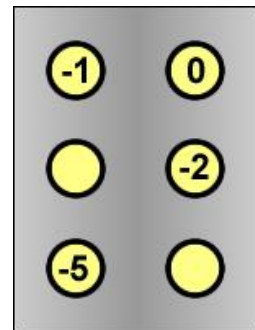Name: _____   Date: _____

Student Exploration: Integers, Opposites, and Absolute Values

Vocabulary: absolute value, inequality, negative number, number line, opposite

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)
Superspy Jim Blonde walked into his house and hung up his hat and coat. He opened a hidden door and stepped into a secret elevator. When he pressed a button, the elevator began to go *down* instead of up.
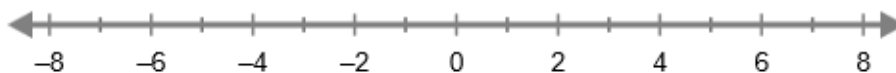
1. If the floors above ground are the 1st floor, 2nd floor, etc., what would

   you call the floors below ground? _____

   _____

2. In Blonde's elevator, the button panel looks like the picture to the right. On the image, fill in the missing button labels.

Gizmo Warm-up
One way to think about numbers is to imagine that numbers represent locations. For example, numbers could represent the floor you are on in a building, or how far you are above or below sea level. In these cases, it is helpful to model the numbers along a **number line**, such as the one in the *Integers, Opposites, and Absolute Values* Gizmo.

1. What do you notice about the numbers to the left of 0? _____

   These are **negative numbers**, or numbers that represent values less than zero. For example, –5 degrees is colder than 0 degrees, and an elevation of 400 feet below sea level (–400 feet) is lower than an elevation of 100 feet below sea level (–100 feet).

2. In the Gizmo, drag the red dot to –4 and the blue dot to 2.

   A. Which value is greater? _____   To check, turn on **Compare numbers**.

      The "<" symbol means "is less than" and the ">" symbol means "is greater than."

   B. Which value is farther from zero? _____

Activity A: Comparing integers	Get the Gizmo ready: • Turn off **Compare numbers**.	

1. With **Compare numbers** turned off, place the red and blue dots wherever you like on the number line. List the value of each dot and guess which value is greater. Turn on **Compare numbers** to check. Repeat this process to complete the first four columns of the table.

Red dot value	Blue dot value	Higher value (guess)	Higher value (actual)	Inequality

2. An **inequality** uses the symbols ">" (is greater than) and "<" (is less than) to compare numbers. In the last column of the table, write an inequality to compare each number pair.

3. How does the position of a point on the number line relate to its value? _____

_____

4. Turn off **Compare numbers**. Place the red dot at –7, the blue dot at 3, the green dot at –2, and the purple dot at –6. Complete the inequality below to describe how these numbers are related, and then check your answer in the Gizmo.

_____ < _____ < _____ < _____

5. Use the "<" and ">" symbols to compare each pair of numbers below.

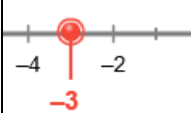   8 ____ 2   –6 ____ 5   –4 ____ –7   –12 ____ –9

6. Write a number that is between the two numbers in each pair. Then, write "<" or ">" signs in the spaces as appropriate. When possible, check your answer in the Gizmo.

   –5 < ____ < 8   –9 ___ ____ ___ –6   –43 ___ ____ ___ –56

7. Marty and Emma are both in debt. If you add up all of Marty's assets and debts, he has a net worth of –$10,400. Emma's has a net worth of –$18,200.

   Who is better off, Marty or Emma? _____ Explain. _____

_____

Activity B:	Get the Gizmo ready:
Opposites and absolute value	• Click **Reset**. • Turn off **Compare numbers**.

1. Move the red dot to –3 on the number line. Turn on **Show opposites**.

    A. What is the **opposite** of –3? _____

    B. Turn on **Show absolute values**. What is the **absolute value** of –3? _____

    The symbol for absolute value is vertical bars. For example, |–3| = 3 means "the absolute value of –3 is 3."

2. Drag dots to several other positions, both positive and negative. List each 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 of a number? _____

   _____

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

   _____

   The absolute value is defined as the distance from zero on the number line. Absolute value is never negative.

5. Turn off **Show opposites** and **Show absolute values**. Write the opposite and absolute value of each number in the table below. When possible, check your answer with the Gizmo.

Number	Opposite	Absolute value		Number	Opposite	Absolute value
–7				44		
5				–89		
0				–65		