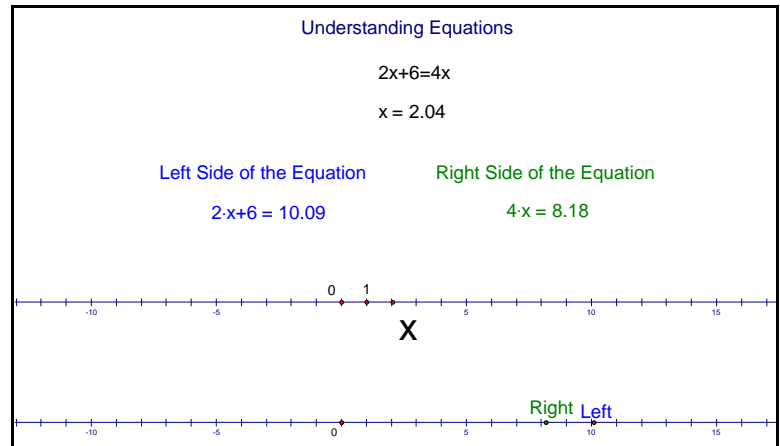


Understanding Solutions to an Equation with Sketchpad

Open the file: Understanding Equations.gsp

This file shows two number lines and an equation at the top of the screen. On the first number line you will see the value of x graphed. This x point can be dragged left and right along number line 1. There is also a point labeled 1. If you drag this to the left toward 0, the scaling on line 1 and 2 is changed, allowing you to view larger and smaller numbers on both number lines.



Part I

1. As you move the x point left and right it takes on different values and substitutes them into the left and right side of the equation. The value of the left and right sides are graphed on number line 2.
2. Drag x to the left and describe what happens to the points labeled Right and Left. (Remember you can change the scaling by adjusting the distance between 0 and 1 on number line 1.)
3. Try to explain why this is happening.
4. Drag x to the right and describe what happens to the points labeled Right and Left.
5. Does something take place that you expected at some value for point x ?
6. When the points labeled Right and Left on number line 2 coincide with each other, what is the value of x ? This value is called the solution of the equation. At this solution, what is the value of the right hand side of the equation? What is the value of the left hand side of the equation at this solution?
7. When x values are chosen that are less than the solution of the equation, where is the Right point in relationship to the Left point? Explain why this is true.
8. When x values are chosen that are more than the solution of the equation, where is the Right point in relationship to the Left point? Explain why this is true.

- To change the equation use the selection tool and double click on the equation. Change the equation to $\frac{x-2}{3} = \frac{x}{4}$.
- You will also need to change the left and the right side of equation statements. Again using the selection tool, double click on the equation that describes the left side and change the equation to $(x-2)/3$. Likewise, change the right side to $x/4$.

Part II

1. As you move the x point left and right it takes on different values and substitutes them into the left and right side of the equation. The value of the left and right sides are graphed on number line 2.
2. Drag x to the left and describe what happens to the points labeled Right and Left. (Remember you can change the scaling by adjusting the distance between 0 and 1 on number line 1.)
3. Try to explain why this is happening.
4. Drag x to the right and describe what happens to the points labeled Right and Left.
5. Does something take place that you expected at some value for point x?
6. When the points labeled Right and Left on number line 2 coincide with each other, what is the value of x? This value is called the solution of the equation. At this solution, what is the value of the right hand side of the equation? What is the value of the left hand side of the equation at this solution?
7. When x values are chosen that are less than the solution of the equation, where is the Right point in relationship to the Left point? Explain why this is true.
8. When x values are chosen that are more than the solution of the equation, where is the Right point in relationship to the Left point? Explain why this is true.

Part III

Repeat the same eight steps with the following equations.

1. $3x - 4 = 4 - x$
2. $3(x - 2) + 3 = 3 - 2(x + 1)$
3. $\frac{2}{3}(x + 6) = \frac{4}{3}x$