Examining Patterns in a Table, Function Rule, and Graphs

By Brittany Clinard, Ashley Lawson, and Sarah Frizzell

Activity Overview

1. In this activity, students will identify characteristics of proportional and non-proportional linear relationships by examining patterns in a table, function rules, and a graph.

2. Students will distinguish between proportional and non-proportional relationships by comparing patterns in table, function rule, and graphs.

Concepts

TN Grade 8 Standards

Grade Level Expectations:

GLE 0806.3.4 Translate among verbal, tabular, graphical and algebraic representations of linear functions.

GLE 0806.3.5 Use slope to analyze situations and solve problems.

GLE 0806.1.3 Develop independent reasoning to communicate mathematical ideas and derive algorithms and/or formulas.

GLE 0806.1.5 Use mathematical ideas and processes in different settings to formulate patterns, analyze graphs, set up and solve problems and interpret solutions.

GLE 0806.1.8 Use technologies/manipulatives appropriately to develop understanding of mathematical algorithms, to facilitate problem solving, and to create accurate and reliable models of mathematical concepts.

Checks for Understanding:

0806.3.6 Identify x- and y-intercepts and slope of linear equations from an equation, graph or table.

0806.3.7 Analyze situations and solve problems involving constant rate of change.

0806.3.8 Recognize a proportion as a special case of a linear equation and understand that the constant of proportionality is the slope, and the resulting graph is a line through the origin.

State Performance Indicators:

SPI 0806.3.4 Translate between various representations of a linear function.

SPI 0806.3.5 Determine the slope of a line from an equation, two given points, a table or a graph.

SPI 0806.3.6 Analyze the graph of a linear function to find solutions and intercepts.

Teacher preparation

Before the activity, the teacher should pre-load the activity file *Pledge.tns* on to the student handheld devices. This can be done via Connect-to-Class software, TI-Nspire computer link software, or by using link cables with the handhelds.

Classroom management tips

1. This activity can be done by the students using the pre-made document file or by them creating various parts of the file as chosen by the teacher.

2. This activity is intended to be student-centered with the students working in small cooperative groups.
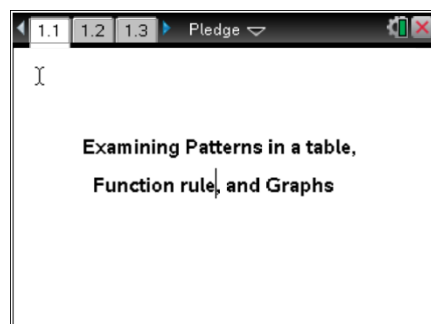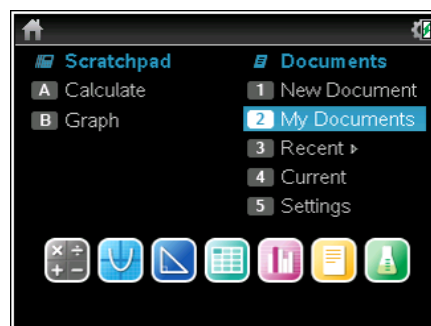
TI-Nspire Applications

Notes
List & Spreadsheets
Data & Statistics
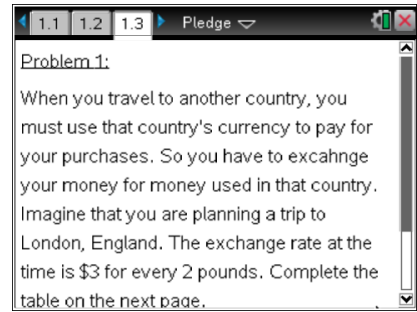Graphs
Calculator

Step-by-step directions

Steps:

1. On the home screen, choose My Documents and go to the file named *Pledge.tns*. Press <ENTER>.

2. Page 1.1 is the title page for this activity. Press <ctrl> and then the left or right arrow to navigate through the activity. Page 1.2 are the standards covered for the activity.
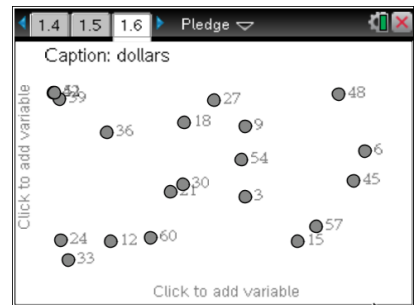
3. 1.3 explains the first problem. Students are instructed to complete the table on the following page.

| 1.1 | 1.2 | 1.3 | ▶ | Pledge ▽ |

Problem 1:

When you travel to another country, you must use that country's currency to pay for your purchases. So you have to excahnge your money for money used in that country. Imagine that you are planning a trip to London, England. The exchange rate at the time is $3 for every 2 pounds. Complete the table on the next page.

4. Students must enter the amount of pounds that would be exchanged for the given amount of dollars. There is a calculator on page 1.5 if needed.

| 1.2 | 1.3 | 1.4 | ▶ | Pledge ▽ |

A dollars	B pounds	C	D
1	3			
2	6			
3	9			
4	12			
5	15			

B1

5. Click in the areas at the bottom and left portions of the screen on page 1.6 to add the variables to create a graph.

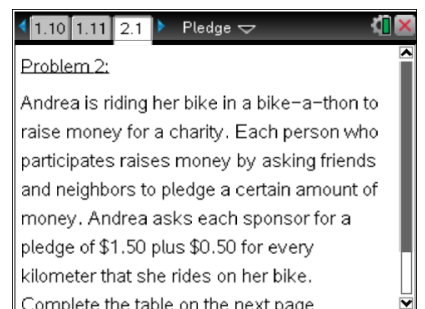| 1.4 | 1.5 | 1.6 | ▶ | Pledge ▽ |

Caption: dollars

Click to add variable

42, 39, 27, 48, 36, 18, 9, 54, 6, 21, 30, 45, 3, 24, 12, 60, 57, 15, 33

Click to add variable

6. Students must then answer questions related to the graph on pages 1.7 through 1.11.

| 1.5 | 1.6 | 1.7 | ▶ | Pledge ▽ |

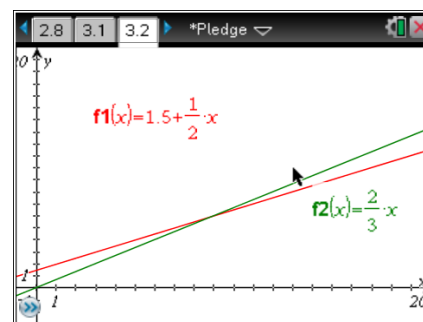**Question**

Explain how you completed the table.

Answer

7. Problem 2 is introduced on page 2.1. Students are given information on a pledge drive and should use similar strategies to complete the problem.

| 1.10 | 1.11 | 2.1 | ▶ | Pledge ▽ |

Problem 2:

Andrea is riding her bike in a bike-a-thon to raise money for a charity. Each person who participates raises money by asking friends and neighbors to pledge a certain amount of money. Andrea asks each sponsor for a pledge of $1.50 plus $0.50 for every kilometer that she rides on her bike. Complete the table on the next page

8. Problem 3 begins on page 3.1. Students are asked to graph the functions used in the previous problems.
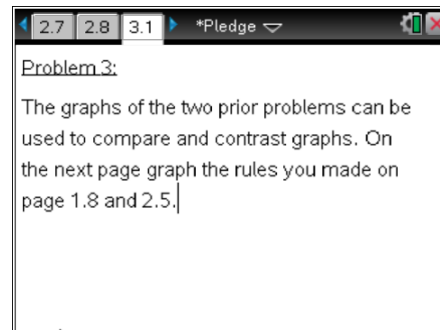
9. On page 3.2 students graph both functions. Click the double arrows at the bottom left corner and insert functions one at a time. You must hit enter to graph a new function. The window should look like the screen shot on the right.

10. Students should continue and answer questions on pages 3.3 and 3.4.
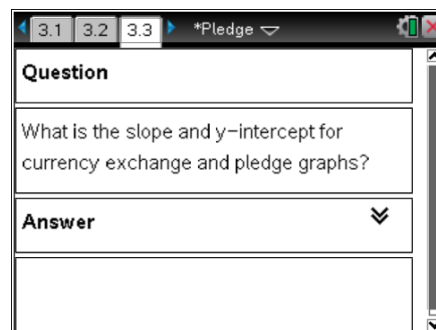
Assessment and evaluation

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

Sample Answers to the questions in .tns file:

Q: Explain how you completed the table.

A: I multiplied all dollar amounts by two and divided the total by three to get the number of pounds.

Q: Write a rule to help you determine the number of pounds that you will receive in exchange for any given number of dollars. Use **p** for the number of pounds and **d** for the number of dollars.

A: **p**= (2/3) **d**

Q: Suppose that three tickets to Agatha Christie's play *The Mousetrap* at St. Martin's Theatre in London cost $340. How much will the three tickets cost in pounds? Explain or show how you arrived at your answer.

A: 3*(ticket price) result times by (2/3), (3*(340))*(2/3)=1,020*(2/3)= £680.00

Q: Change the rule you wrote on page 1.9 to help you determine the number of dollars that you will receive in exchange for any given number of pounds.

A: **d** = (3/2) **p**

Q: One adult's ticket for London Zoo cost £8.50, and one child's ticket costs £6.00. If two adults and one child go the zoo, how much will the tickets cost in dollars? Explain or show how you arrived at your answer.

A: 2*(adult ticket)+ (child ticket) result times by (3/2), (2(8.50)+6)*(3/2)=(23)*(3/2)= $34.50

Q: Write a rule to help you determine the amount of money Andrea will raise for any given number of kilometers that she rides on her bike. Use **m** for the amount of money and **k** for the number of kilometers.

A: **m**= 1.5 +(1/2)**K**

Q: How much many will Andrea receive from each sponsor if she rides 50 Kilometer?

A: $26.50

Q: Change the rule you write in 2.5 to help you determine the number of kilometers Andrea will need to ride to raise any given amount of money.

A: **k** =2*(**m**-1.5)

Q: How many kilometers will she need to ride to receive $22.50 from each sponsor?

A: 42 kilometers

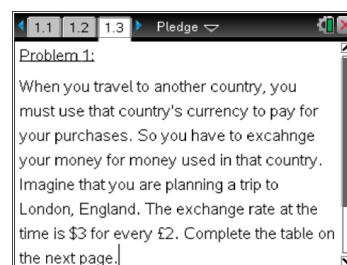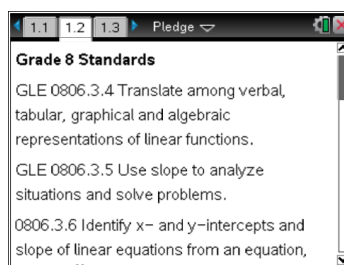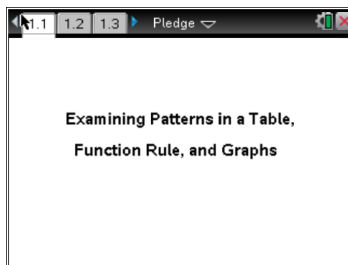Q: What is the slope and y-intercept for currency exchange and pledge graphs?

A: currency exchange: slope=(2/3) y-intercept= origin or 0, pledge: slope=(1/2) y-intercept= 1.5

Q: Describe how the graphs are alike and different?

A: Both graphs have different slopes and y-intercepts. Both graphs are also similar because they are increasing functions.
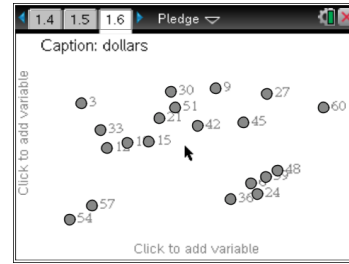
Student TI-Nspire Document
Pledge.tns

Screen 1 (1.2 | 1.3 | 1.4 — Pledge)

A dollars	B pounds	C	D
3			
6			
9			
12			
15			

A1 | 3

Screen 2 (1.3 | 1.4 | 1.5 — Pledge)

0/99

Screen 3 (1.4 | 1.5 | 1.6 — Pledge)

Caption: dollars

(scatter plot with points: 3, 30, 9, 27, 51, 60, 33, 21, 42, 45, 18, 15, 48, 57, 36, 24, 54)

Click to add variable

Click to add variable

Screen 4 (1.5 | 1.6 | 1.7 — Pledge)

Question

Explain how you completed the table.

Answer

Screen 5 (1.6 | 1.7 | 1.8 — Pledge)

Question

Write a rule to help you determine the number of pounds that you will reciece in exchange for any given number of dollars. Use p for the number of pounds and d for the number of dollars.

Answer

Screen 6 (1.7 | 1.8 | 1.9 — Pledge)

Question

Suppose that three tickets to Agatha Christie's play *The Mousetrap* at St. Martin's Theatre in London cost $340. How much will three tickets cost in pounds? Explain.

Answer

Screen 7 (1.8 | 1.9 | 1.10 — Pledge)

Question

Change the rule you wrote on page 1.9 to help you determine the number of dollars that you will receive in exchange for any given number of pounds.

Answer

Screen 8 (1.9 | 1.10 | 1.11 — Pledge)

Question

One adult's ticket for the London Zoo costs £8.50, and one child's ticket costs £6.00. If two adults and one child go to the zoo, how much will the tickets cost in dollars? Explain.
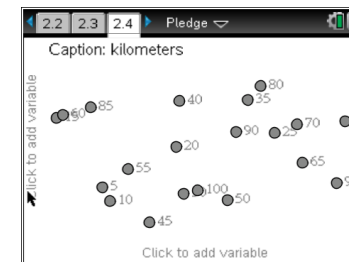
Answer

Screen 9 (1.10 | 1.11 | 2.1 — Pledge)

Andrea is riding her bike in a bike-a-thon to raise money for a charity. Each person who participates raises money by asking friends and neighbors to pledge a certain amount of money. Andrea asks each sponsor for a pledge of $1.50 plus $0.50 for every kilometer that she rides on her bike. Complete the table on the next page.

Page 2.3 is calculator page if needed.

Screen 10 (1.11 | 2.1 | 2.2 — Pledge)

A kilomet...	B money...	C	D
5			
10			
15			
20			
25			

A1 | 5

Screen 11 (2.1 | 2.2 | 2.3 — Pledge)

0/99

Screen 12 (2.2 | 2.3 | 2.4 — Pledge)

Caption: kilometers

(scatter plot with points: 60, 85, 80, 40, 35, 90, 25, 70, 75, 20, 65, 5, 55, 95, 10, 100, 50, 45)

Click to add variable

Click to add variable

Screen 13 (2.3 | 2.4 | 2.5 — Pledge)

Question

Write a rule to help you determine the amount of money Andrea will raise for any given number of kilometers that she rides on her bike.

Answer

Screen 14 (2.4 | 2.5 | 2.6 — Pledge)

Question

How much will Andrea recieve from each sponsor if she rides 50 kilometers?

Answer

Screen 15 (2.5 | 2.6 | 2.7 — Pledge)

Question

Change the rule you write in 2.5 to help you determine the number of kilometers Andrea will need to ride to raise any given amount of money.

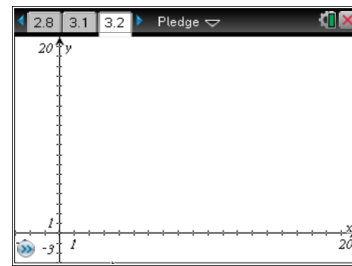**Answer**

| 2.6 | 2.7 | 2.8 | Pledge |

Question

How many kilometers will Andrea need to ride to receive $22.50 from each sponsor?

Answer ⌄

| 2.7 | 2.8 | 3.1 | Pledge |

Problem 3:

The graphs of the two prior problems can be used to compare and contrast graphs. On the next page graph the rules you made on page 1.8 and 2.5.

| 2.8 | 3.1 | 3.2 | Pledge |

| 3.1 | 3.2 | 3.3 | Pledge |

Question

What is the slope and y-intercept for currency exchange and pledge graphs?

Answer ⌄

| 3.2 | 3.3 | 3.4 | Pledge |

Question

Describe how the graphs are alike and different?

Answer ⌄

| 3.3 | 3.4 | 3.5 | Pledge |

This activity was adapted from Navigating through Number and Operations in Grade 6-8, a publication from the National Council of Teachers of Mathematics Navigation Series.

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