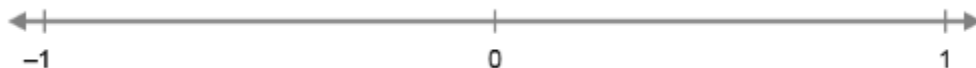
Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

Marcus and Marcella are trying to figure out which fraction is greater, $\frac{7}{12}$ or $\frac{2}{3}$.

1. Which do you think is the greater fraction? _____

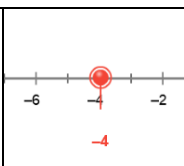2. Name two ways to find which fraction is greater. _____

    _____

    _____

Gizmo Warm-up

One way to compare two numbers is to plot them on a **number line**, such as the one in the *Rational Numbers, Opposites, and Absolute Values* Gizmo. In the Gizmo, click the "zoom in" (+) button to the right of the number line twice so that the number line looks like this:

1. Drag the purple dot to $\frac{7}{12}$ and the green dot to $\frac{2}{3}$. Draw the dots on the number line above.

2. Based on their positions on the number line, which fraction is greater? _____

    Explain. _____

    _____

3. In the space to the right, use the "less than" (<) symbol to
    write an **inequality** to compare the two fractions. To check
    your work, select the **Compare numbers** checkbox.

Activity A: Comparing rational numbers	Get the Gizmo ready: • Click **Reset**. Check that the number line ranges from –1 to 1. (If not, click ⊞ until it does.) • Turn off **Compare numbers**.	

Introduction: Fractions are examples of **rational numbers**, or numbers that can be expressed as the ratio of two integers. For example, $\frac{3}{4}$ is the ratio of the integers 3 and 4. Rational numbers also include integers. For example, 2 is the ratio of 2 and 1.

1. With **Compare numbers** turned off, place the purple and green dots wherever you like on the number line. Give the value of each dot, list which is greater, and write an inequality with a "less than" (<) or "greater than" (>) symbol. Turn on **Compare numbers** to check answers.

Purple dot value	Green dot value	Higher value	Inequality

2. Turn off **Compare numbers**. Press "zoom out" (⊟) once so the range is –2 to 2. Place the purple dot at $\frac{5}{12}$, the green dot at $-1\frac{5}{6}$, the blue dot at $-\frac{2}{3}$, and the red dot at $1\frac{3}{4}$. Complete the inequality below to describe how these numbers are related, and check your answer in the Gizmo.

_____ < _____ < _____ < _____

3. In general, how does the position of a point on the number line relate to its value? _____
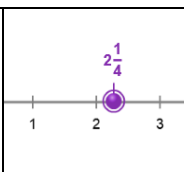
_____

4. To compare fractions with unlike denominators, it is helpful to convert them into equivalent fractions with the same denominator. Convert each fraction below into an equivalent fraction with a denominator of 12. Then, write an inequality to compare the four original fractions.

$$\frac{1}{2} = \frac{}{12} \qquad \frac{1}{3} = \frac{}{12} \qquad \frac{1}{4} = \frac{}{12} \qquad \frac{1}{6} = \frac{}{12}$$

_____ < _____ < _____ < _____

Use the Gizmo to check your work.

Activity B: **Opposites and absolute value**	<u>Get the Gizmo ready</u>: • Click **Reset**. Click the "reset zoom" (⊙) button so the number line ranges from –4 to 4. • Turn off **Compare numbers**.	$2\frac{1}{4}$

1. Move the purple dot to $2\frac{1}{4}$.

    A. Turn on **Show opposites**. What is the **opposite** of $2\frac{1}{4}$? _____

    B. Turn on **Show absolute values**. What is the **absolute value** of $2\frac{1}{4}$? _____

    The symbol for absolute value is vertical bars. For example, the equation " $\left|2\frac{1}{4}\right| = 2\frac{1}{4}$ "

    means "the absolute value of $2\frac{1}{4}$ is $2\frac{1}{4}$."

2. Drag dots to several other positions, both positive and negative. List each rational number, its opposite, and its absolute value in the tables below.

Number	Opposite	Absolute value

Number	Opposite	Absolute value

3. In general, how do you find the opposite and absolute value of a number? _____

_____

_____

    The opposite of a number is a number that is the same distance from zero as the given number, but on the other side of zero. The absolute value of a number is its distance from zero on the number line. Because it is a distance, absolute value is never negative.

4. Find the opposite and absolute value of each number below. Check your work in the Gizmo.

Number	Opposite	Absolute value
$3\frac{7}{12}$		
$-1\frac{3}{4}$		

Number	Opposite	Absolute value
$-\frac{11}{12}$		
$2\frac{1}{12}$		