

Teaching Absolute Value Using the Idea of Distance: Equality Problems  
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In order to motivate the idea of absolute value using distance, we created several story problems that had an appropriate context. The following problems were used in class or on various assessments during our investigation. Note that while each problem is structured as an absolute value equality problem of the form  $|x - a| = b$ , each problem could be easily modified to fit absolute value inequalities of the form  $|x - a| < b$  or  $|x - a| > b$ .

Problems involving all positive values

Jake and Sarah are in a tall building. Jake is waiting on the 10th floor for Sarah. If Sarah is 6 floors away, what floor is Sarah on?

Tammy and Jeramy are in a 42 story building. Tammy is on the 18th floor, and Jeramy is 15 floors away. Which floor is Jeramy on?

The Bengals have the ball on 40-yard line. Their first play moves the ball 4 yards. Where do the Bengals start on the next play?

George checks the thermometer outside his house on his way to school and it reads 36° F. While George is at school, the temperature changes 8 degrees. What will the thermometer say when George checks it after school?

Megan is driving on the freeway. If she started at mile marker 178, and drove 63 miles, at what mile marker would she be at now?

Janet is making a trip to the Himalayas to go mountain climbing. She can't decide between two mountains to climb. The first mountain is 26,811 feet high. The difference between the first peak and the second peak is 2,217 feet. What is the height of the second mountain?

Tammy is on a road trip with her family. She sees mile marker 193 before taking a little nap. When she wakes up, the family is 75 miles from the last mile marker Tammy saw. What mile marker are Tammy and her family at?

The boys' basketball team has scored 37 points. The game is 11 points away from a tie. What is the other team's score?

Susie and Tommy are decorating their Christmas tree. Tommy hangs an ornament 56 inches off the ground. If Susie hangs her ornament 14 inches away from Tommy's, how far up is Susie's ornament?

### Problem involving some negative values

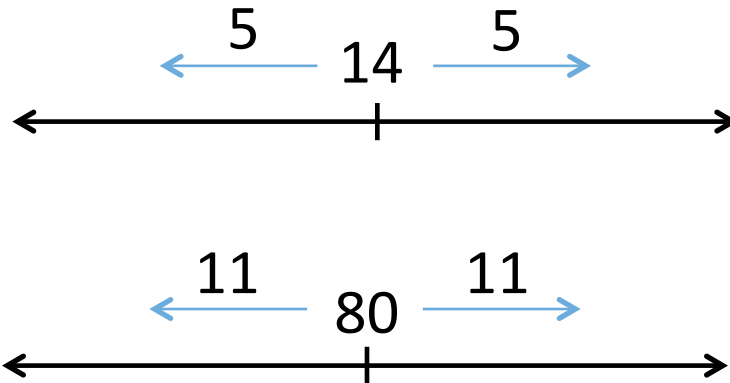
Note that not all distance contexts will apply to negative values. Temperature is a natural distance-based idea (thermometer as a number line) that sensibly includes negative values.

A thermostat reads  $11^{\circ}$  F at the beginning of the day. By lunchtime, the temperature has changed  $16^{\circ}$ . What is the new temperature?

### Working in multiple representations

In our investigation, we not only asked students to translate story problems, like those above, into number lines and symbolic equations, but also to start with these other representations and create their own story problems. Here are examples of these types of problems, including the instructions.

Directions: Make up a story for each number line and solve the problem. Use absolute value notation to represent each number line. Show your work.



Directions: Represent the following absolute value equations using number lines. Make up a story for your number line and solve the problem. Show your work.

$$|x - 94| = 11$$

$$|x - 8| = 17$$