**Curriculum Guide: Inequalities**

**Designed by Esther N. Udoh**

**Definition:** **Inequalities are mathematical statements that connect unequal expressions.**

**Objective: This curriculum guide will help students understand inequalities, and be able to differentiate between inequality signs. They will solve inequality problems, being able to recognize problems where the inequality signs will need to change to arrive at a solution. Students will represent inequality solutions on a number line.**

**Below are the inequality symbols and their meanings:**

**> greater than**

**< less than**

**≥ greater than or equal to**

**≤ less than or equal to**

What makes one sign different from the other signs?

Have students brainstorm how one sign differs from the other signs.

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**WORKSHEET 1**

Looking closely at the inequality signs, can you find out what makes one sign different from the other signs? Write down what you discovered.

**> \_\_\_\_**

**< \_\_\_\_**

**≥ \_\_\_\_**

**≤ \_\_\_\_**

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The sign points to the lesser number.

The sign opens towards the larger number.

Greater than sign points to the right,

Less than sign points to the left.

**Note:** Students may come up with different ways to differentiate between one inequality sign and another. By finding out the difference, it makes it easier for them to get into solving inequalities.

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**WORKSHEET 2**

**Fill in the gap with the appropriate inequality sign (>or<):**

**Exercise 1**

1. **515 ….. 525**
2. **6114…..4114**
3. **2424…..2442**
4. **1613…..1216**
5. **5616….. 7624**
6. **1316….. 1216**
7. **2020…..2120**
8. **7227…..7272**
9. **1101…..1011**

 **10.5100…..5010**

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**Fill in the gap with the appropriate inequality sign:**

1. **515 < 525**
2. **6114 > 4114**
3. **2424 < 2442**
4. **1613 > 1216**
5. **5616 < 7624**
6. **1316 > 1216**
7. **2020 < 2120**
8. **7227 < 7272**
9. **1101 > 1011**

 **10.5100 > 5010**

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**Solving Inequalities**

Before getting into solving an inequality, you can use an activity called **Notice/Wonder** activity to get the students ready for this new concept, and also to create the right atmosphere for it. Have a chart ready, divided into two parts. On the left side, write down what the students observe (**notice**) about the inequality, and on the right side, write down their questions (**wonder**). Write the inequality to be solved on the board.

**Solve:**

**3x – 6 ≥ 12**

**Notice/Wonder Activity Chart**

**I Notice**  **I Wonder**

|  |  |
| --- | --- |
|  |  |

On the left side of the chart, write down what students observe **(notice**) about the inequality question, and on the right side write down students’ questions (**wonder**). Students might notice the inequality signs and may ask if they can solve inequality using the same methods for solving regular equations.

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Inequalities can be solved like regular equations.

**Example 1**

Solve 3x – 6 ≥ 12, using the elimination method

**3x – 6 ≥ 12**

 **+6** **+6**

**3x ≥ 18**

**3 3**

 **X ≥ 6**

**Graphing the answer**

**The answer to the inequality problem can be represented on the number** **line.** All numbers from 6 and above are solutions to the inequality problem

**On the number line the answer will appear like this:**

*

 **0 1 2 3 4 5 6 7 8 9 10 11 12 13 14**

**A shaded circle on top of 6 shows that 6 is included in the solution set, as well as all the real numbers in a number line that are greater than 6. A shaded circle represents the inequality ≥ (greater than, or equal to) or ≤ (less than, or equal to). The red arrow points to the right representing numbers 6 and above.**

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**Example 2**

Solve 8x + 4 > 12, using the elimination method

**8x + 4 > 12**

 **- 4 -4**

**8x > 8**

**8 8**

**X > 1**

**On the number line the answer will appear like this:**

 O

 **-3 -2 -1 0 1 2 3 4 5 6**

**An open circle shows that 1 is not included in the solution set. The solution includes all the real numbers in a number line that are greater than 1. The circle is on top of 1, and is open. An open circle represents the inequality < (less than) or > (greater than). The red arrow points to the right, representing numbers above 1.**

**Example 3**

 Solve 2x + 3 < 9, using the elimination method

 **2x + 3 < 9**

  **-3 -3**

 **2x** < **6**

 **2 2**

 **X < 3**

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**On the number line the answer will appear like this:**

 **O**

 **-4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9**

**An open circle on top of 3 shows that 3 is not included in the solution set. The solution includes all the real numbers in a number line that are less than 3. An open circle represents the inequality < (less than) or > (greater than). The red arrow points to the left, representing numbers less than 3.**

**Example 4**

 Solve 5x – 14 ≤6, using the elimination method

 **5x – 14 ≤ 6**

 **+14 +14**

 **5x ≤ 20**

 **5 5**

 **X ≤ 4**

**On the number line the answer will appear like this:**

 **-4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10**

**A shaded circle on top of 4 shows that 4 is included in the solution set, as well as all the real numbers in a number line that are less than 4. A shaded circle represents the inequality ≥ (greater than, or equal to) or ≤ (less than, or equal to). The red arrow points to the left representing numbers 4 and below.**

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**RESOURCES**

**Resource 1 -Video**

**https://www.oercommons.org/courseware/lesson/661**

**Teacher**: Watch the **video** on **SIGNED NUMBERS AND THE NUMBER LINE.** Watch this video with students, and control video as you watch students’ engagement. Students don’t work at the same pace. Observe students to know when to repeat an explanation of a concept. See this video from the students’ perspective.

Students might use hand-held devices to take pictures of concepts. Please allow free movement in the classroom. Some students might use hand-held

**Resource 2 -Video**

 **https://www.oercommons.org/authoring/23087-solving-inequalities/view**

**Teacher**: Watch the **video** on **SOLVING ONE STEP INEQUALITY.** Watch this video with students, and control video as you watch students’ engagement. Students don’t work at the same pace. Observe students to know when to repeat an explanation of a concept. See this video from the students’ perspective.

**Resource 3**

 **https://www.oercommons.org/courses/ck-12-foundation/view**

Students might use hand-held devices to take pictures of concepts. Please, allow free movement in the classroom. Some students might use hand-held devices to check math vocabulary.

**Resource 4**

**https://www.oercommons.org/courseware/lesson/1709/overview**

Students might use hand-held devices to take pictures of concepts. Please, allow free movement in the classroom. Some students might use hand-held devices to check math vocabulary

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**Resource 5 - Video**

[**https://www.oercommons.org/courses/plotting-inequalities-video/view**](https://www.oercommons.org/courses/plotting-inequalities-video/view)

**Teacher**: Watch the **video** on **GRAPHING INEQUALITIES SOLUTIONS ON THE NUMBER LINE.** Watch this video with students, and control video as you watch students’ engagement. Students don’t work at the same pace.

Observe students to know when to repeat an explanation of a concept. See this video from the students’ perspective.

**Resource 6 – Lessons and Videos**

**https://www.oercommons.org/courses/solve-inequalities/view UNDERSTANDING THE CONCEPT OF INEQUALITIES AND GRAPHING INIQUALITIES SOLUTIONS**

**Technology**: This Curriculum Guide will require an instructor computer, laptop, or chromebook. Chrome casting will be great, and images are cast on a TV, so everyone is watching the same thing.

Students’ computers would be an added bonus. Students can also use hand-held devices. It could also be added to an online delivery system, such as Canvas or Blackboard.

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**Sometimes the inequality sign is reversed to arrive at the right solution. Example:**

Solve 2x – 2 < 4x

 2x – 2 < 4x

 -4x -4x

 -2x -2 < 0

 +2 +2

 -2x < 2

 -2 -2

 X **>** -1

Here, the inequality sign is reversed. **The rule is that, if you multiply or divide an inequality by a negative number, the inequality sign must be reversed.**

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**Exercise 2**

**Solve and graph your answers:**

1. 2x ≤ 22
2. 8x > 24
3. 12x < 11x
4. 7x – 3 < 4x

**Exercise 3**

**Solve:**

1. 6x – 2 ≥ 4
2. 4x – 16 ≥ 24
3. 3x > 21
4. 2x – 3 < 7

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**Exercise 2**

1. **x ≤ 11**

 **7 8 9 10 11 12 13 14 15 16**

1. **x > 3**

 **o**

 **0 1 2 3 4 5 6 7**

1. **x <**  **0**

 **O**

 **-3 -2 -1 0 1 2 3 4**

1. **x < 1**

 **O**

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

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**Exercise 3**

1. **x ≥ 1**
2. **x ≥ 10**
3. **x > 7**
4. **x < 5**

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