## Lesson 15: Efficiently Solving Inequalities

Let’s solve more complicated inequalities.

### 15.1: Lots of Negatives

Here is an inequality: .

1. Predict what you think the solutions on the number line will look like.
2. Select **all** the values that are solutions to :
   1. 3
   2. -3
   3. 4
   4. -4
   5. 4.001
   6. -4.001
3. Graph the solutions to the inequality on the number line:

* 

### 15.2: Inequalities with Tables

1. Let's investigate the inequality .

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | * -4 | * -3 | * -2 | * -1 | * 0 | * 1 | * 2 | * 3 | * 4 |
|  | * -7 |  | * -5 |  |  |  | * -1 |  | * 1 |

* 1. Complete the table.
  2. For which values of is it true that ?
  3. For which values of is it true that ?
  4. Graph the solutions to  on the number line:
  + 

1. Here is an inequality: .
   1. Predict which values of will make the inequality true.
   2. Complete the table. Does it match your prediction?

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | * + -4 | * + -3 | * + -2 | * + -1 | * + 0 | * + 1 | * + 2 | * + 3 | * + 4 |
|  |  |  |  |  |  |  |  |  |  |

* 1. Graph the solutions to  on the number line:
  + 

1. Here is an inequality: .
   1. Predict which values of will make the inequality true.
   2. Complete the table. Does it match your prediction?

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | * + -4 | * + -3 | * + -2 | * + -1 | * + 0 | * + 1 | * + 2 | * + 3 | * + 4 |
|  |  |  |  |  |  |  |  |  |  |

* 1. Graph the solutions to  on the number line:
  + 
  1. How are the solutions to different from the solutions to ?

### 15.3: Which Side are the Solutions?

1. Let’s investigate .
   1. Solve .
   2. Is true when is 0? What about when is 7? What about when is -7?
   3. Graph the solutions to  on the number line.
   * 
2. Let's investigate .
   1. Solve .
   2. Is true when is 0?
   3. Graph the solutions to on the number line.
   * 
3. Solve the inequality and graph the solutions on the number line.

* 

1. Solve the inequality  and graph the solutions on the number line.

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#### Are you ready for more?

Write at least three different inequalities whose solution is . Find one with on the left side that uses a .

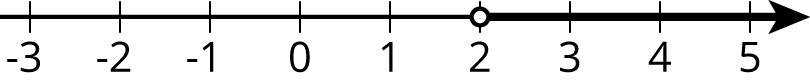
### Lesson 15 Summary

Here is an inequality: . The solution to this inequality is all the values you could use in place of to make the inequality true.

In order to solve this, we can first solve the related equation to get the solution . That means 2 is the boundary between values of that make the inequality true and values that make the inequality false.

To solve the inequality, we can check numbers greater than 2 and less than 2 and see which ones make the inequality true.

Let’s check a number that is greater than 2: . Replacing with 5 in the inequality, we get or just . This is true, so is a solution. This means that all values greater than 2 make the inequality true. We can write the solutions as and also represent the solutions on a number line:



Notice that 2 itself is not a solution because it's the value of that makes  *​equal* to 18, and so it does not make true.

For confirmation that we found the correct solution, we can also test a value that is less than 2. If we test , we get or just . This is false, so and all values of that are less than 2 are not solutions.



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