Activity 1: Variables on the Number Line

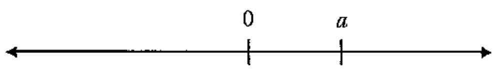
Numbers on the Number Line

1. Draw a number line. Mark a point near the middle of the number line and label it 0. Next, locate, mark, and label the point representing 1.
2. Locate, mark, and label the numbers 3, 7, –2, and –6.
3. Use a ruler to compare the distance between 3 and 7 with the distance between –2 and –6. Are these distances the same? If not, why not?

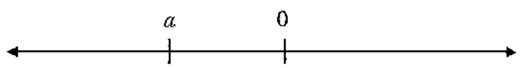
Variables on the Number Line

Given each representation below, locate the points that represent the indicated numbers.

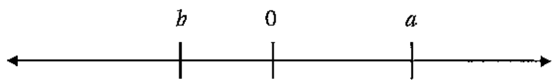
1. Plot and label each of the following points: $2a$, $a/2$, $a/3$, $-a$, and $-2a$.



2. Plot and label each of the following points: $2a$, $a/2$, $a/3$, $-a$, and $-2a$.



3. Plot and label each of the following points: $-a$, $-(-a)$, $-b$, and $-(-b)$.



4. If a is a positive number, then $2a > a$ and a is closer to 0 than $2a$. How does this relationship change if a is negative?

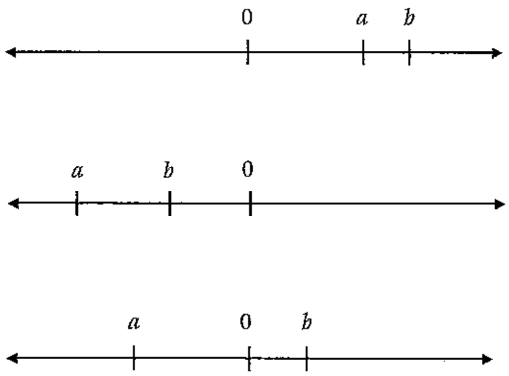
From the December 2010/January 2011 issue of **MATHEMATICS** teacher

Activity 1: Variables on the Number Line (continued)

Inequalities on the Number Line

1. Suppose that each of a and b are numbers so that $a < b$.

   (a) Using the three possible locations for a and b, plot the locations of the points representing $-a$ and $-b$ in each case.



   (b) If $a < b$, write a general rule that relates $-a$ and $-b$. Explain how the number lines above illustrate your rule.

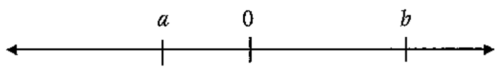
2. Find an example of a pair of numbers a and b for which each of the following is true: $a < b$ and $a + b < a$. Illustrate this situation on the number line.

3. Find an example of a pair of numbers a and b for which each of the following is true: $a < b$ and $a < a + b < b$. Illustrate this situation on the number line.

Activity 2: Absolute Value and the Concept of Distance

Absolute Value and the Distance between Two Numbers

1. Suppose x is a number. The absolute value of x, denoted by $|x|$, is the distance that x is from the number 0. Locate and label the number $|b|$ on the number line below.

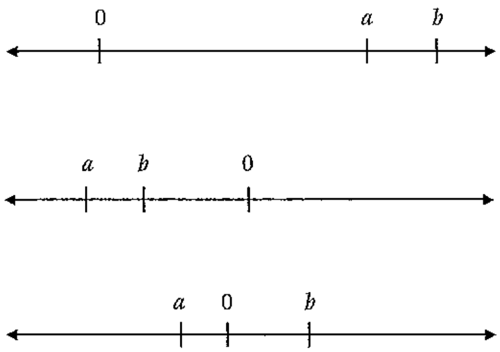


   Now locate and label the number $|a|$ on the number line. What is another name for the number $|a|$?

2. Use the number line to find the distance between the following pairs of numbers:

(*a*) 2 and 3	(*b*) 4 and 9	(*c*) –12 and 12
2 and –3	–4 and 9	12 and 12
–2 and 3	–4 and –9	
–2 and –3	4 and –9	

3. The number lines below show three possible cases: (1) two positive numbers; (2) two negative numbers; or (3) one positive and one negative number.



   (*a*) For each case, determine the distance d between each pair of nonzero numbers. Locate, mark, and label the value of d on the number line.

   (*b*) Describe a process for finding the distance between two numbers.

4. Draw a number line and locate a, b, and 0 on the number line so that the distance from a to b when placed on the number line falls *between* a and b.

5. In the examples above, we notice that the distance between a and b can be less than a, between a and b, or greater than b. Give a numerical example in which the distance is slightly less than a. Give a numerical example in which the distance is much greater than b.

From the December 2010/January 2011 issue of **MATHEMATICS**

Activity 2: Absolute Value and the Concept of Distance (continued)

Equations with Absolute Value

1. Suppose that x is a number. Write a sentence that uses the word *distance* and that expresses the meaning of the equation $|x - 3| = 2$.

2. Use the concept of distance and the number line below to show what number(s) x make the equation $|x - 3| = 2$ true.

3. Use the concept of distance and the number line below to show what number(s) x make the inequality $|x - 4| < 2$ true.

4. Suppose that x is a number. Write a sentence that uses the word *distance* and that expresses the meaning of the equation $|x + 3| = 2$. Hint: $|x + 3| = |x - (-3)|$.

5. Use the concept of distance and the number line below to show what number(s) x make the equation $|x + 3| = 2$ true.

6. Use the concept of distance and the number line below to show what number(s) x make the inequality $|x + 4| < 2$ true.

7. Use the concept of distance and the number line below to show what number(s) x make the inequality $|x - 4| > 2$ true.

8. Use the concept of distance and the number line below to show what number(s) x make the inequality $|x + 3| > |x - 4|$ true.