Title of Lesson: Inequalities Everywhere
UFTeach Students' Names: Heather McNeill

Teaching Date and Time: 09/27/2012

Length of Lesson: 50 minutes

Grade / Topic: 8th grade Algebra I Honors / Compound Inequalities

Source of the Lesson: Portions of the lesson were taken from the class text, Algebra 1 Honors Gold Series Prentice Hall, 2011

Appropriateness for Middle School Students: This lesson uses Stand-up, hand-up, pair-up and gets the students out of their seats. Students work individually, in small groups and as a whole class.

Concepts

Compound inequalities are inequalities which that have more than one set of constraints. They are two distinct inequalities that are joined together. The idea relates to union and intersection (or and and or). When solving compound inequalities it is important that what you do to one part you do to the other. The graphs of compound inequalities are the combination of the two individual graphs. And means that our number must be within the confines of both inequalities and or means that it can be in with one or the other (it would never be in both). Just as the equal sign in greater than (less than) or equal to signifies that we shade in our circle when graphing, we must also use a bracket with the notation. Then when the value is not included, we must not shade in the dot and we use parentheses. Information in this section was taken from the student text, Algebra 1 Honors Gold Series Prentice Hall, 2011

Florida State Standards (NGSSS):

> **MA.912.A.3.4** - Solve and graph compound inequalities in one variable and be able to justify each step in a solution. Complexity: Basic application of skills and concepts.

Performance Objectives

- SWBAT solve and graph compound inequalities using *and* and *or.*
- SWBAT graph when provided with the interval notation for of the inequality.

Materials List and Student Handouts

- 1 Fast food paper per student (24 total)
- 1 Elaboration paper per student (24 total)
- 1 evaluation per student (24 total)

Advance Preparations

- Have the SmartBoard presentation ready.
- The group leader is to pass out papers if extra help is necessary.

Safety

- Students need to safely move from one part of the room to another during transitions.

5E Lesson Template:

ENGAGEMENT		Time:_5 minutes_____
What the Teacher Will Do	**Teacher Directions and Probing Questions**	**Student Responses and Potential Misconceptions**
Greet students and introduce myself. Review concepts the students have been working with and inform them of today's lesson topic.	Good morning, how are you guys doing today? Today we are going to be talking about compound inequalities. I know that you have recently been working with inequalities, solving and graphing them on a number line, right? Then most recently you worked with sets and learning how we write sets using set (or interval) notation.	
Provide directions and guidelines for number puzzle. Have the whole class participate in the puzzle and have a small discussion about the design of the puzzle once the number is revealed. (The teacher will have a second bag in case the class fails the first puzzle. It will contain a different number with different clues, but will follow the same logic.	To start things off today we are going to play a game. In this bag I have a number. It is your job as a class to correctly state what number is in the bag. Here are the rules: You have up to 6 guesses as a class. You may request up to 4 clues, but for each clue you request you will lose a guess. What are your questions about the rules? So as a class, what would you like to do? What if I give you a clue, would you like a clue? (Provide specific clue when requested) Clue #1: It is a number between 1 and 25. Clue #2: It is greater than 9. Clue #3: It is less than 13. Clue #4: The sum of the digits is greater than one. So what is the number I have in the bag? What were the possible numbers I could have had in my bag? How do you know that? Is it possible to lose this game if you heard all 3 (or 4)	[We would like a clue.] Is it 8? [Can we please have another clue?] Is it 20? [Another clue?] Is it 18 [The last clue, please?] Is it 11? [It is 11, or 12] [11, or 12 when you hear the first three clues you can limit it to only 10, 11, and 12 with 3 guesses remaining. Or you can hear the 4th

	clues before making any guesses? Why or why not?	clue and narrow your choices down to 11, and 12 with 2 guesses left. It is impossible to lose if you play your choices right.]

EXPLORATION		Time: _21 minutes_____
What the Teacher Will Do	**Teacher Directions and Probing/Eliciting Questions**	**Student Responses and Misconceptions**
The teacher will provide instructions to help students get started on the activity to help Paula, Tommy, Molly and Bubba to solve their fast food dilemmas.	You are now going to get a piece of paper that has four different scenarios on it. The person in desk 1 will look at Paula's Pizza, desk 2 will look at Tommy's Taco, desk 3 will get Molly's Milkshakes, and desk 4 will look at Bubba's Burgers. If one of your group members is missing, that's fine. You will have 5 minutes to work on helping out your restaurant owner, either Paula, Tommy, Molly, or Bubba. If you finish helping them solve their problem then you can begin helping another owner out. After 5 minutes you need to be prepared to talk with your group about your owner and how you helped them solve their problem. It is your job to teach them and make sure that they understand. What are your questions about the task?	
The teacher will circulate around the room and make sure that each student is able to at least begin their assigned problem.	What does your owner need your help with? How might you go about doing that? How do you know that you have a valid solution?	[Finding out how many pounds of cheese to order.] [Solving the inequality and choosing a value in the solution.] [My number will be in my inequality.]
The teacher will instruct students to spend the next 16 minutes (4 minutes per student) explaining their assigned problem to their peers and conversing with one another about the process and solution.	Now you are going to take turns within your group sharing your specific problem. You should spend no more than 4 minutes on each problem. The student will share what they did, not just their answer, and then the rest of the group will comment and question.	

	This should take no more than 16 minutes.	
The teacher will circulate around and sit in on different groups.	Do you agree with what she is saying? Why do you think that? How did you come up with that?	[Yes, but I thought about it this way…]

EXPLANATION		Time: _10 minutes _
What the Teacher Will Do	**Teacher Directions and Probing/Eliciting Questions**	**Student Responses and Misconceptions**
The teacher asks students to share their ideas and processes for solving each of the 4 problems. Students can approach the board and share their solutions. At least four different students will share their thoughts. This is meant to be an open discussion with the students driving the explanation of each problem.	Now we are going to discuss each of the four problems. Who will share with the class how they went about helping Paula? How did you find a solution to this? For Tommy, how did you get information if you were only given that graph? What was different about Molly's graph from our other graphs? Is the wording any different? What did you recommend Bubba do? Are there any questions about any of the four problems?	 [I had to solve for x, get it by itself.] I guessed and checked. [I wrote an inequality to match the graph.] [It had two separate parts. There was the word **or**.] [He should probably stop selling them, he loses money sometimes.]

ELABORATION		Time: _9 minutes_____
What the Teacher Will Do	**Probing/Eliciting Questions**	**Student Responses and Misconceptions**
The teacher leads an elaboration activity with solving a compound inequalitiy.	Please see the next paper, read what it says and work with your group to solve the problem. What is your goal? What do we need to consider about finding the average? How might we set this up?	 [To find the range of acceptable pH values.] [The average will be 1/3 the sum of the 3 pH values. We know 2 of the values and need to find possible values for the 3rd.]

EVALUATION		Time: _5 minutes___
What the Teacher Will Do	**Assessment**	**Student Responses**

The teacher will distribute the evaluation and proved the students 5 minutes to complete it individually.	Alright, you guys have worked really hard today discovering compound inequalities. You have worked in groups, individually and we have discussed things as a class, but now I want to know what you know individually. This will help me to see what parts went well and what parts I need to improve on. You should spend the next 5 minutes answering these couple questions and when you are done please turn your paper face down and I will come around to collect it. Are there any questions about what you are to be doing? Thank you.	N/A

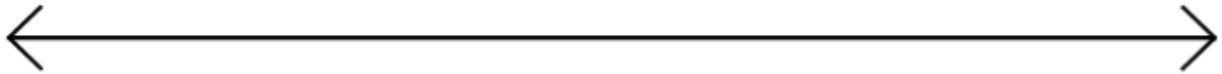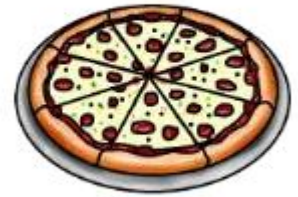**Name:**_____

Paula's Pizzas

The average amount of pizzas sold on any given weekday is represented below:

$$57 \leq (1/4)x + 7 < 119.$$

Show your steps to solve the compound inequality and then graph your solution. If each pizza sells for $9.84, how much are Paula's sales?

Tommy's Tacos

Tommy must place a cheese order. The average monthly amount of cheese is represented in pounds below:

The cheese factory does not know how to read this graph and needs the information expressed as a compound inequality as well as in interval notation. Can you help the cheese company?
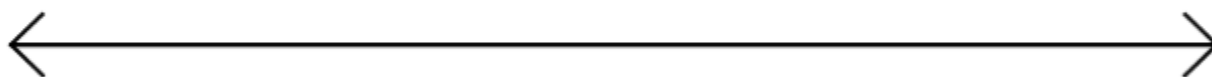

How many pounds of cheese should Tommy order?

Molly's Milkshakes

Molly is known for her milkshakes during the hot summer months, and her hot cocoa during the crisp winter mornings. Molly's most successful days are when the temperature is either:

$$3x - 8 \leq 154 \quad \text{or} \quad -2x + 5 < -163.$$

Represent the temperatures of her most profitable days with a graph, and using interval notation.

Bubba's Burgers

Bubba just started selling sardine sandwiches and is curious to see if they will turn a profit or not. Below is the inequality that represents the profit made from Saturday's sales of sardine sandwiches. Which graph shows the solution to the inequality? What do you suggest Bubba do?

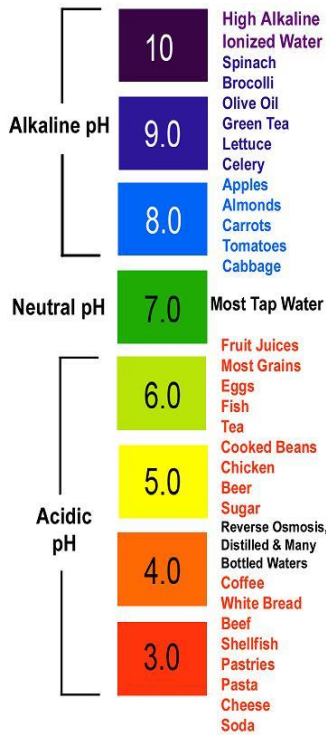$$15 \leq 7n - 2(n - 10) < 35$$
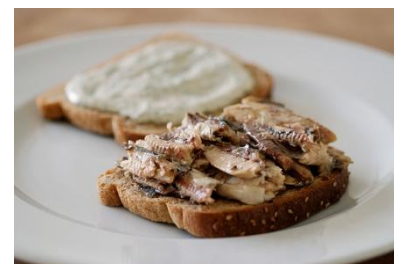
A.

B.

C.

D.

Elaborating Inequalities and Connecting to Chemistry

UFTeach
Developing the Next Generation of Florida's Math and Science Teachers

The acidity of the water in a swimming pool is considered normal if the average of three pH readings is between 7.2 and 7.8, inclusive. The first two readings for Michael's swimming pool were 7.4 and 7.9. What possible values for the third reading, p, will make the average pH normal? Represent your solution on a graph.

Show your work and be prepared to justify your steps.

Alkaline pH	10	High Alkaline Ionized Water Spinach Brocolli Olive Oil
	9.0	Green Tea Lettuce Celery
	8.0	Apples Almonds Carrots Tomatoes Cabbage
Neutral pH	7.0	Most Tap Water
Acidic pH	6.0	Fruit Juices Most Grains Eggs Fish Tea
	5.0	Cooked Beans Chicken Beer Sugar
	4.0	Reverse Osmosis, Distilled & Many Bottled Waters Coffee White Bread
	3.0	Beef Shellfish Pastries Pasta Cheese Soda

Name: _____

Evaluation:

1. What are the solutions of 3t + 2 , -7 or -4t + 5 <1 ? Show your solution and then graph your solution.

2. What are the solutions of: All real numbers that are between -5 and 7. Write your solution in interval notation and then graph your solution.

3. Write each interval as an inequality, then graph. (-∞, -3] or [4 to ∞)