UNIT 3: SOLVING LINEAR INEQUALITIES

Part A: Video Tutorial Section

Videos 1 and 2:

https://www.youtube.com/watch?v=P_-c9D6mjGA **(Writing and Graphing Inequalities)**

https://www.youtube.com/watch?v=unSBFwK881s **(More Examples of Writing and Graphing Inequalities)**

Videos 3 and 4:

https://www.youtube.com/watch?v=UTs4uZhu5t8 **(Solving Inequalities Using Addition and Subtraction)**

https://www.youtube.com/watch?v=jkZG2BotskU **(More Examples Solving Inequalities Using Addition and Subtraction)**

Video 5 and 6:

https://www.youtube.com/watch?v=PNXozoJWsWc **(Solving Inequalities Using Multiplication or Division)**

https://www.youtube.com/watch?v=QLMlYoXz2Zg **(More Examples of Solving Inequalities Using Multiplication or Division)**

Video 7 and 8:

https://www.youtube.com/watch?v=5gi84_mx_to **(Solving Multi-Step Inequalities)**

https://www.youtube.com/watch?v=xOxvyeSl0uA (**More Examples of Solving Multi-Step Inequalities)**

Video 9 and 10:

https://www.youtube.com/watch?v=FWbcKade3rw **(Graphing Linear Inequalities in 2 Variables)**

https://www.youtube.com/watch?v=unSBFwK881s **(More Examples Graphing Linear Inequalities in 2 Variables)**

Part B : Vocabulary, Hints and Explanations

Important Vocabulary Students Need to Understand!

inequality	• An inequality solves a variable using the greater than, less then, greater or equal to, or less than or equal to symbols.
>	• is greater than • is more than
<	• is less than • is fewer than
≥	• is greater than or equal to • is at least • is no less than
≤	• is less than or equal to • is at most • is no more than
solution of an inequality	• Is a value that makes the inequality true
solution set	set of all solutions of an inequality
graph of an inequality	• shows all the solutions of the inequality on a number line • an open circle is used when a number is <u>not</u> a solution • a closed circle is used when a number is a solution

Students have been solving inequalities using a number line in previous grades.

<u>Hint:</u> Some students are not able to read the inequality signs. They cannot tell a greater than > sign from a less than < sign.   Just as you can teach left from right by putting up your hands and making the "L" for left, you can do the same for less than. Or use the left-hand index and thumb to make an "L", tip the "L" toward the thumb. You have a less than < sign.

Inequalities have more than one solution. Because there are multiple possible solutions the solutions are called a solution set.

A student should solve the equation in the same manner as he has solved for an equality. (see Unit 1 – hints that includes "railroad problems" and "circling the variable").

Hint: A student may struggle to recall that multiplication or division by a negative causes the sign to change or "flip". You might try saying something like "I flip my lid when I have to divide by those flipping negatives" to remind a student to "flip" th sign.

Ex: -2x > 22   Solution: x < -11

Graphing Inequalities:

Students often hear the term "graphing" and assume they need graph paper. To graph an inequality, such as presented here, the student needs to draw a number line.

Hint: Point out that the inequality has only one variable. Therefore, it can only be graphed using one line.

To graph an inequality:

1. The student creates a number line. He places values on the number line with the solution to the inequality he has found in the center. He then adds values on either side that are greater or lesser than the center value.
2. The student places a circle at the solution to the inequality. If the sign included the equals (or underline) the student fills in the circle. If the sign is < or > the student leaves the circle open.
3. The student then draws a line with an arrow in the correct direction to show all possible answers in the solution set.

Hint: Tell the student that the equals portion of the sign is "something extra" so it gets "something extra" in the form of filled in.

Hint: If a student is unsure which direction to draw the line, point out that the < and > symbols are line arrow heads to point which direction to draw the line. Remind the student to be sure to add that arrow head onto the line he draws.

Compound Inequalities:

A compound inequality is an inequality that joins two inequalities with the word "and" or the word "or".

Ex: The number x is more than 3 and less than 9

The number x is less than 0 or greater than 7

Solving compound inequalities: The student solves each inequality as if it were a single inequality.

Graphing compound inequalities: The student will use one number line with two end points.

If the inequality states "and", the student will graph one solution set, with two "end caps" and a shared line with no arrows.

If the inequality states "or" the student will graph two end points for two separate lines and include end arrows. There will be a space between that does not solve either inequality.

Graphing Inequalities With Two Variables (Linear Inequality):

Just as the student learned to graph linear equalities, he will use a similar process to graph linear inequalities.

Notice that you will now have an ordered pair as a solution to the inequality. The solution set is any ordered pair that will make the inequality true.

A student will find ordered pairs to solve the inequality just as he did with linear equations (see Unit 1).

The student will be graphing on a coordinate plane (graph paper).

To graph a linear inequality:

1. Using ordered pairs that are solutions to the inequality as if it were a linear equality, the student will graph the line. If the inequality includes the equals sign, make the line solid. If the inequality does not include the equals sign, make the line dashes.
2. The student then shades the portion of the graph, to one side or the other of the line, that includes all ordered pairs that are possible solutions.
3. If the student is unsure which side to shade use the "zero test". Complete the inequality using the ordered pair (0,0). If the point (0,0) solves the inequality, shade the area that includes the (0,0). If the point (0,0) does not make the inequality true, shade the area that does not include that point.

Linear Inequalities with One Variable:

A student may be required to graph an inequality that appears to have only one variable. These inequalities state only a y or an x value. These are represented by either a vertical or a horizonal line on the graph.

Hint: Recall that the student learned that a horizontal line has a slope of 0. This is a line on which every ordered pair has the same y value.

Ex: (2,7) (5,7) (1,7) etc. Would graph as a horizontal line.

The inequality for this set of ordered pairs would be   y < 7 or y > 7

To graph: The student follows the same process as above to create either a solid or dashed line and again uses the (0,0) test to determine which side of the line to shade.

If the inequality states   x < 5 or x > 5 , the line will be vertical because every ordered pair in the solution set will have the same x value.

Ex: (5,3) (5,8) (5,12)

To graph: The student follows the same process as above to create either a solid or dashed line and again uses the (0,0) test to determine which side of the line to shade.