Performance Based Learning and Assessment Task

Class Fundraising Committee

I. ASSESSMENT TASK OVERVIEW & PURPOSE:

Students will create a system of linear inequalities given a real-world situation. Students will also find the solution to the system of inequalities that will maximize profits.

II. UNIT AUTHORS:

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III. COURSE:

Algebra I

IV. CONTENT STRAND:

Algebra

V. OBJECTIVES:

The learner will be able to write, graph, and solve a system of linear inequalities given a real-world situation.

VI. REFERENCE/RESOURCE MATERIALS:

Graphing Calculators, Graph paper (optional), Computers

VII. PRIMARY ASSESSMENT STRATEGIES:

The student and teacher will use an assessment list and rubric as a checklist. For students, it will be used as a self-evaluation. For teachers, it will be used to assign a grade.

VIII. EVALUATION CRITERIA:

A rubric will be used to evaluate students' performance on this task determined by a rating scale of 0 to 2 for categories such as cooperative work, mathematical correctness, and presentation of ideas.

IX. INSTRUCTIONAL TIME:

Two 80 minute class periods. One for introduction and research. One for write-up and presentation.

Class Fundraising Committee

Strand

Algebra

Mathematical Goals and Objective(s)
- Students will use their knowledge of writing inequalities in two variables given a situation.
- Students will use their knowledge of systems of inequalities to solve the given situation for maximized profit.

Related SOL
- A.5c (solve real-world inequalities)
- A.5d (solve system of inequalities)

NCTM Standards
- Understand the meaning of equivalent forms of expressions, equations, inequalities, and relations;
- Write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency—mentally or with paper and pencil in simple cases and using technology in all cases;
- Use symbolic algebra to represent and explain mathematical relationships
- Apply and adapt a variety of appropriate strategies to solve problems
- Communicate mathematical thinking coherently and clearly to peers, teachers, and others

Materials/Resources
- Computers
- Graphing Calculators
- Graph paper (optional)

Assumption of Prior Knowledge
- Students know how to research on the computers
- Students know how to enter inequalities into the graphing calculator
- Students know how to find the solution to a system of inequalities

Introduction: Setting Up the Mathematical Task

Each grade level has to fundraise to put money into that class's account for things like prom and the senior trip. The principal told each class that they have to raise a minimum of $1500 each school year. Your class has decided that holding a family-friendly event for the community where you sell tickets for admission will be the quickest and easiest way to raise the minimum amount needed. However, because of security and weather, the event must be held in your gymnasium, which has a maximum occupancy. You and your group have to determine what event you would like to host (ie family-friendly concert, sporting event, craft show, etc.), the amount charged for each ticket to maximize the profit, and then present your findings to your class's staff sponsors.

Student Exploration

Small Group Work

Student/Teacher Actions:
- Day 1: In small groups of 3 or 4, students will research ideas for family-friendly events and determine what event they would like to host. The teacher will circulate to ensure students remain on task and assist groups in researching if needed. Once the event has been decided, the student groups will need to determine the amount to charge for each entrance ticket in order to maximize the profit. The teacher may prompt (if needed) to think about the boundaries for the situation and solutions to systems of inequalities.
- Day 2: The groups will finish working on the task and create the presentation persuading the sponsors to choose their event. The teacher will assist the groups, if needed, with proper presentation methods.

Monitoring Student Responses
- Students will complete a document to answer questions like what type of event they chose, cost of tickets and their reasoning for the cost, what they need to acquire for the event (items they already have and items they need to purchase) along with the costs of these items, etc. This is attached.
- Students will create a presentation (PowerPoint, Prezi, poster, etc.) to propose their fund-raising event for their class sponsors to vote on.
- Students will fill out an accountability sheet that presents their systems of inequalities with their graph to show where they are making a profit.
- After all presentations, students and class sponsors will vote on which idea they think is the best and why using a rating scale and descriptions.

Assessment List and Benchmarks
- Students will complete the attached document
- Students will prepare a presentation for their class sponsors

- Objective: The learner will be able to write, graph, and solve a system of linear inequalities given a real-world situation.

  o **Questions**
    ▪ How did you determine the minimum amount to charge for tickets?
    ▪ Write and graph the system of inequalities you will use to determine this.
    ▪ Interpret the mathematical solution to the situation given. What does the solution mean for the real-world situation?

- o **Rate your classmates**
  - ▪ Students will be given a rating scale to determine how much they like/dislike each of the other groups' ideas
  - ▪ At the end, students will need to explain which idea they like the best and why by using supporting information from each group's presentations.
- ● Optional Extension: Students may change their venue from the school's gymnasium to a different location of their choice. They will determine how this may affect their total cost and how much they will charge for tickets with the additional cost.
- ● Optional Extension: Students may use GeoGebra to investigate the effects that changing the price of the tickets has on the situation or use sliders to help visualize the optimal price to charge children and adults.

Assessment List

Element	Point Value	Points Earned	
		Self	Teacher
1. Mathematical procedures are correct.	2		
2. All questions answered on question document	2		
3. Mathematical calculations are correct.	2		
4. Work is shown neatly.	2		
5. Inequalities and graphs correctly shown on accountability sheet	2		
6. Group members worked collaboratively	2		
7. Presentation of material was neat	2		
8. Presentation to class members and sponsors was clear and concise	2		

_____ Total / 16 Possible

#	Element	0	1	2
1	Mathematical procedures are correct.	No mathematical procedures are correct	Half of the mathematical procedures are correct	All the mathematical procedures are correct
2	All questions answered on question document	No questions are answered on the question document	Half of the questions are answered	All the questions are answered on the question document
3	Mathematical calculations are correct	No mathematical calculations are correct	There are only a few errors in the calculations	All mathematical calculations are correct
4	All work is shown neatly	No work is shown or is not legible	Only part of the work is neatly shown	All of the work is shown neatly and is legible
5	Inequalities and graphs correctly shown on accountability sheet	Major errors on the graph of the inequalities	Small errors on graphing of inequalities	Inequalities are graphed correctly
6	Group members worked collaboratively	Group members did not work collaboratively	NA	All group members worked collaboratively and contributed
7	Presentation of material was neat	None of the material for the presentation was neat.	Some of the material for the presentation was neat.	All material for presentation was neat.
8	Presentation to class members and sponsors was clear and concise	Presentation to class members and sponsors was hard to follow and unclear.	Presentation to class members and sponsors was somewhat clear and concise.	Presentation to class members and sponsors was clear and concise.

Class Fundraising Committee

At your high school, each grade level needs to raise money for their class account for events like prom and the senior trip. Your principal told each class that they have to raise a minimum of $1500 each school year for the necessary funds. Your class has decided that they would like to hold a family-friendly event for the community where you will have to sell tickets for admission since it is the quickest and easiest way to raise the minimum amount needed. However, because of security and weather, the event must be held in your gymnasium, which has a maximum occupancy. You and your group will have to determine what event you would like to host (i.e. family-friendly concert, sporting event, craft show, etc.), the amount charged for each ticket to maximize the profit, and then present your findings to your class's staff sponsors.

Answer the following questions.

1. What type of event will you be holding?

2. What items will you need to acquire to make the event a success and how much do they cost? (Hint: Remember using some things from the school - chairs, basketballs, etc. may be free)

3. What is the total cost to the class for the event?

4. What is the minimum ticket price for your event? Will there be separate prices for adults versus children?

5. How did you come up with this cost?

Accountability Sheet

Names of group members:

_____

_____

_____

_____

Define your variables.

Write the correct system of inequalities for the event planned.

Graph of system of inequalities used.

Name: _____   Date: _____   Period: _____

Class Fundraising Committee Geogebra Extension

1. Open Geogebra.
2. Type your parameters into the input bar just as you wrote them.
   **Hint 1: You don't need to solve for y or x, Geogebra can figure it out for you)
   **Hint 2: To access > or <, hit the α button on the right hand side of the input bar.
   For your cost inequality, instead of writing the cost for the children and adult tickets, type the letter a in front of x and b in front of y.

3. Adjust your zoom by clicking on the ⊕ and choosing zoom in 🔍 or zoom out 🔍 and then clicking the location on your screen where you would like to zoom in or out.
4. Make each inequality have its own color by right clicking on the inequality. Choose object properties. At the top, select the color tab. Choose the color you want.
5. Create two sliders for parameters a and b. These will stand for the cost of the adult (a) and

   children tickets (b), Click the slider tool [a=2] . Click a location on the screen where you want the slider to be located. Name the slider a. Choose your minimum and maximum values to be appropriate. What did you choose? Why?

   Do this again naming it b. What minimum and maximum values did you choose? Why?

6. Play around with the sliders changing your adult and children pricing. Pay attention to how the feasible region changes. What do you notice happening with your feasible region?

7. Do you think you have chosen the best price for your tickets to maximize your profit? Why or why not?

class Fundraising committee

At your high school, each grade level needs to raise money for their class account for events like prom and the senior trip. Your principal told each class that they have to raise a minimum of $1500 each school year for the necessary funds. Your class has decided that they would like to hold a family-friendly event for the community where you will have to sell tickets for admission since it is the quickest and easiest way to raise the minimum amount needed. However, because of security and weather, the event must be held in your gymnasium, which has a maximum occupancy. You and your group will have to determine what event you would like to host (i.e. family-friendly concert, sporting event, craft show, etc.), the amount charged for each ticket to maximize the profit, and then present your findings to your class's staff sponsors.

Answer the following questions.
1. What type of event will you be holding?

We will be hosting a benefit basketball game featuring the Harlem All-Star Legends versus our own faculty and basketball team to be held in our gymnasium which has a maximum occupancy of 675.

2. What items will you need to acquire to make the event a success and how much do they cost? (Hint: Remember using some things from the school - chairs, basketballs, etc. may be free)

Concession stand - run by volunteers from another grade for their own fundraising (cost to us is free). Referees (the local Referee Association will donate their time so cost is free). Basketballs and uniforms - we will use the basketballs from our school as well as team uniforms (cost is free). Aside from booking fee for the All-Stars there will be no cost to us.

3. What is the total cost to the class for the event?

The booking fee for the All-Stars will be $2000 for the game plus they receive all proceeds from autographs and merchandising.

4. What is the minimum ticket price for your event? Will there be separate prices for adults versus children?

There will be separate prices for adults and children: 10 dollars for adults and 5 dollars for children under 18.

5. How did you come up with this cost? These prices are similar to what is charged for school plays and sporting events.

      Minimum needed to raise: $1500
      Cost of Booking : $2000
      Total needed is $3500

Accountability Sheet

Names of group members:

　　__Susie James_____

　　__Luke Siscuit_____

　　__Christian Lee_____

　　__Cassity Fuller_____

Define the variables used.

　　The x represents the number of adult tickets sold and the y represents the number of children tickets sold.

Write the correct system of inequalities for the event planned.

Parameters needed: $0 \leq x \leq 675$

　　　　　　　　　$50 \leq y \leq 675$

　　Because it is unreasonable to sell none to a small amount of children's tickets, we made sure to sell at least 50 of them..

Inequalities:

　　$x + y \leq 675$　--------> $y \leq -x + 675$

To make sure that our occupancy isn't too much.

　　$10x + 5y \geq 3500$ -----> $y \geq -2x + 700$

To make sure we profit from the price of the tickets.

　　$0 \leq x \leq 675$

The adult tickets sold.

　　$50 \leq y \leq 675$

The children tickets sold

Graph of system of inequalities used.
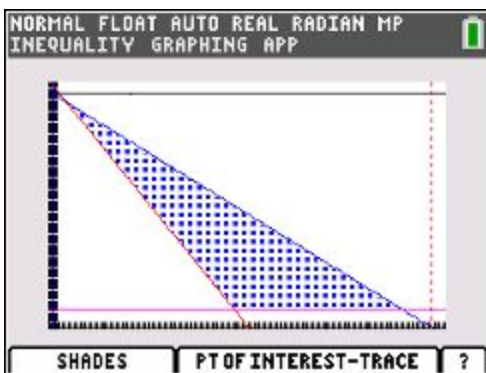
The graph illustrates the amount of adult and children tickets needed to be sold in order to break even. The max profit would be found if we sold 675 adult tickets with no children tickets sold, but this is not really reasonable for this type of event. Additionally, any combination of ticket sales that fall within the shaded region would give us a profit that is equal to or greater than the $3500 needed to meet the requirements.

Class Fundraising Committee Geogebra Extension

1. Open Geogebra.
2. Type your parameters into the input bar just as you wrote them.
   **Hint 1: You don't need to solve for y or x, Geogebra can figure it out for you)
   **Hint 2: To access $\geq$ or $\leq$, hit the α button on the right hand side of the input bar.
   For your cost inequality, instead of writing the cost for the children and adult tickets, type the letter a in front of x and b in front of y.

3. Adjust your zoom by clicking on the ⊕ and choosing zoom in 🔍 or zoom out 🔍 and then clicking the location on your screen where you would like to zoom in or out.
4. Make each inequality have its own color by right clicking on the inequality. Choose object properties. At the top, select the color tab. Choose the color you want.
5. Create two sliders for parameters a and b. These will stand for the cost of the adult (a) and

   children tickets (b), Click the slider tool 📊. Click a location on the screen where you want the slider to be located. Name the slider a. Choose your minimum and maximum values to be appropriate. What did you choose? Why?

We chose to have a minimum value of 0 and a maximum value of 15. This would be a reasonable ticket price for people to pay to see a game.

   Do this again naming it b. What minimum and maximum values did you choose? Why?

We chose the same minimum and maximum value as a because of trying to have a reasonable ticket price. We don't want people to pay too much or they may not come.

6. Play around with the sliders changing your adult and children pricing. Pay attention to how the feasible region changes. What do you notice happening with your feasible region?

Here is a picture of our chosen adult and children ticket values and the feasible region is shaded. The a value is 10 and the b value is 5.
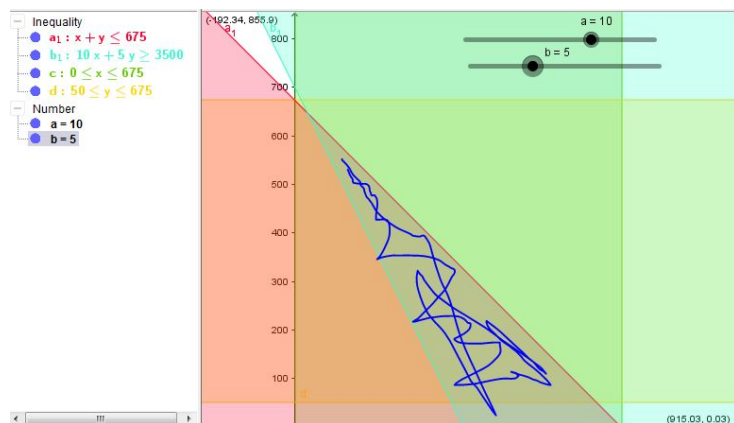
When we change only the a value it moves the light blue line. If we increase the a value, the light blue line moves towards the y-axis and the triangle becomes larger. If we decrease the a value, the light blue line moves towards the red line and the triangle becomes smaller. Look at the pictures below.
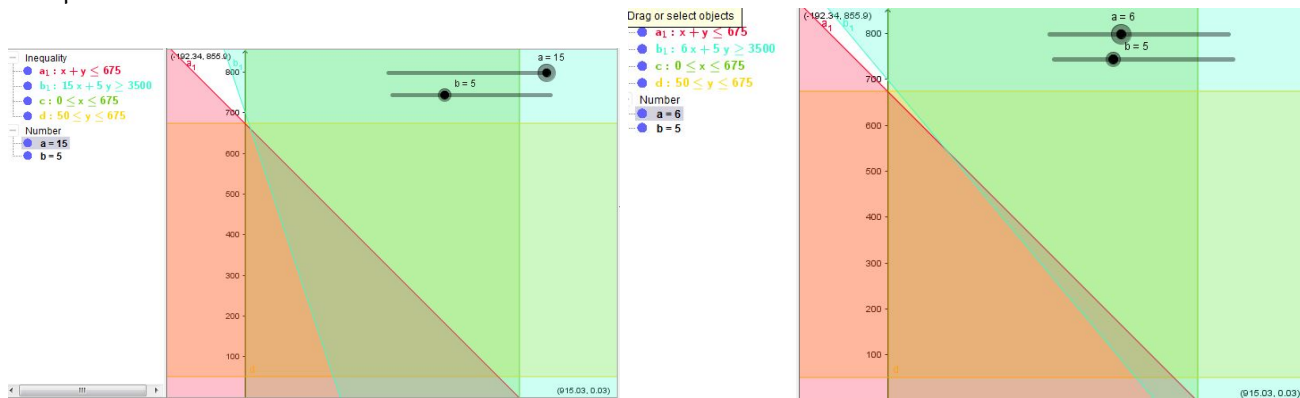
When we increase the b value only, the light blue line moves closer towards the x axis and changes from a triangle to an open shape. When we decrease only the b value, the light blue line becomes straighter and makes our triangle smaller.
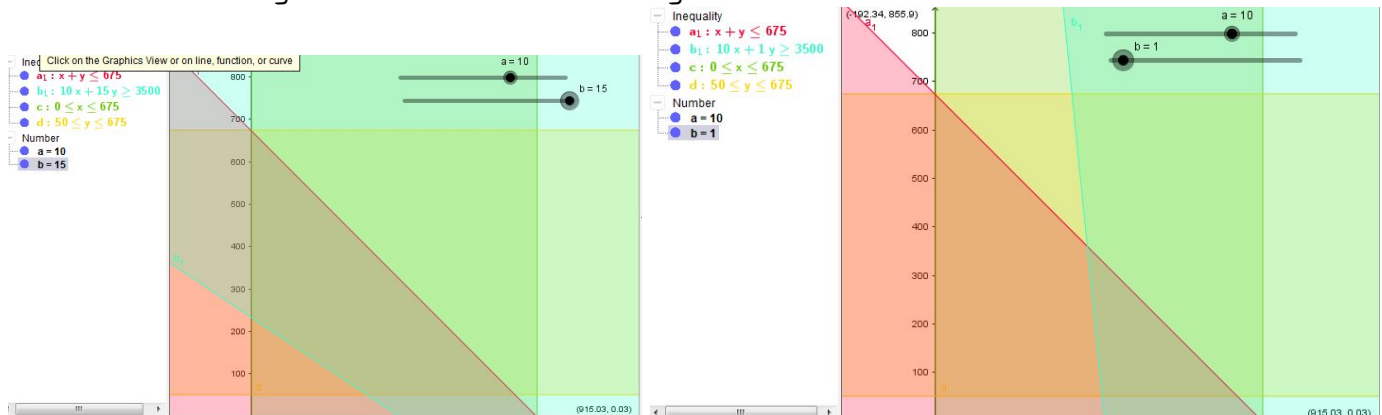
7. Do you think you have chosen the best price for your tickets to maximize your profit? Why or why not?

We think it may be better to change the children's ticket price to $6 a piece and the adult ticket price can stay the same at $10 a piece. Doing this will allow our overlapping region to be larger and have a little more profit.