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Linear Inequalities [11th grade]

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UNDERSTANDING BY DESIGN

Unit Overview

Unit Title: Linear Inequalities

Grade Level: Junior

Subject/Topic Area(s): Algebra II

Designed By: Maeve Goetz

Time Frame: 4 weeks; Block Schedule

School District: San Antonio Independent School District

School: Highlands High School

School Address and Phone:

3118 Elgin Ave.
San Antonio, TX 78210
(210) 333-0421

Brief Summary of Unit (Including curricular context and unit goals):

     The students will be introduced to linear inequalities and systems of linear inequalities. The main understandings that I want to develop in my students are that there are many methods to solving math problems and that solving the problem is not always enough (mathematically correct solutions are not always the best solutions). They will need to analyze the solutions they develop to determine whether or not their answer is reasonable.

     Students will demonstrate their knowledge of linear equalities by solving them algebraically, graphically, and using a table. Students will compare and contrast linear equations to linear inequalities. They will explore real-world examples of linear inequalities and discuss when linear inequalities are necessary to solve certain problems.

     Students will apply what they have learned to a project. Each student will open a store of their choosing. They must decide how many of two products they would like to have at their store based upon the amount of space each takes up and the profit earned by each product. They will also compare this simplified problem to what the problem would be like in the real world.

Unit: Linear Inequalities
Course: Core III

Stage 1: Desired Results

Understandings

Students will understand that:
There are many methods for solving mathematical problems.
Systems give absolute or optimal solutions for a set of equations or inequalities.
Mathematically correct solutions may not always yield the best solutions.

## Essential Questions	## Knowledge & Skill
When do you use inequalities? When do you not? How do you decide which method to use to solve a problem? When is a "correct" mathematical answer not the best solution?	§111.33. Algebra II (3) The student formulates systems of equations and inequalities from problem situations, uses a variety of methods to solve them, and analyzes the solutions in terms of the situations. Following are performance descriptions. (A) The student analyzes situations and formulates systems of equations or inequalities in two or more unknowns to solve problems. (B) The student uses algebraic methods, graphs, tables, or matrices, to solve systems of equations or inequalities. (C) For given contexts, the student interprets and determines the reasonableness of solutions to systems of equations or inequalities.

Stage 2: Assessment Evidence

Performance Task: see attached paper.

Other evidence:
Writing samples to accompany one of their examples of solving a linear inequality (explain what they do in each step and why).
Quiz over solving linear inequalities.
Quiz over solving systems of linear inequalities.
Cumulative Test.

Stage 3: Learning Activities

(Steps taken to get students to answer Stage 1 questions and complete performance task)
Note: The text referred to here is Contemporary Mathematics in Context: Course Three, 2003 ed.

Day 1-2:
- Ask the students the question: what are inequalities (mathematical or otherwise)?
- What are some examples of inequalities? Graph one of the examples given to show how real-world ideas and examples can be represented mathematically. Emphasize how you determine which region will be shaded.
- Demonstrate "coding" for linear inequalities. "Coding" should have been covered with solving linear equations; explain the extensions of "coding" here. After performing a few examples for the students, have the students work through a set of 10 inequalities where they are to get "y" by itself.

Day 3:

- Explain how to graph inequalities. Again, work a few examples for the students, then walk around the room and check for understanding. Give them examples where they must first "solve" for y, before graphing.
- During the last 5 minutes of class, have the students write an explanation of what they are doing and why they are doing it as they solve a linear inequality.

Day 4:
- Compare and contrast linear equation and linear inequalities.
     What is the solution of a linear equation/inequality?
     How many solutions does a linear equation/inequality have?
     What does the graph of a linear equation/inequality look like?
     What does a linear equation/inequality look like and what do the different numbers and variables represent?
- Have the students find the solutions of a linear inequality algebraically, using a table, and by analyzing its graph.

Day 5:
- Quiz students over solving linear inequalities.

Days 6-9:
- Compare and contrast systems of linear equations to systems of linear inequalities.
- What are examples of key words that will help you to identify when you will need to use inequalities to solve a problem?
- Go through Unit 1 Lesson 4 Investigations 1-2

Day 10:
- Quiz over systems of linear inequalities.

Days 11-12:
- Go through Unit 1 Lesson 4 Investigation 3.

Days 13-16:
- Allow students to work on their projects. Keep track of their progress using the following checklist:

_____ Day 13: Introduce the performance task. Read through the instructions and go over the rubric.   Make sure students give the name of their store and information (description, size, and potential profit) of each product involved.
_____ Days 14-15: Inequalities written down and graphs completed.
_____ Day 16: Reflections completed.

Days 17-18:
- Students will turn in their projects and begin presenting their "stores" to the rest of the class on Day 17.

Day 19:
- Review systems of linear equations with the students.
- Have students write an answer to: How do you solve a system of linear inequalities and what does the graphical solution look like?

Day 20:
- Cumulative Test

Linear Inequalities Project!
Due in Class on _____

   You are going to open your own store. However, you need to get a business partner in order to get enough money to get your store running. To show your potential partner your business qualifications, you will show her the process you go through when stocking your products. You are currently trying to decide how much of product A and product B you want to buy. Product A takes up less space than Product B, but it also yields a smaller profit. *Note: Assume that there will be no problem selling any amount of either product.*

   You will need to name your store and decide what you want to sell. Product A and Product B will be of your choosing (name and describe each product). You will need to decide on a reasonable amount of space that each product will take up in your store. You will also need to assign an appropriate amount of profit for each product that you sell. Given those amounts of profits for each product and keeping in mind that you have $600ft^3$ to store those products, how much do you want to make each month in profit from those products? Write two inequalities to represent your constraints and explain what they represent. Graph the inequalities and label all important points and axes.

   For the final portion of this project, I would like you to reflect on the work you've done. Why was the use of a system of linear inequalities necessary for this problem? What do you think about the assumption I asked you to make (at the end of the first paragraph)? What other factors would influence the person's decision to become your business partner? Pretend you are receiving this proposal; would you want to invest in the store if you were in their place? What other costs will come into play if you were really opening up your own store? What is your favorite thing about your store or presentation? Is there anything you would have liked to have done differently?

     ****You will give a short (2-3 min) presentation of your project after you turn it in.****

<u>Due in Class on:</u> _____

Turn this paper in with your project.

	Fails to Meet (F)	Approaching (C)	Meets (B)	Exceeds (A)
Description of Store and Products **15%**	There is no description of the store or products. Profits and the amounts of space needed for each product are given, but none of the amounts are reasonable	There is a weak description of the store and products. Profits and the amounts of space needed for each product are given, but none of the amounts are reasonable.	Description of store and products is weak. Profits and the amounts of space needed for each product are given and at least two of the amounts are reasonable.	Description of store and products is thorough. Profits and the amounts of space needed for each product is given and each is reasonable.
Inequalities **35%**	Inequalities for the space constraints and the profit are not written correctly and are not accurately explained.	Inequalities for the space constraints and the profit are written correctly, but are not explained accurately.	Inequalities for the space constraints and the profit are written correctly and are accurately explained.	Inequalities for the space constraints and the profit are written correctly and are accurately explained and elaborated upon.
Graphs **25%**	Graph is not accurate or no important points or elements are labeled.	Graph is accurate, but not well drawn. Very few important points and elements are labeled.	Graph is accurate and easy-to-understand. Most important points and elements are labeled.	Graph is accurate and easy-to-understand. They look professional and are all important points and elements are labeled.
Reflection **25%**	Very few or no questions are answered. Writing is not easy to read.	Only around half the questions were answered. Writing is mostly easy to read.	Most questions were answered and elaborated upon. Writing is easy to read.	All questions were answered and elaborated upon. Writing is very easy to read and grammatically correct.