TI-Nspire Activity: Solving Linear Inequalities by Graphing.
By: Edison Teano, Jr.

Activity Overview

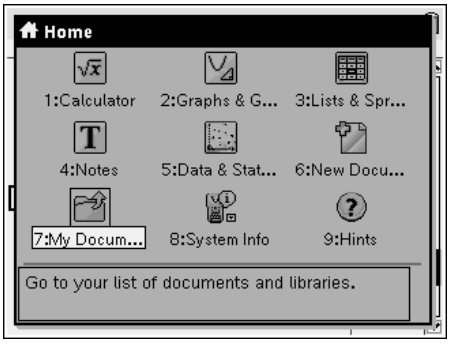
The mathematics goal of this activity is to deepen students' understanding of solving linear inequalities by graphing. First, students will compute the cost of driving each truck for a few miles using the calculator. Second, they will input the computed values in a table. Third, they will write the algebraic relationships representing the two truck companies. Fourth, they will graph the set of points representing both truck companies. Finally, they analyze the table and the graphs to find the break-even point, which represents the point when driving both trucks cost the same in both companies. This activity will further explore the multiple representations of a linear function using tables, graphs, and symbols and discuss their meaning within the given situation.
At the end of a double- period class, the students should be able to:
1. Solve linear inequalities by using the TI-Nspire calculator;
2. Solve real world problems by applying the concept of solving linear inequalities;
3. Complete the group activity collaboratively; and
4. Make a reflection about the concept learned for the day.

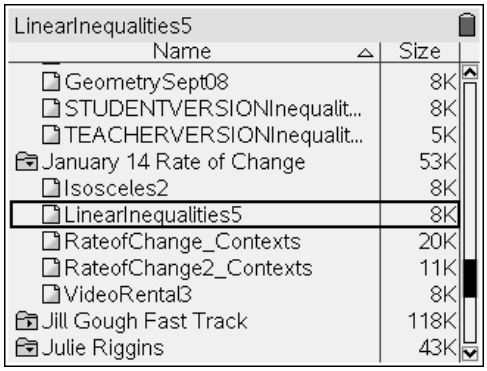
Concepts

Inequality
At least
At most
Multi-step inequality

Teacher Preparation

Load *LinearInequalities5.tns* file onto all the students' handhelds. The activity consists of a problem designed to be teacher directed with time for students to investigate and record their observations. Under The Classroom section below, you will find suggestions to guide the students into deeper understanding of the concept of solving systems of linear equations by graphing.





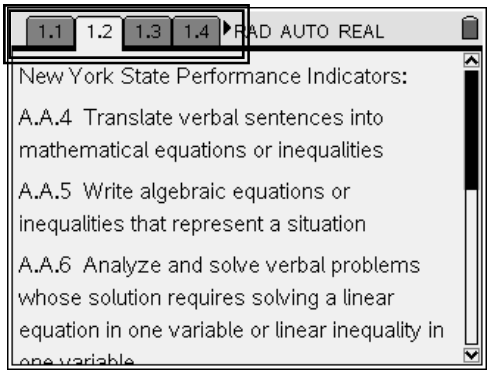
The Classroom

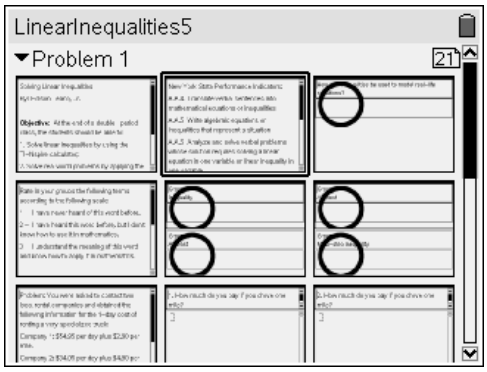
Guide the students in opening the *LinearInequalities5.tns* document.

- Turn the device on w
- Press the Home Key c.
- Select 7: My Documents.
- Open the folder containing the TNS file by scrolling to the folder using the NavPad and pressing ·.
- Scroll to *LinearInequalities5.tns* document and press · to open it.
    - **If asked if you want to save the other document, press the Tab key e to highlight the No button and press Enter ·.

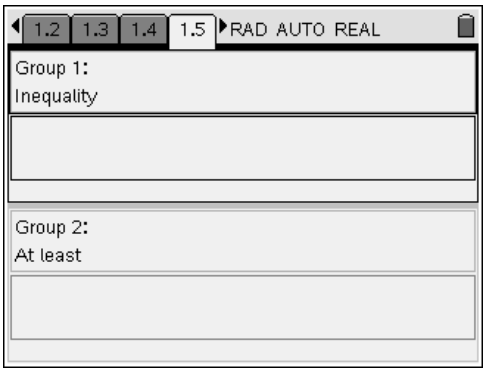
Remind the students how to move between pages.

- To move between pages, press / and ¡ or ¢ on the NavPad.
- To scroll ahead or back several pages in a document, press / and ` to view the Page Sorter view of the document. Use the NavPad to move to the desired page and press the center click key x to open the page.

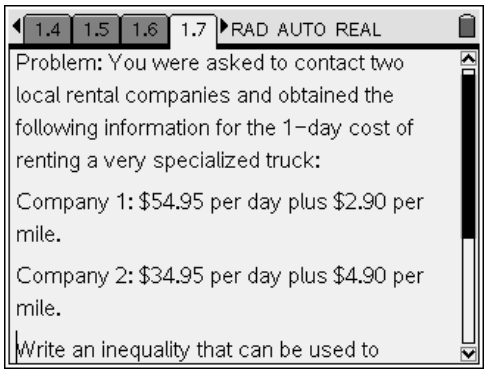




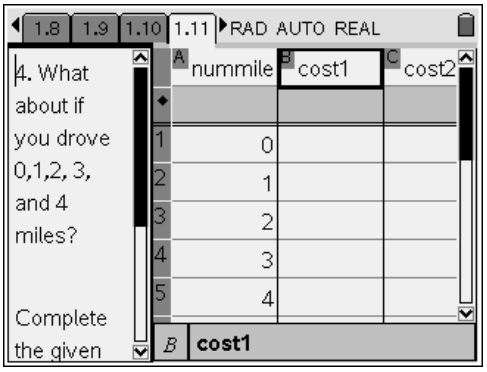
Review the activity's performance indicators with the students and have them complete the knowledge rating on page 1.5 to activate your students' background and prior knowledge of the concepts and academic vocabulary to be used in the lesson. You may use this page as a diagnostic tool to determine students' vocabulary development needs in the lesson and to guide instruction based on the students' familiarity with the concepts to be introduced.



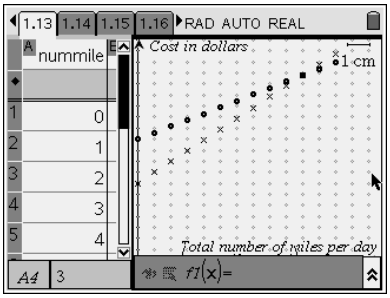
Problem 1 Comments:
Have students skim the text, and then read the problem and questions aloud for the class. Remind students to press / and e to move from the problem to the questions in the page.



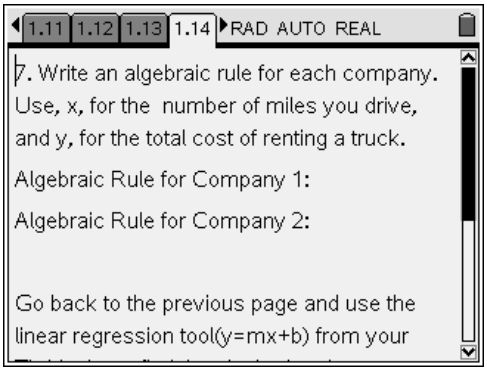
On page 1.7, students read from the problem that Company 1 renters pay $2.90 for each mile that they drive and $54.95 for the day. Further, they also read from page 1.7 that Company 2 renters pay $4.90 for each mile that they drive and $34.95 for the day. On page 1.11, students use a table to compare the number of miles that they drive in one day (nummile) to the total cost of renting a truck in dollars (cost1 and cost2) for both Company 1 and Company 2. By computing with your students several changes in the total cost of renting trucks in dollars, your students should be able to deduce the pattern. From the pattern, students should be able to describe specific examples and then link the specific examples to the general statements about the relationship between the total costs of renting trucks to the number of miles driven in one day.



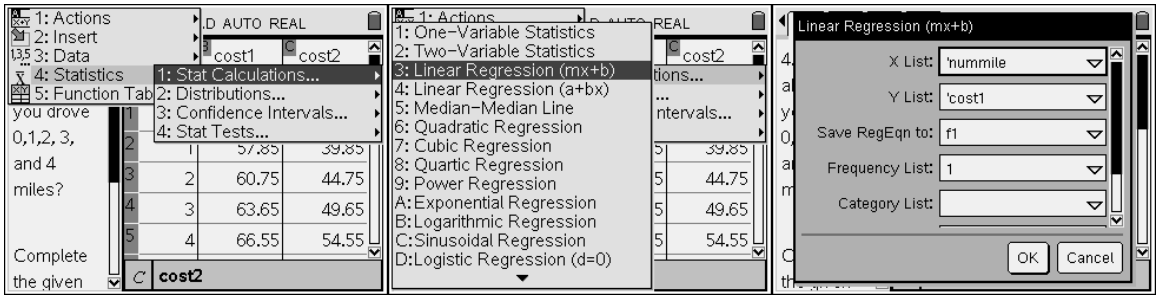
On page 1.13, students use a scatter plot to see the relationship between the written text, the values contained in the table, and the set of points plotted on each one of the graphs.



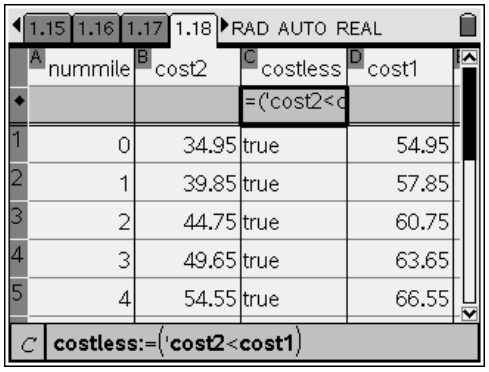
Further, students read the label on each set of axes and the set of points graphed for each plan to better understand how the daily fee and the cost per mile of driving the trucks affect the total cost of renting a truck each day. The set of Company 1 points starts at the coordinate (0, 54.95) and is plotted next at (1, 57.85). This means that Company 1 starts with a cost of $54.95 for the membership fee and it will cost $57.85 for driving one mile. The set of Column 2 points starts at the coordinate (0, 34.95) and is plotted next at (1, 39.85). This means that Company 1 starts with a higher cost. The intersection point on the graph represents the break-even point, the point at which both companies cost the same for renting a truck. Indicate to the students that the points for Company 2 form a steeper incline than those for Company 1. Emphasize to your students that the steepness, or the slope, of the line provides us with information about the rate of change (in our problem, the cost per mile for driving a truck) between two points.



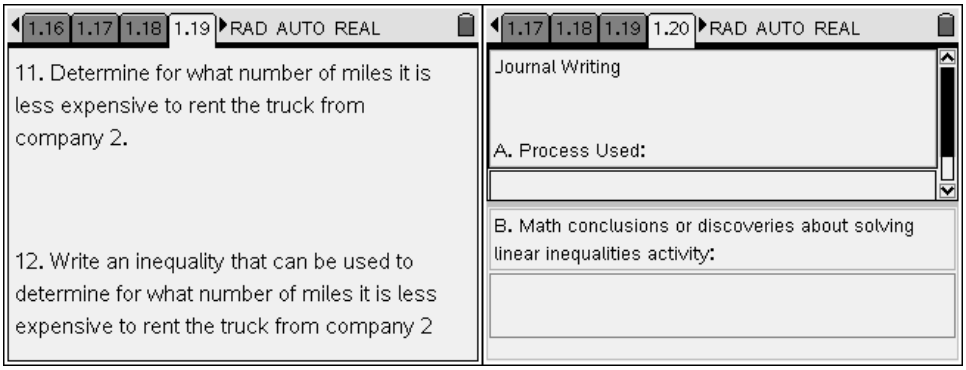
On page 1.14, students are asked to write an algebraic rule for each plan. Company 1 starts with a daily fee of $54.95 and it cost $2.90 for each mile that is driven by the truck. Therefore, if x represents the number of miles driven, the total cost of renting a truck in dollars (y) is 2.90x + 54.95. By applying the same reasoning, students should be able to conclude that in Company 2 if x represents the number of miles, the total cost of renting a truck in dollars (y) is 4.90x + 34.95. In addition to writing the algebraic relationships for both plans, students are asked to compute the regression equations for both plans using the TI-Nspace calculators.



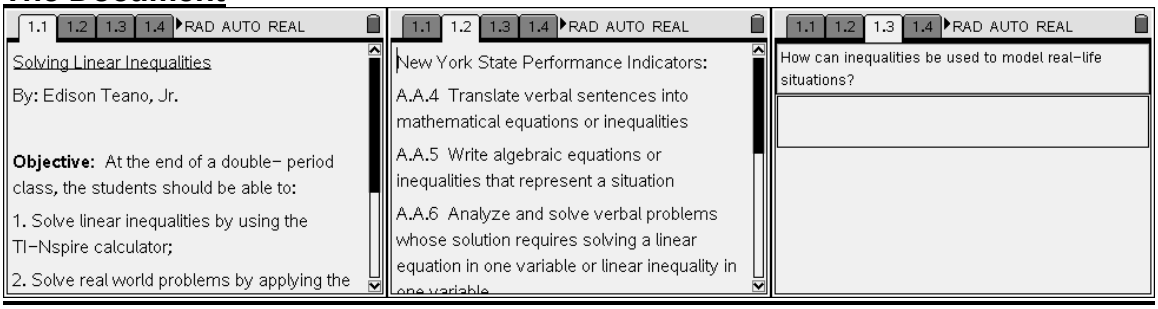
Finally, on page 1.18 students are asked to compare the cost of renting a truck from Company 1 and from Company 2 and to determine for what number of miles it is less expensive to rent the truck from Company 2. By using the algebraic relationships and the information obtained from column C of page 1.18, students should be able to write the following inequality to determine for what number of miles it is less expensive to rent a truck: $4.90x + 34.95 < 2.90x + 54.95$.
Emphasize to students that the intersection point on the graph represents the break-even point-for this number of miles, each company plan costs the same amount. Company 2 is less expensive if the truck is driven for less than 10 miles.



After the students have recorded their observations on page 1.19, they should each share them with the entire class. Finally, provide students with the opportunity to complete their journal writing on pages 1.20 and 1.21.



The Document



Solving Linear Inequalities

By: Edison Teano, Jr.

Objective: At the end of a double- period class, the students should be able to:

1. Solve linear inequalities by using the TI-Nspire calculator;
2. Solve real world problems by applying the

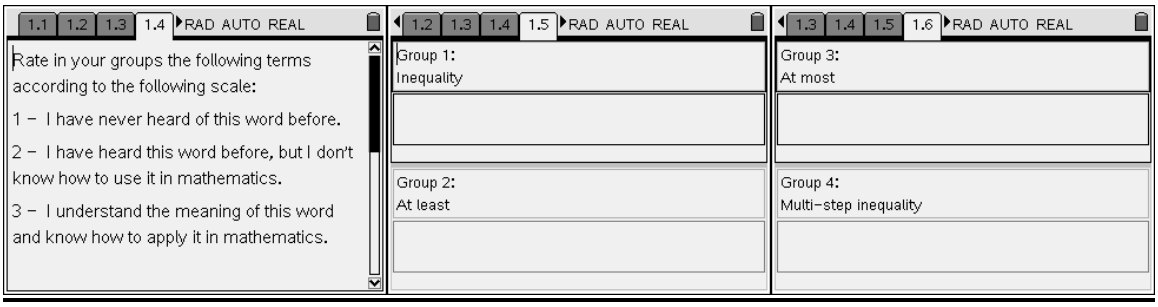
New York State Performance Indicators:

A.A.4 Translate verbal sentences into mathematical equations or inequalities

A.A.5 Write algebraic equations or inequalities that represent a situation

A.A.6 Analyze and solve verbal problems whose solution requires solving a linear equation in one variable or linear inequality in one variable

How can inequalities be used to model real-life situations?



Rate in your groups the following terms according to the following scale:

1 - I have never heard of this word before.

2 - I have heard this word before, but I don't know how to use it in mathematics.

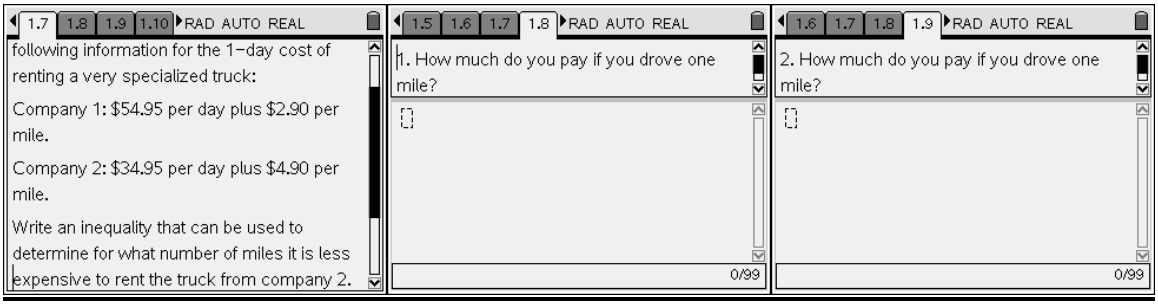
3 - I understand the meaning of this word and know how to apply it in mathematics.

Group 1:
Inequality

Group 2:
At least

Group 3:
At most

Group 4:
Multi-step inequality



following information for the 1-day cost of renting a very specialized truck:

Company 1: $54.95 per day plus $2.90 per mile.

Company 2: $34.95 per day plus $4.90 per mile.

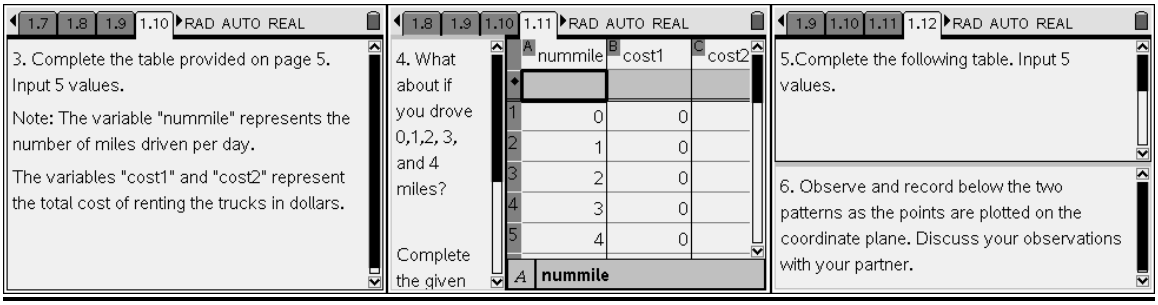
Write an inequality that can be used to determine for what number of miles it is less expensive to rent the truck from company 2.

1. How much do you pay if you drove one mile?

0/99

2. How much do you pay if you drove one mile?

0/99



3. Complete the table provided on page 5. Input 5 values.

Note: The variable "nummile" represents the number of miles driven per day.

The variables "cost1" and "cost2" represent the total cost of renting the trucks in dollars.

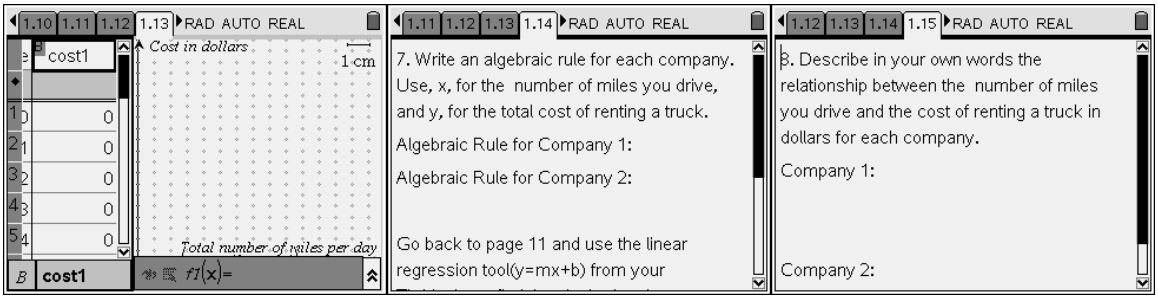
4. What about if you drove 0,1,2, 3, and 4 miles?

Complete the given

	nummile	cost1	cost2
1	0	0	
2	1	0	
3	2	0	
4	3	0	
5	4	0	

5.Complete the following table. Input 5 values.

6. Observe and record below the two patterns as the points are plotted on the coordinate plane. Discuss your observations with your partner.



cost1

Cost in dollars

1 cm

total number of miles per day

7. Write an algebraic rule for each company. Use, x, for the number of miles you drive, and y, for the total cost of renting a truck.

Algebraic Rule for Company 1:

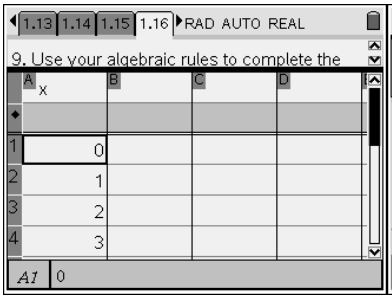
Algebraic Rule for Company 2:

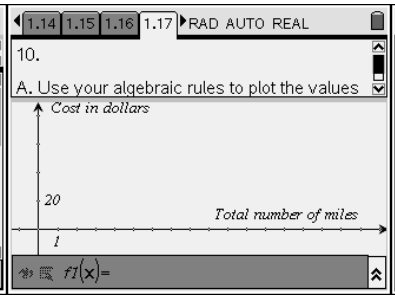
Go back to page 11 and use the linear regression tool(y=mx+b) from your

8. Describe in your own words the relationship between the number of miles you drive and the cost of renting a truck in dollars for each company.

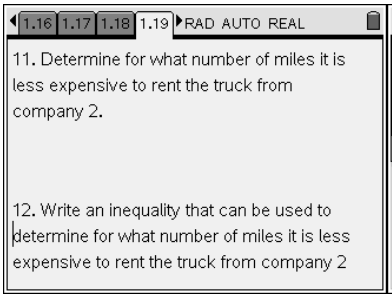
Company 1:

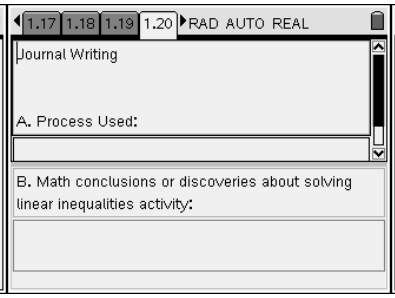
Company 2:

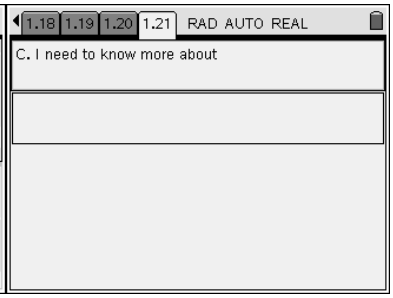

1.13 1.14 1.15 1.16 RAD AUTO REAL
9. Use your algebraic rules to complete the
A x B C D
1 0
2 1
3 2
4 3
A1 0


1.14 1.15 1.16 1.17 RAD AUTO REAL
10.
A. Use your algebraic rules to plot the values
Cost in dollars
20
Total number of miles
1
f1(x)=

1.15 1.16 1.17 1.18 RAD AUTO REAL
A nummile B cost2 C costless D cost1
=(cost2<c
1 0 0 false 0
2 1 0 false 0
3 2 0 false 0
4 3 0 false 0
5 4 0 false 0
C costless:=(cost2<cost1)


1.16 1.17 1.18 1.19 RAD AUTO REAL
11. Determine for what number of miles it is less expensive to rent the truck from company 2.
12. Write an inequality that can be used to determine for what number of miles it is less expensive to rent the truck from company 2


1.17 1.18 1.19 1.20 RAD AUTO REAL
Journal Writing
A. Process Used:
B. Math conclusions or discoveries about solving linear inequalities activity:


1.18 1.19 1.20 1.21 RAD AUTO REAL
C. I need to know more about