Pledge Plans: An Exploration of Linearity
By: Blake VanWinkle and Justin Ellis

Activity overview
      1. Connect the concept of linearity with real-world contexts.
      2. Use a table to organize information.
      3. Make a graph to display data using correct labels and scales.
      4. Recognize the relationship among the table, the graph, the equation, and the
          slope of the line.
      5. Identify the *y*-intercept from a graph or a table.

Concepts:
TN Algebra 1 Standards
Course Level Expectation:
CLE 3102.1.4 Move flexibly between multiple representations (contextual, physical,
         written, verbal, iconic/pictorial, graphical, tabular, and symbolic), to solve
         problems, to model mathematical ideas, and to communicate solution
         strategies.
3102.1.13 Change from one representation of a relation to another representation; for
         example, change from a verbal description to a graph.
3102.1.19 Recognize and practice appropriate use of technology in representations and in
         problem solving.
3102.3.20 Understand that a linear equation has a constant rate of change called slope and
         represent slope in various forms.
3102.4.1 Using algebraic expressions solve for measures in geometric figures as well as
         for perimeter, area, and volume.
3102.5.1 Identify patterns or trends in data.
3102.5.8 Examine real-world graphical relationships (including scatter plots) to
         determine type of relationship (linear or nonlinear) and any association
         (positive, negative, or none) between the variable of the data set.
3102.5.9 Determine an equation for a line that fits real-world linear data; interpret the
         meaning of the slope and y-intercept in context of the data.
3102.5.11 Use an equation that fits the data to make a prediction.
SPI 3102.1.1 Interpret patterns found in sequences, tables, and other forms of quantitative
         information using variables or function notation.
SPI 3102.1.2 Write an equation symbolically to express a contextual problem.

Teacher Preparation
Before the activity the teacher should pre-load the activity file *Pledge Plans.tns* on to the
devices via the *Navigator System* or by using link cables with the handhelds.

Classroom management tips
1. The students can complete this activity using the *Pledge Plans* file on their TI-Nspire handhelds.
2. This activity is intended to be completed independently by the students.
3. Student should be familiar with the TI-Nspire technology prior to activity.

TI-Nspire Applications
- Notes
- Lists & Spreadsheets
- Data & Statistics

Step-by-step directions
Steps:
1. From the home screen choose My Documents and navigate to the appropriate folder containing *Pledge Plans.tns* file.

2. Page 1.1 is the title page for the activity. Use ctrl key and the arrows to navigate through the activity.

3. Page 1.4 introduces the Problem of the activity. Students are prompt to finish the table on Page 1.6 with a calculation page on Page 1.7.
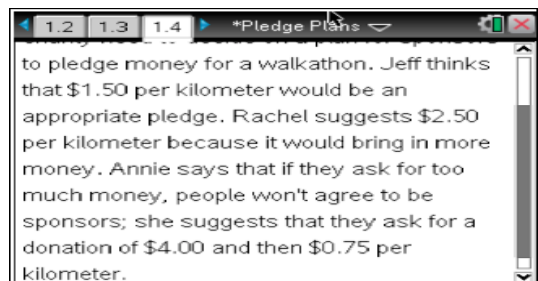
4. The table on Page 1.6 can be completed manually or utilize the gray formula boxes.

1.4	1.5	1.6	▶	*Pledge Plans ▽	⬛✕
A distance	**B** jeff		**C** rachel	**D** annie	
◆					
1	1				
2	2				
3	3				
4	4				
5	5				

| A1 | 1 | ◀ | ▶ |

5. Go to Page 1.9 for the graph and then click in the areas at the bottom and left portions of the screen to add the variables that you wish to graph.
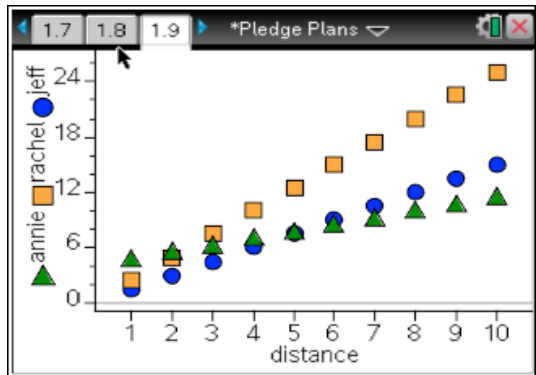
6. Between Page 1.11 – Page 1.18, students will answer various questions concerning the problem.

Question

Write an equation that models Annie's pledge plan. Allow *m* to represent money owed. Allow *d* to represent distance walked.

Answer

7. Page 1.19 is a notification that the students should go back and reflect on the table, graph, and equation. Students should answer the question on Page 1.20 after reflecting.

Go back and notice how Annie's plan differs from the other plans. Look at the graph, equation, and table.

Assessment and Evaluation

The teacher can collect student files using Connect-To-Class software or TI-Nspire Computer Link software.

Sample Answers to questions in *Pledge Plans.tns* file.

Q: In your own words, describe the relationship between money earned and distance walked for Jeff's pledge plan.
A: Jeff's plan earns $1.50 per kilometer walked.
Q: Write an equation that models Jeff's pledge plan. Allow *m* to represent money owed. Allow *d* to represent distance walked.
A: *m*=1.5*d*
Q: In your own words, describe the relationship between money earned and distance walked for Rachel's pledge plan.
A: Rachel's plan earns $2.50 per kilometer walked.
Q: Write an equation that models Rachel's pledge plan. Allow *m* to represent money owed. Allow *d* to represent distance walked.
A: *m*=2.5*d*
Q: In your own words, describe the relationship between money earned and distance walked for Annie's pledge plan.
A: Annie's plan earns a minimum of $4.00 with $0.75 per kilometer walked.
Q: Write an equation that models Annie's pledge plan. Allow *m* to represent money owed. Allow *d* to represent distance walked.
A: *m*=4+.75*d*
Q: How does increasing the amount of pledge per kilometer affect the amount of money earned to the table?
A: By increasing the amount of pledge per kilometer increases the amount of money earned all together.
Q: How does increasing the amount of pledge per kilometer affect the amount of money earned to the graph and equation?
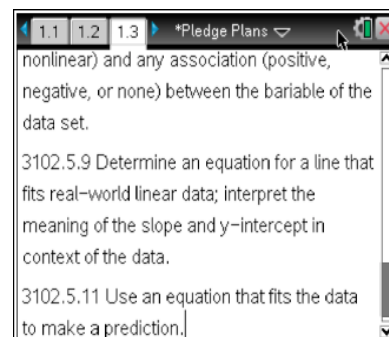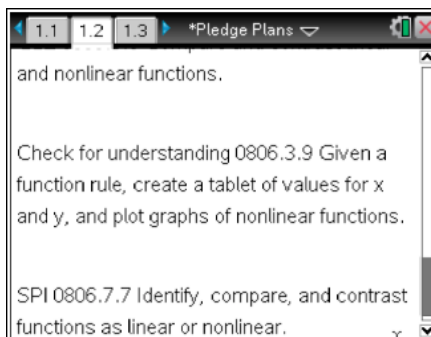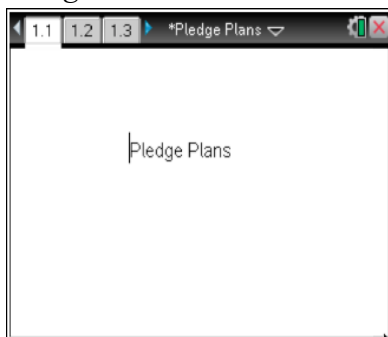**A:** By increasing the amount of pledge per kilometer makes for a steeper graph and a larger slope in the equations.
Q: In your own words, describe what is different about Annie's plan. What causes it to cross the other plans' graphs?
A: It has a higher initial value with a lower slope.

Student TI-Nspire Document
Pledge Plans.tns

1.2 1.3 1.4 ▶ *Pledge Plans ▽

to pledge money for a walkathon. Jeff thinks that $1.50 per kilometer would be an appropriate pledge. Rachel suggests $2.50 per kilometer because it would bring in more money. Annie says that if they ask for too much money, people won't agree to be sponsors; she suggests that they ask for a donation of $4.00 and then $0.75 per kilometer.

1.3 1.4 1.5 ▶ *Pledge Plans ▽

Make a table showing the amount of money a sponsor would owe under each of the pledge plans on page 1.6.

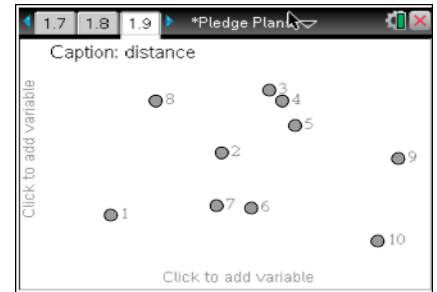Page 1.7 will be available for any calculations.

1.4 1.5 1.6 ▶ *Pledge Plans ▽

A distance	B jeff	C rachel	D annie
1			
2			
3			
4			
5			

A1 | 1

1.6 1.7 1.8 ▶ *Pledge Plans ▽

0/99

1.6 1.7 1.8 ▶ *Pledge Plans ▽

On page 1.9 construct a graph relating the information regarding the table.

Click in the spaces at the bottom and left portions of the screen and select the appropriate variables.

The first y variable should be Jeff.

1.7 1.8 1.9 ▶ *Pledge Plans ▽

Caption: distance

Click to add variable

Click to add variable

1.8 1.9 1.10 ▶ *Pledge Plans ▽

For the following questions, feel free to go back and look at the table and graph.

1.9 1.10 1.11 ▶ *Pledge Plans ▽

Question

In your own words, describe the relationship between money earned and distance walked for Jeff's pledge plan.

Answer ⩔

1.10 1.11 1.12 ▶ *Pledge Plans ▽

Question

Write an equation that models Jeff's pledge plan. Allow m to represent money owed. Allow d to represent distance walked.

Answer ⩔

1.11 1.12 1.13 ▶ *Pledge Plans ▽

Question

In your own words, describe the relationship between money earned and distance walked for Rachel's pledge plan.

Answer ⩔

1.12 1.13 1.14 ▶ *Pledge Plans ▽

Question

Write an equation that models Rachel's pledge plan. Allow m to represent money owed. Allow d to represent distance walked.

Answer ⩔

1.13 1.14 1.15 ▶ *Pledge Plans ▽

Question

In your own words, describe the relationship between money earned and distance walked for Annie's pledge plan.

Answer ⩔

1.14 1.15 1.16 ▶ *Pledge Plans ▽

Question

Write an equation that models Annie's pledge plan. Allow m to represent money owed. Allow d to represent distance walked.

Answer ⩔

1.15 1.16 1.17 ▶ *Pledge Plans ▽

Question

How does increasing the amount of pledge per kilometer affect the amount of money earned to the table?
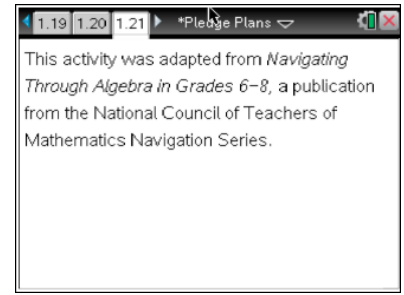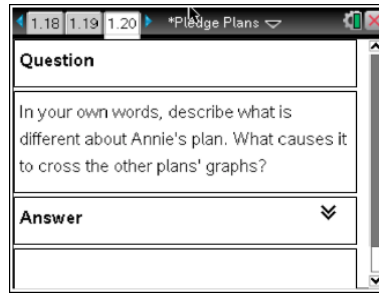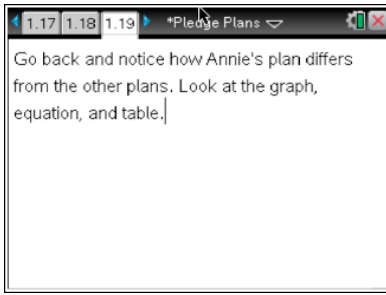
Answer ⩔

1.16 1.17 1.18 ▶ *Pledge Plans ▽

Question

How does increasing the amount of pledge per kilometer affect the amount of money earned to the graph and equation?

Answer ⩔

1.17 1.18 1.19 ▶ *Pledge Plans ▽	1.18 1.19 1.20 ▶ *Pledge Plans ▽	1.19 1.20 1.21 ▶ *Pledge Plans ▽
Go back and notice how Annie's plan differs from the other plans. Look at the graph, equation, and table.	**Question** In your own words, describe what is different about Annie's plan. What causes it to cross the other plans' graphs? **Answer** ❯❯	This activity was adapted from *Navigating Through Algebra in Grades 6–8,* a publication from the National Council of Teachers of Mathematics Navigation Series.

This activity was adapted from *Navigating Through Algebra in Grades 6-8*, a publication from the National Council of Teachers of Mathematics Navigation Series.