

FINAL SIOP LESSON PLAN

Name: Stephanie Hart

Content Area: Mathematics, Solving Inequalities

Grade Level: 8

English Learners: This is a sheltered class within a mainstream classroom with English only speakers. There are approximately 30% English learners: 2 Level 2s, 4 Level 3s and 2 Level 4s. The lesson is delivered to the entire class.

Preparation

1. **ACADEMIC CONTENT STANDARD(S):**
California Standards for Mathematics (Algebra - Grade 8)
5.0 - Students solve multistep problems involving linear equations and linear inequalities in one variable and provide justification for each step.
California Common Core Standards
7.NS Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$.
8.EE.7.a Solve linear equations in one variable.
Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).
A-REI 3-3.1 Solve equations and inequalities in one variable. [Linear inequalities; literal equations that are linear in the variables being solved for; quadratics with real solutions.]
 3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
3.1 Solve one-variable equations and inequalities involving absolute value, graphing the solutions and interpreting them in context. CA
4. **ACADEMIC LEARNING GOALS (outcomes/objectives) for this lesson:**

Students will:

- Learn academic vocabulary:
 - o Inequality
 - o Solution of an Inequality
 - o Equivalent Inequalities
- Write numerical inequalities given verbal sentences
- Graph their answers on a number line
- Solve one variable inequalities by addition and subtraction

5. ELD STANDARD(S):

Listening:

- o Students will listen to teacher review and lecture academic vocabulary and solving inequalities
- o Students will work in pairs and groups

Speaking:

- o Students will participate in class review / discussion / brainstorming and work in groups to learn academic vocabulary solve problems and present answers

Reading:

- o Review and creation of graphic organizers, Power Point (image heavy for L2s/L3s), note guides (Scaffolded for L2s-L4s), written equation exercise and group work

Writing:

- o Writing word problems for numerical equations
- o Note-taking (Scaffolded for L2s-L4s)
- o Recording answers from group work.

6. ELD GOALS (outcomes/objectives) for EL Learners:

- Take written notes with scaffolded note guide
- Discuss and analyze use of inequality symbols
- Use key vocabulary words to create both written and numerical inequalities
- Small group work to read, discuss, solve and report solutions to class

7. ADAPTATIONS:

- PowerPoint with Images
- Vocabulary Graphic Organizer

- Scaffolded Notes

Building Background

1. Content Word Wall with review vocabulary (Variable,
2. PowerPoint using photos images instead of numbers
 - Power Point was adjusted to have "Wake-up Early" vs. "Sleep-in" to make example a little more personable, per Peer Review

Comprehensible Input

Classroom set-up: Desks are set up in tables, six groups of 5 students each. Lower-intermediate to Advanced-intermediate EL students are interspersed throughout all groupings, as are students of varying math capabilities. Academic Objectives, Language Objectives, Daily Agenda and Homework Assignment are posted on the dry-erase board as are Graphic Organizers for Review Vocabulary and New Vocabulary for this lesson.

1. Review Academic and Language Objectives for Lesson (1 minute)
 - a. Academic Objectives:
 - i. Review vocabulary and learn new vocabulary (*see Graphic Organizers or Word Wall*)
 - ii. Write numerical and worded inequalities
 - iii. Graph Inequalities
 - iv. Solve one-variable inequalities by addition and subtraction
2. Pass out Scaffolded Note-Taking Guides and Warm-up Review Questions (*5 questions from previous section work, 1 spiral question to revisit material from earlier in the course*). These questions are designed to review last lesson as well as material earlier in the course that inequalities build upon as an assessment tool. Ask groups to work together on answering each question (*this is a routine in the class and will be familiar*). When done, have one person from each table come up to the front and show how to solve one of the problems. (*Have naming*

sticks at front of class representing each table of students and pick sticks to call on who will demonstrate the problem) (10 minutes)

3. Inequalities Warm-up Power Point. As a class, say the meaning for each inequality symbol aloud together. Relate meaning of inequality symbols using images rather than numbers to access background knowledge and build interest. Engage students to discuss each slide. Explicitly teach vocabulary with Word Wall Graphic Organizer Review Vocab (*Positive, Negative, Variable, Linear Equation*). Use repetition of key words. Think-Group-Share for slide 5 if anything would make the A's better than the Giants...*assuming most prefer Giants* ...Pause on slide 5 and have a discussion with the class whether there is anything the A's could add to themselves to become "greater than" the Giants...a new stadium, new uniforms, new coaching??, let kids come up with ideas and discuss which items could be in "solution set." Show slide 6 to show a possible answer to "solution set." Ask class for a Thumbs-up/Thumbs-down to be sure they understand inequality signs and solution sets before moving on. (10 minutes)
4. Direct students to refer to Note-taking Guides for Lecture. Think-Pair-Share definition of Solution Set. To scaffold, write on the board a few sets of numbers so kids can see what a set looks like, i.e. $\{1,2,3,4\}$, $\{3, 5, 10, 11\}$ then ask, "What could make a set a solution set? (*the set of all solutions to a particular problem*). As students share, help students articulate their ideas by restating and/or rephrasing their comments. Add vocabulary from slide 6 (*Solution Set, Inequality*) to Word Wall and have students add to their notes. Review inequality symbols on notes. (5 minutes)
5. Touch back on Academic Objectives (*written on the board*): We have worked on new vocabulary and vocabulary review. Now we are going to work on writing worded and numerical inequalities. (1 minute)

6. Per notes, have kids write worded inequalities for Examples 1-4 going through them together one at a time. Emphasize vocabulary "Variable" with example 3 and 4. (3 minutes)
7. Note to class on *Academic Objectives: Graph Inequalities*. Review Number Line (on Word Wall). Have someone read definition. Show picture of a number line to help visualize definition. Build on terms "Positive" and "Negative" from PowerPoint presentation (3 minutes)
8. Demonstrate *Graphing Inequalities* with Example problems 5-7 on Note-Guide. Differentiate between open dot and closed dot endpoints and direction of arrow. Ask students what graph represents? (*Solution Set for the Inequality*) (3 minutes)
9. Note to class on *Academic Objectives: Solve One Variable Inequalities by Addition and Subtraction*. Before moving on to Example 8, review Word Wall for *Variable, Inverse Operations, Equations*. Ask class what the Inverse Operation for addition is. Proceed with Examples 8 and 9. Do 8 for the class. Have them do 9 on their own and ask for a few volunteers to tell answer. Ask rest of class if they agree with answer, then provide answer. (3 minutes)
10. Introduce Equivalent Inequalities. Think-Pair-Share definition for Equivalent Inequalities. Work on final two examples, 10 and 11, with class. (5 minutes)
11. Give each group a worded inequality on a 3x5 card that they have to write into a numerical equation, solve, then graph on board (*more than one group can go up and write answers at once*)...have Reader, Table Recorder, Board Recorder, Grapher, and Presenter of Problem ...pre-make list of Roles on board with details, i.e. Presenter must explain what the Board Recorder and Grapher are writing on the board. Pass out ABCD cards (4 3x5 cards, each with a different letter written largely on it) and check on work walking around class ensuring full participation and give assistance as needed. (10 minutes)

12. Closure: Language Objective (review vocabulary), Exit ticket (3 problems on PowerPoint. Have entire class answer questions at same time by holding up either A, B, C, or D (3x5 cards) to reflect their response to the questions for assessment...this is a routine in the class to do the Exit Ticket questions), Review homework assignment (10 minutes)

Strategies

1. Preview of Inequalities with Warm-up Power Point; connecting with personal experience
2. Taking notes
3. Evaluating
4. Completing a Graphic Organizer
5. Participate in discussions
6. Engage in cooperative learning groups
7. Interacting with others, Think-Pair-Share

Interaction

1. Question and answer, discussion and repeating with teacher
2. Think-Pair-Share
3. Cooperative Groupings
4. Presentations to Class

Practice/Application

1. Solving and presentation problems of Warm-up Review Questions
2. Class discussion of Warm-up Power Point
3. Think-Pair-Share and group work during note-taking
4. Group work with 3x5 cards (collaboration and presentation)
5. Exit Ticket assessment questions

Review/Assessment

Checks for Understanding:

1. Presentation of problems and solutions

2. Class discussion and questions of students from teacher throughout lesson
3. Exit Ticket assessment questions
4. Thumbs-up/Thumbs-down

Summary review of key vocabulary and concepts:

1. Go through words on Review Vocabulary Graphic Organizer and New Vocabulary Graphic Organizer again
2. Go through Academic Objectives List again

References

Burger, Edward B., Leinwand, Steven J., Chard, David J., and Renfro, Freddie L. *Algebra 1*. USA: Holt, Rinehart and Winston, 2008.

SUPPLEMENTAL ATTACHMENTS TO SIOP LESSON

POWER POINT - INEQUALITIES WARM-UP:

<http://harthomeroom.weebly.com/instructional-technology.html>

4 SETS OF SCAFFOLDED NOTES (see below)

- L2/L3
- L3/L4
- EO
- Teacher Version

INEQUALITIES NOTES - SCAFFOLDED L2/L3

Inequality: a statement that _____ quantities are not _____

Solution Set: a value for the variable that makes the _____ true

Quantities are compared using the following signs:

$A < B$: A is less than B

$A > B$: A is _____ B

$A \leq B$: A is _____ B

$A \geq B$: A is greater than or equal to B

$A \neq B$: A is _____ B

Examples: Write the following inequality statements in words.

1) $11 < 24$

Eleven is _____ twenty-four

2) $3.54 > 3.52$

Three point five four is _____ three point five two

3) $a \geq 7$ (see VARIABLE on WORD WALL)

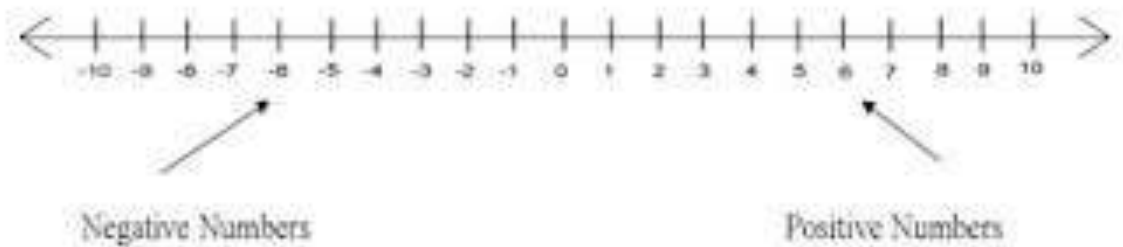
a is _____ seven

4) $12 \leq 6 + p$

Twelve is _____ six plus p

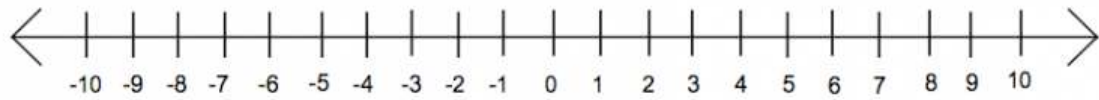
Graphing Inequalities:

Number Line

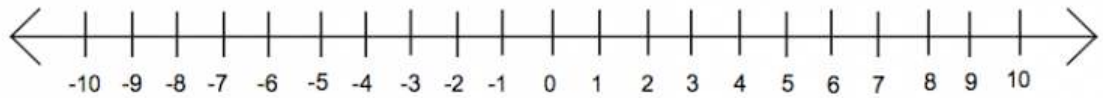


Examples: Graph Solution Sets on Number Line

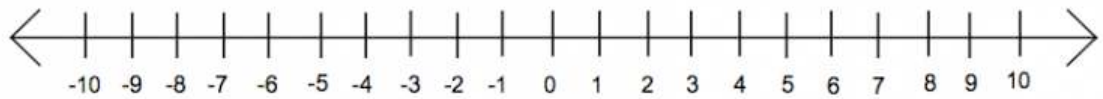
5) $a > 7$



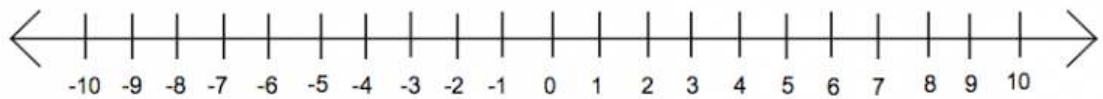
6) $b < -5$



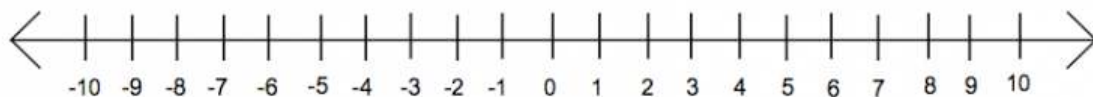
7) $h \geq -2$



8) $a + 4 \leq 8$



9) $-5 > x - 5$



EQUIVALENT INEQUALITIES: inequalities with the _____ solution set

Example: Show why $x > 5$ and $x + 2 > 7$ are EQUIVALENT INEQUALITIES

Example: Identify the EQUIVALENT INEQUALITIES in the following:

A. $x + 4 \geq 6$

C. $x + 12 \geq 10$

D. $x - 4 \geq -2$

D. $x - 2 \geq -4$

Answer: _____

INEQUALITIES NOTES - SCAFFOLDED L3/L4

Inequality: a statement that _____

Solution Set: a value for the variable _____

Quantities are compared using the following signs:

$A < B$: A is _____ B

$A > B$: A is _____ B

$A \leq B$: A is _____ B

$A \geq B$: A is greater than or equal to B

$A = B$: A is _____ B

Examples: Write the following inequality statements in words.

1) $11 < 24$

Eleven is _____

2) $3.54 > 3.52$

Three point five four is _____

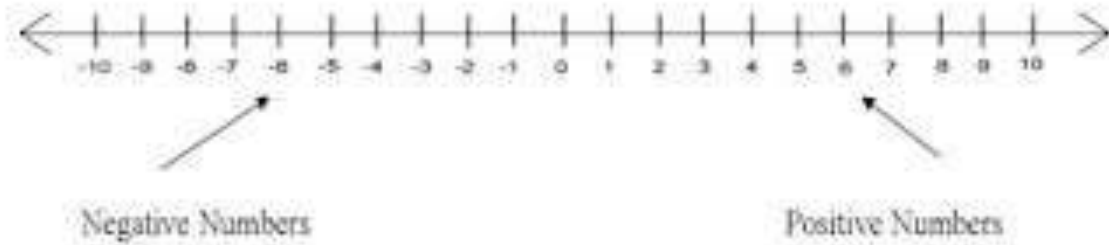
3) $a \geq 7$ (see VARIABLE on WORD WALL)

a is _____

4) $12 \leq 6 + p$

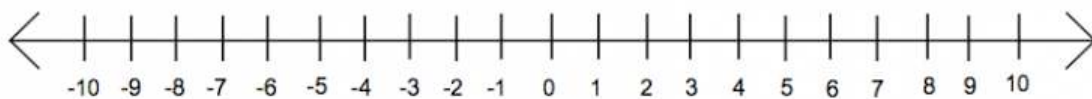
Graphing Inequalities:

Number Line

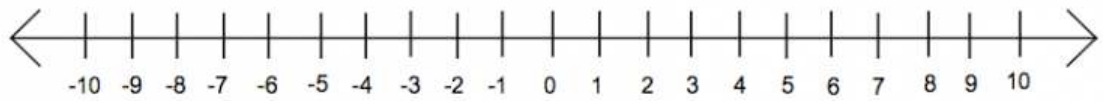


Examples: Graph Solution Sets on Number Line

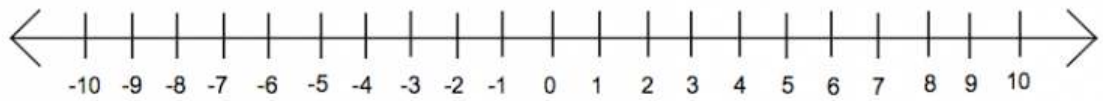
5) $a > 7$



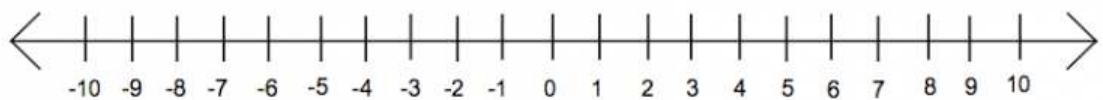
6) $b < -5$



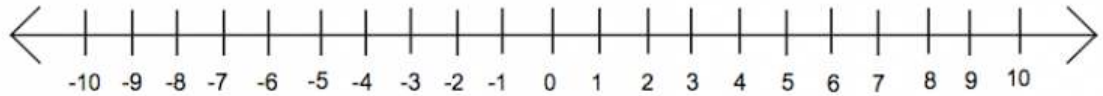
7) $h \geq -2$



8) $a + 4 \leq 8$



9) $-5 > x - 5$



EQUIVALENT INEQUALITIES: inequalities _____

Example: Show why $x > 5$ and $x + 2 > 7$ are EQUIVALENT INEQUALITIES

Example: Identify the EQUIVALENT INEQUALITIES in the following:

A. $x + 4 \geq 6$

C. $x + 12 \geq 10$

D. $x - 4 \geq -2$

D. $x - 2 \geq -4$

Answer: _____

INEQUALITIES NOTES - SCAFFOLDED EO

Inequality: _____

Solution Set: _____

Quantities are compared using the following signs:

A ____ B : A is _____ B

A ____ B : A is _____ B

A ____ B : A is _____ B

A ____ B : A is _____ B

A ____ B : A is _____ B

Examples: Write the following inequality statements in words.

1) $11 < 24$

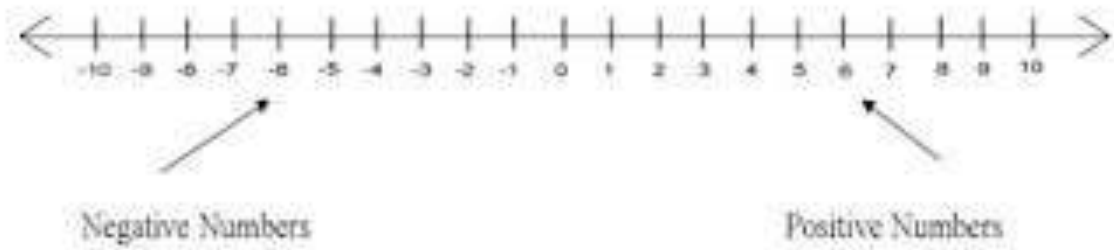
2) $3.54 > 3.52$

3) $a \geq 7$ (see VARIABLE on WORD WALL)

4) $12 \leq 6 + p$

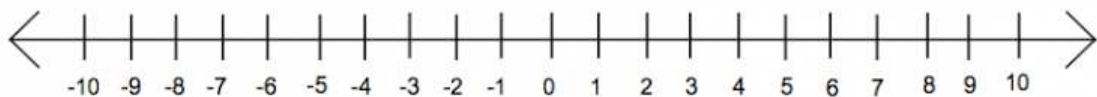
Graphing Inequalities:

Number Line

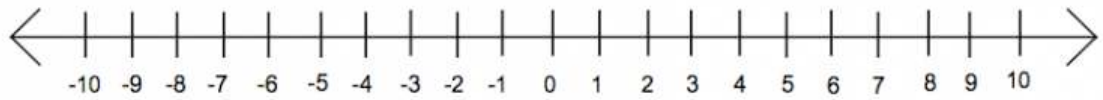


Examples: Graph Solution Sets on Number Line

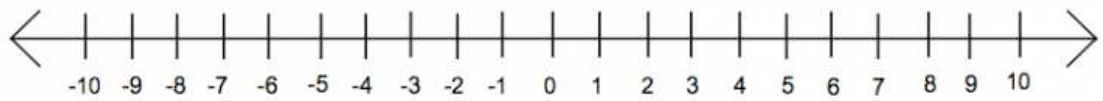
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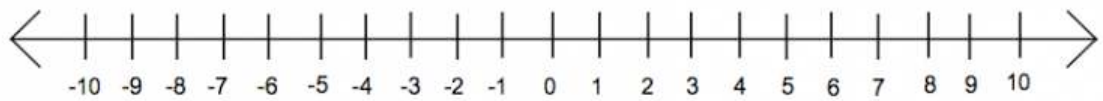
6) $b < -5$



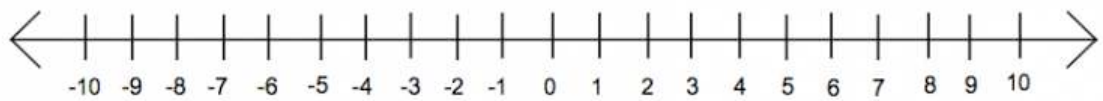
7) $h \geq -2$



8) $a + 4 \leq 8$



9) $-5 > x - 5$



EQUIVALENT INEQUALITIES: _____

Example: Show why $x > 5$ and $x + 2 > 7$ are EQUIVALENT INEQUALITIES

Example: Identify the EQUIVALENT INEQUALITIES in the following:

A. $x + 4 \geq 6$

C. $x + 12 \geq 10$

D. $x - 4 \geq -2$

D. $x - 2 \geq -4$

Answer: _____

INEQUALITIES NOTES: TEACHER VERSION

Inequality: a statement that two quantities are not equal

Solution Set: a value for the variable that makes the inequality true

Quantities are compared using the following signs:

A $<$ B: A is less than B

A $>$ B: A is greater than B (draw picture of fish eating larger amount)

A \leq B: A is less than OR equal to B

A \geq B: A is greater than OR equal to B

A \neq B: A does not equal B

Examples: (have students write words for statement in space provided then discuss answers)

1) $11 < 24$

____[Eleven is (less than) 24]____ (Do not include for EOs)

2) $3.54 > 3.52$

____[Three point five four is (greater than) three point five two]____

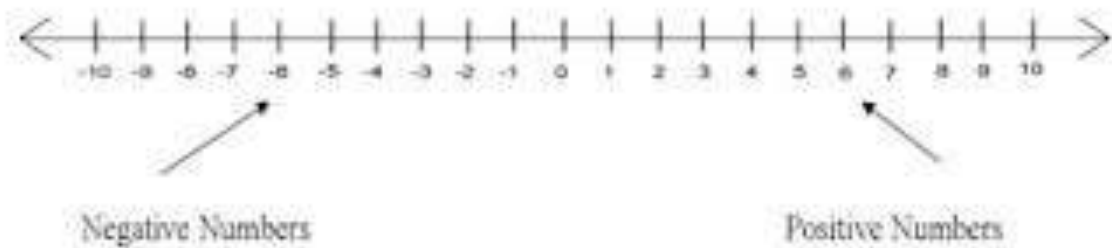
3) $a \geq 7$ (refer to VARIABLE on WORD WALL)

___ [a is (greater than or equal to) seven]___

- 4) $12 \leq 6 + p$ (emphasize this can be worded several ways, i.e. twelve is less than or equal to six plus p, six plus some number p, six more than p, etc.)

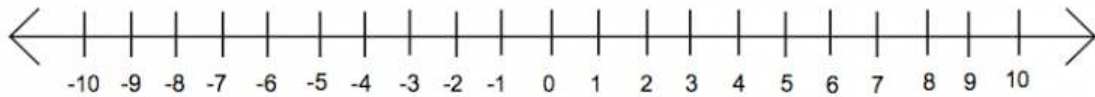
Graphing Inequalities:

NUMBER LINE (talk about line, especially positive and negative, greater to the right, lesser to the left)

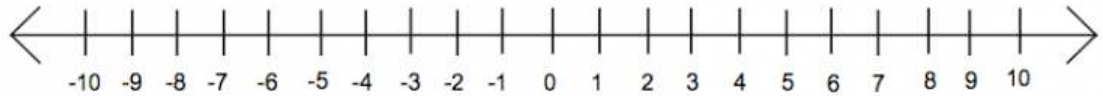


Examples:

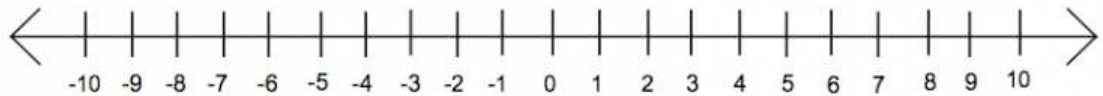
- 5) (From above): $a > 7$



- 6) $b < -5$



7) $h \geq -2$

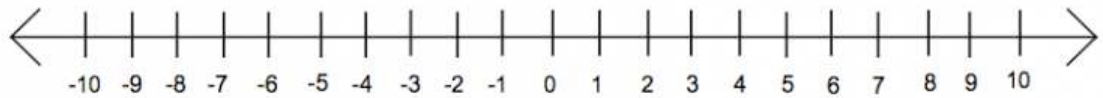


Before go on...review EQUATIONS, VARIABLES, and INVERSE OPERATIONS (Building more background using previously learned concepts...see Word Wall - Vocabulary Graphic Organizer)...(do one quick one-step equation solution, (i.e. $y + 7 = 12$))

8) $a + 4 \leq 8$



9) $-5 > x - 5$



EQUIVALENT INEQUALITIES: inequalities with the (same) solution set

Example: Show why $x > 5$ and $x + 2 > 7$ are EQUIVALENT INEQUALITIES

Example: Identify the EQUIVALENT INEQUALITIES in the following:

A. $x + 4 \geq 6$

C. $x + 12 \geq 10$

D. $x - 4 \geq -2$

D. $x - 2 \geq -4$

Answer: _____