Geometry
Unit: Introduction to Geometry
Section: Measuring Segments

Tutorial: Measuring Segments Using a Number Line and Absolute Value

Slide 1
In this tutorial, you will first review the concept of absolute value. Then, you will use the concept of absolute value to measure segments on a number line.

Slide 2
Recall that absolute value is a measure of distance from zero.
For example, two is two units from zero.
We say that the *absolute value* of two is two, since it is two units from zero on the number line.

Slide 3
How many units from zero is negative three on the number line?
Since negative three is three units from zero on the number line,
we say that the absolute value of negative three is three, since it is three units from zero on the number line.
Remember that absolute value is a distance. Therefore, absolute value is always positive.

Slide 4
Now, let's see how the concept of absolute value applies to the lengths of line segments.
Recall that a line segment is named by its endpoints.
This is line segment AB.
We know that B is two units from zero and A is three units from zero.
The total distance on the number line from point A to point B is five units.
We write this mathematically using absolute value.
The length of AB is the absolute value of the difference of the coordinates of points A and B.
The absolute value of B minus A is the absolute value of two minus negative three or the absolute value of five, which is five. So, we say the length of AB is five units.
You may be wondering why we started with point B when doing the calculation. In fact, it doesn't matter which endpoint you start with.
If we started with A, we'd have the absolute value of negative three minus two, or the absolute value of negative five, which is still five units.
We usually start with the right endpoint to avoid dealing with too many negatives, but it is really up to you. The absolute value will take care of them for us.

Slide 5
Let's look at another example.
Point X is located at negative four and point Y is located at five.
To find the length of XY, we find the absolute value of the difference of these coordinates.
The absolute value of five minus negative four equals the absolute value of nine. So, segment XY has a length of nine units. Notice that when we write the length of a segment, we denote it using the endpoints of the segment without a segment bar on top.

Slide 6
Now it is your turn to try some problems. Answer each question, then click the solution button to see if you are correct.

A number line is shown from -5 to 5 with points A, B, C, D, E, F, G, H, I, J, K at each of the integers -5. -4, -3, -2. -1, 0, 1, 2, 3, 4, 5.

1. What is the length of segment CH?

Answer: the absolute value of 2 minus negative 3 equals the absolute value of 5 equals 5.

2. What is the length of segment AE? <hidden answer>

Answer: the absolute value of negative 1 minus negative 5 equals the absolute value of 4 equals 4.

3. If DJ equals 2 x plus 2, what is the value of x?

Answer: DJ equals the absolute value of 4 minus negative 2 equals the absolute value of 6 equals 6. 6 equals 2 x plus 2. 2 equals x.

Slide 7
In this tutorial you have learned how to use absolute value to measure segments on a number line and how to apply this knowledge to problem solve.

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Now we can write the final equation.
F of x is equal to negative five times the quantity x squared minus fourteen x plus forty eight.
F of x is equal to negative five x squared plus seventy x plus two hundred forty.

Screen 8

Suppose a quadratic function has roots at negative 3 and 5 and a vertex at (1, negative 16). Write this quadratic function using the general formula.
Check your answer by clicking the solution button.

Solution:
Sum of the roots:
$r_1 + r_2$ = negative 3 + 5 = 2
Product of the roots:
r_1 times r_2 = negative 3 times 5 = negative 15

f of x equals a times the quantity x squared minus 2x minus 15.

Use the vertex (1, negative 16) to find a.
negative 16 = a times the quantity 1 squared minus 2 times 1 minus 15
negative 16 = a times negative 16
1 = a

f of x equals x squared minus 2x minus 15

Screen 9

Here are the steps we used to write a quadratic function using the roots and the vertex.
Find the sum and the product of the roots.
We can now insert these two quantities into our general equation.
Solve for a.
Write the final equation.