DAY 1: Steps, Pretzels & Fruit

Materials

Copies: 1.1 Big Steps
1.2 Pretzels
1.3 Buying Fruit
Ticket Out the Door Day 1

Supplies: Pretzel sticks (about 15 per person, separated into 2 baggies per person, labeled Task 1 and Task 2)

Objective

Students will do a series of activities and record their work as a table and as a graph and compare and contrast these to come to an understanding of "proportional".

Student Talk Strategy

Think-Pair-share to analyze each activity

Academic Language Use

Proportional-two lists of numbers are proportional if the numbers in one list are constant multiples of the numbers in the other list, with the same constant "of proportionality" for all the numbers. In this unit, beginning on Day 2, students will come to understand this concept by doing activities (in which some are proportional and others are not) and comparing the tables and graphs to notice the constant multiplier.

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Activity Notes

5 minutes: Introduction

Introduce yourself and the objectives for this 9-day intervention unit. Explain some guiding principles you would like to have established for this unit. Some examples may include the following: 1) the students will be active learners, using manipulatives, drawing and talking with each other and the class; 2) error is a great way to learn and you will reward students who take risks and have consequences for those who would show any form of disrespect to a classmate; 3) it is important that the students *understand* the math and not just memorize or do it without being able to explain.

25 minutes: Big Steps

Put students into groups of 2 and have them decide which partner will be person A and which will be person B. Pass out activity sheet 1.1. Give the students 1 minute to read the task silently. Ask a few questions to make sure they understand, such as, "How many steps will person A take each time?" "How many steps will person B take each time?" "What do you need to record?" "What do you do when you're done with the steps?" Tell the students they will have 10 minutes to complete task 1, the table and graph. Put a timer up on the overhead to keep them working at a good pace. Let them know when that time has passed and have them begin on task 2. Give them about 8

minutes to complete task 2. Give the students 5 minutes to answer the analysis questions on their own and then have them share with a partner (think-pair-share) and then select a few students to share with the class.

15 minutes: Pretzels
Pass out activity sheet 1.2. Explain to the students that they will be following the same process as they did in activity 1.1. Again, give them a minute to read the directions. Ask a few questions to make sure they understand. "How many pretzels does person A get each time? Person B?" Explain that they need to 1st use the pretzels for the activity and then they can eat once they show you their work; if they are unable to do this, they can choose to work from the book on their own for the remainder of the class. Pass out the pretzels to each pair. Tell them they have about 7 minutes for task 1 (let them know when this time has passed) and then have them move on to task 2. Again, when they have finished the two tasks, have them complete the comparison questions (and eat the pretzels!)

10 minutes: Buying Fruit
Pass out activity sheet 1.3. Give them a minute to read the directions and then 9 minutes to complete the tasks, as was done in the first two sheets.

5 minutes: Ticket out the Door
Pass out the Ticket out the Door and collect it as soon as each student finishes (so that you can discuss mistakes with students as they turn it in).

Big Steps

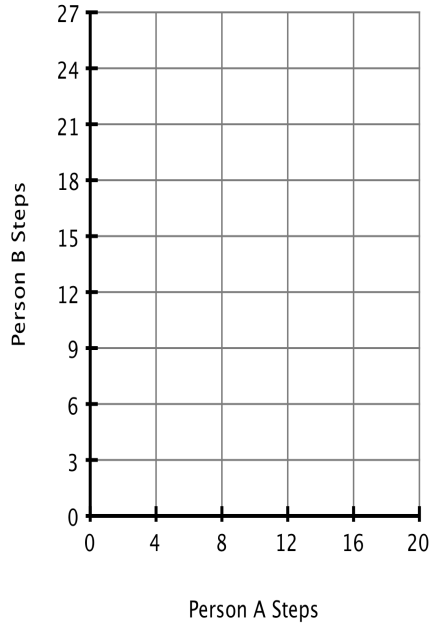
Task 1

Person A and B will both start on the same starting line. Person A will take 2 steps each turn. Person B will take 6 steps each turn. Continue taking turns, recording the total number of steps of each person, until person A has taken 10 steps.

Total # of Steps

Person A	0	2	4			
Person B	0	6				

Graph the points from the table above.



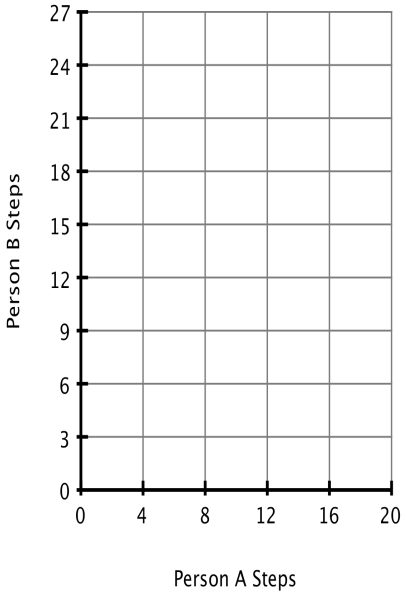
Task 2

Person A and B will both start on the same starting line. Person A will take 2 steps each turn. Person B will take 3 steps on their 1st turn, then 1 step on the next turn, then 3 steps, then 1 step, etc.. Continue taking turns, recording the total number of steps of each person, until person A has taken 10 steps.

Total # of Steps

Person A	0	2	4			
Person B	0	3	4			

Graph the points from the table above.



Analysis Questions

1. What is similar about the way you walked in the two tasks?

2. What is different about the way you walked in the two tasks?

3. What is similar about the tables?

4. What is different about the tables?

5. What is the same about the graphs?

6. What is different about the graphs?

Pretzels

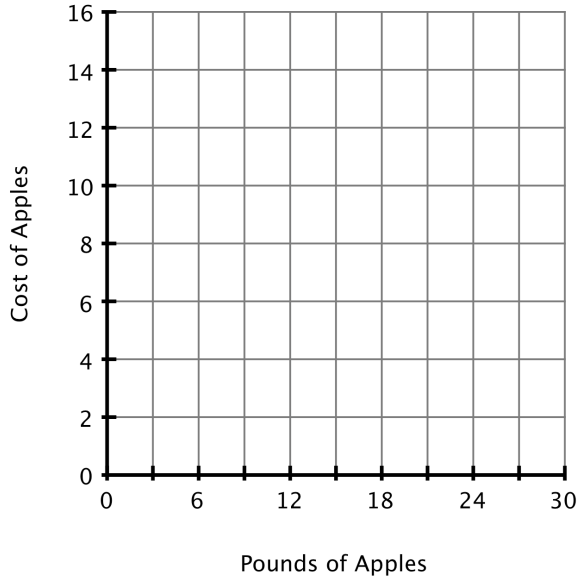
Task 1

You and your partner will have a bag of pretzels. Take turns getting pretzels for your pile as follows: Person A takes 3 pretzels each turn and Person B takes 1 pretzel each time. Continue taking turns, each time recording the total number of pretzels each person has, until Person B has 6 pretzels.

Total # of Pretzels

Person A	0	3	6				
Person B	0	1					

Graph the points from the table above.



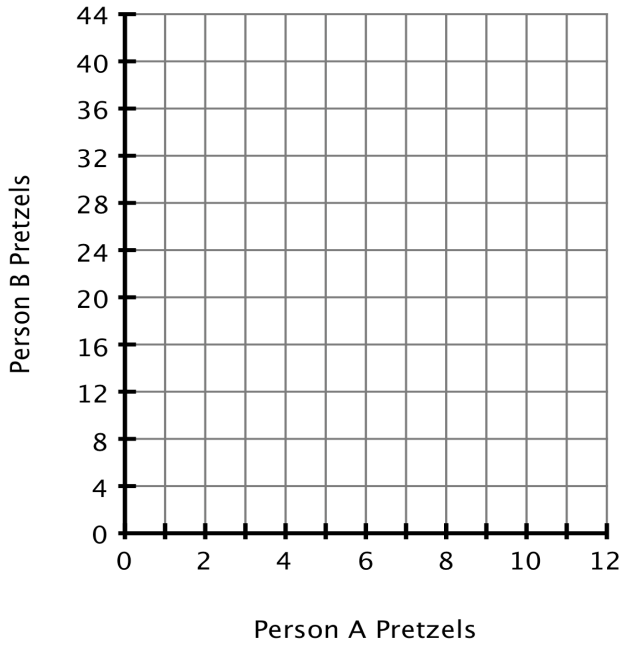
Task 2

You and your partner will have a bag of pretzels. Take turns getting pretzels for your pile as follows: Person A takes 1 pretzel each turn and Person B takes 1 pretzel on turn 1, then 2 pretzels on turn 2, then 3 pretzels on turn 3, etc. Continue taking turns, each time recording the total number of pretzels each person has, until Person A has 8 pretzels.

Total # of Pretzels

Person A	0	1	2						
Person B	0	1	3						

Graph the points from the table above.



Analysis Questions

1. What is similar about the way you were taking pretzels in the two tasks?

2. What is different about the way you were taking pretzels in the two tasks?

3. What is similar about the tables?

4. What is different about the tables?

5. What is the same about the graphs?

6. What is different about the graphs?

Buying Fruit

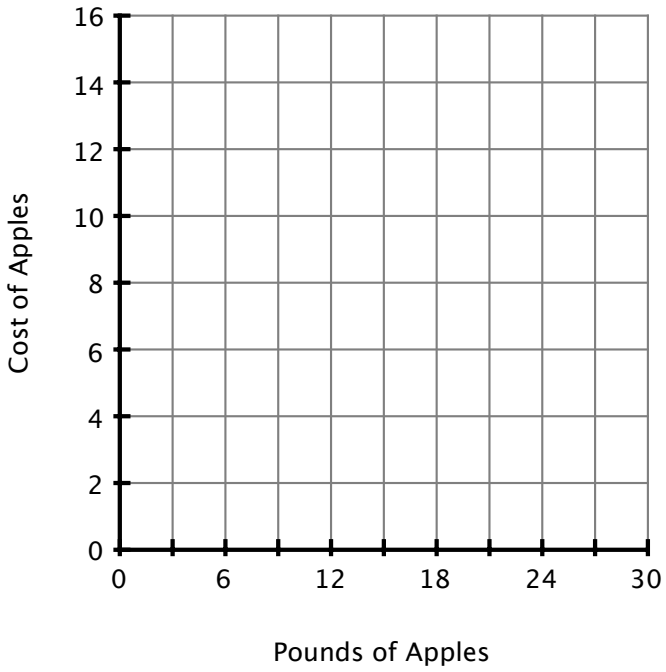
Task 1

You are shopping for fruit. The sign says 3 pounds of apples for $1.50. Using that information, complete the table and graph below.

Cost of Apples

Pounds	0	3	6					
Cost	0	$1.50						

Graph the points from the table above.



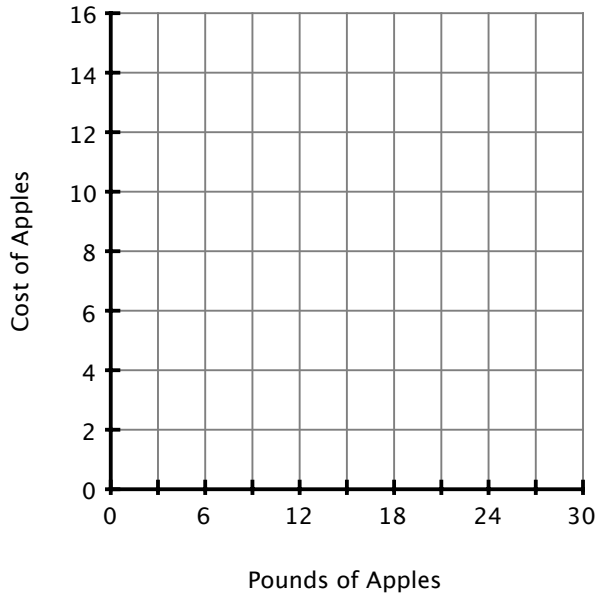
Task 2

You are shopping for fruit. The sign says buy 3 pounds of apples and get a pound free. 3 pounds of apples cost $2. Using that information, complete the table and graph below.

Cost of Apples

Pounds	0	3	4	7	8					
Cost	0	$2	$2	$6						

Graph the points from the table above.



Analysis Questions

1. What is similar about the two tasks?

2. What is different about the two tasks?

3. What is similar about the tables?

4. What is different about the tables?

5. What is the same about the graphs?

6. What is different about the graphs

DAY 2: Jumping Jacks & Cars

Materials

Copies:
2.1 Jumping Jacks
2.2 Pushing Cars
2.3 What Does it Mean to be Proportional?
Ticket Out the Door Day 2

Supplies:
Stop Watches (1 per group)
Cars (Matchbox or Hot Wheel) 1 per group
Rulers (1 per group)
1 piece of tape per group (to mark a starting line)

Objective

Students will continue with activities that are proportional and non-proportional, record their work as a table and as a graph, and then compare and contrast these to come to an understanding of "proportional".

Student Talk Strategy

Think-Pair-share to analyze activities 2.1 and 2.2
Report to a Partner for 2.3

Academic Language Use

Proportional- two lists of numbers are proportional if the numbers in one list are constant multiples of the numbers in the other list, with the same constant "of proportionality" for all the numbers. In this unit, students will come to understand this concept by doing activities (in which some are proportional and others are not) and comparing the tables and graphs to notice the constant multiplier.

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Activity Notes

15 minutes: Jumping Jacks

Put students into groups of 2 and have them decide which partner will be person A and which will be person B. Pass out activity sheet 2.1 and a stopwatch. Give the students 1 minute to read the task silently. Ask a few questions to make sure they understand, such as, "How many jumping jacks will person A take every 5 seconds?" "After 10 seconds, how many jumping jacks will person B have done? What about after 15 seconds?" "What do you need to record?" Tell the students they will have 5 minutes to complete task 1, the table and graph. Put a timer up on the overhead to keep them working at a good pace. Let them know when that time has passed and have them begin on task 2. Give them about 5 minutes to complete task 2. Give the students 5 minutes to answer the analysis questions on their own and then have them share with a partner (think-pair-share) and then select a few students to share with the class.

15 minutes: Pushing Cars
Pass out activity sheet 2.2. Explain to the students that they will be following the same process as they did in activity 2.1. Again, give them a minute to read the directions. Ask a few questions to make sure they understand. "How far does car A go in 5 seconds? How far will it go in 10 seconds?" "Why do you need a ruler?" "How far has car B gone at time 0 (before you start)?" Have 2 pairs come together to form a group of 4 for this activity. Give each group a ruler, a car and a stopwatch. Tell them they have about 7 minutes for task 1 (let them know when this time has passed) and then have them move on to task 2. If time permits, have them complete the comparison questions.

25 minutes: What does it mean to be proportional?
Have the students take out all their previous activity sheets from this unit: 1.1, 1.2, 1.3, 2.1 & 2.2. Explain that they will be analyzing the tables and the graphs. As a class, look through each *table*. As you look at a table, add a column on the right and call it "x". For each table, give the class 30 seconds and see if anyone can come up with the value to match x. Answers are as follows:

Activity Sheet	Task 1	Task 2
1.1	3x	N/A
1.2	1/3 (x)	$\frac{1}{2}n(n+1)$
1.3	.50 (x)	N/A
2.1	3/5 (x)	N/A
2.2	1/5 (x)	1/5 (x) + 5

Pass out activity sheet 2.3 and give the students 5 minutes to answer the questions on their own. Come back together as a class and have a discussion about the major concepts. The following statements are summary conclusions you want to draw out from the students:
1) Two numbers are proportional if one set of numbers can be multiplied by a constant to result in the second set of numbers. In the case of adding the x to the tables, those tables that have an ax (x with a coefficient), are proportional. Those that can NOT be written as ax are NOT proportional.
2) Two numbers are proportional if their graph makes a straight line through (0,0). Note: This is also referred to as Direct Variation.

Have the students turn to the backside of 2.3. (Note: there are two options for running this depending upon time.)
Option A
Explain that they need to decide if each task would be proportional or not. They can use a table or graph to help. Give them 5 minutes to finish this and then have them report to a partner to discuss what they think and why. Select a few volunteers to share their answers and reasoning.
Option B
Use Inside-outside circle for this instead: to do this, have half the class work on scenario A and half the class work on scenario B. Let them work in groups of 3-4. Give them 5 minutes to discuss their task. Then have them form two lines with the A's facing the B's. Explain that the A's will each have 2 minutes to share their scenario, if it was proportional or not and why, followed by the B's doing the same thing for their

scenario. After 4 minutes, have the A's move to their right 1 person and continue until time is out.

5 minutes: Ticket out the Door
Pass out the Ticket out the Door and collect it as soon as each student finishes (so that you can discuss mistakes with students as they turn it in).

Jumping Jacks

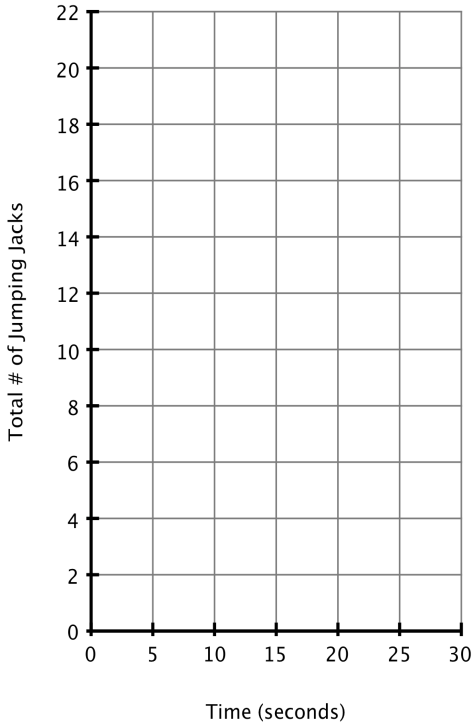
Task 1

Person A will be doing jumping jacks while Person B times them with a stopwatch. When both people are ready, Person B will say "go" and start the stop watch and Person A will do 3 jumping jacks. Person B will continue watching the stopwatch and will say "go" EVERY 5 seconds. Every time Person B says "go", Person A will do 3 jumping jacks. This will continue for 30 seconds. Record the time and total number of jumping jacks in the table below.

Jumping Jacks vs. Seconds

Time (seconds)	0	5					
Total # of Jumping Jacks	0	3					

Graph the points from the table above.



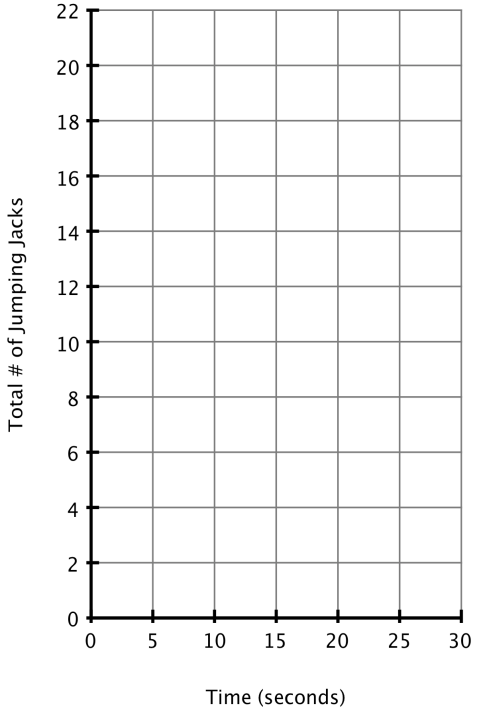
Task 2

In this task, Person B will be doing jumping jacks and Person A will time. Person B will begin by doing 10 jumping jacks BEFORE time begins. After Person B finishes the 10 jumping jacks, Person A will start the stopwatch and say "go". Person B will do 3 more jumping jacks. Every 5 seconds, Person A will say "go", but Person B will ONLY do jumping jacks every other time (so they do 3 on the 1st "go", then rest for the next "go", then do 3 on the next "go" and then rest on the next "go", etc). Continue for 35 seconds.

Jumping Jacks vs. seconds

Time (seconds)	0	5	10	15				
Total # of Jumping Jacks	10	13	13	16				

Graph the points from the table above.



Analysis Questions

1. What is similar about what you did in the two tasks?

2. What is different about what you did in the two tasks?

3. What is similar about the tables?

4. What is different about the tables?

5. What is the same about the graphs?

6. What is different about the graphs?

Pushing Cars

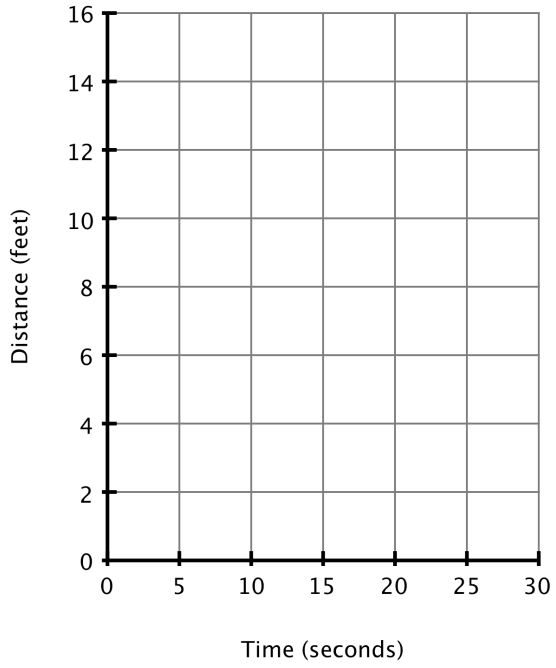
Task 1

Mark a starting line with a piece of tape. In your group, 1 person will push the car, one will be the timer, one will use the ruler to measure and the final team member will record. When ready, have the car begin on the starting line. When the timer says go, push the car 1 foot (the person with the ruler can lay this out so the car pusher knows how far to go). Every 5 seconds, the timer needs to say, "push" and the pusher needs to push the car 1 more foot. Continue pushing the car 1 foot every 5 seconds for 30 seconds. Record your data below.

Distance Traveled

Time (seconds)	0	5	10				
Distance (feet)	0	1					

Graph the points from the table above.



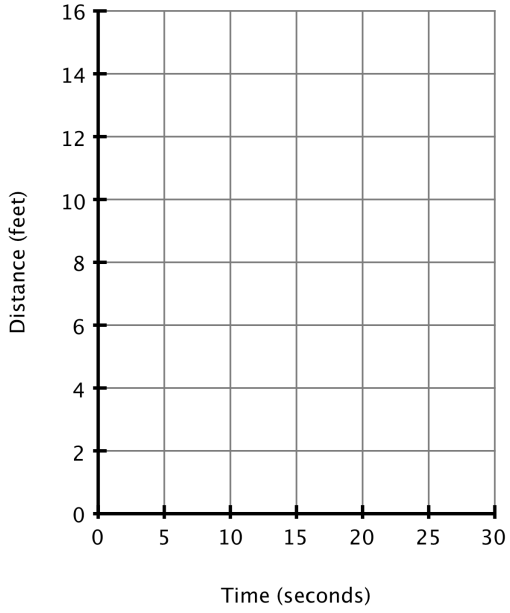
Task 2

Go back to the starting line from Task 1. In your group, 1 person will push the car, one will be the timer, one will use the ruler to measure and the final team member will record. When ready, have the car begin 5 feet in FRONT of the starting line. When the time says go, push the car 1 foot (the person with the ruler can lay this out so the car pusher knows how far to go). Every 5 seconds, the timer needs to say, "push" and the pusher needs to push the car 1 more foot. Continue pushing the car 1 foot every 5 seconds for 30 seconds. Record your data below.

Distance Traveled

Time (seconds)	0	5	10				
Distance (feet)	5	6					

Graph the points from the table above.



3. What is similar about the tables?

4. What is different about the tables?

5. What is the same about the graphs?

6. What is different about the graphs?

Analysis Questions

1. What is similar about the two tasks?

2. What is different about the two tasks?

What Does it Mean to Be Proportional?

Task 1:
Look back at your charts from 1.1, 1.2, 1.3, 2.1 & 2.2. With your class, try to figure out the "formula" for each table (i.e., if x goes on the top row, what goes on the bottom?). Note: you may not have learned the math to be able to write formulas for every table, as it has to work for EVERY set of numbers to be a formula or rule.

Task 2:
Look at the tables and formulas you found.
1) What is the same about all of the Task 1's?

2) What is the same about all the Tasks 2's?

3) How are the tables and values for x *different* from the task 1's and the task 2's? What do you think causes this?

Task 3:
Look at the graphs from all of the activities.
1) What is the same about the graphs of all the Task 1's?

2) What is *different* about the graphs of Task 1's and Task 2's? What about the tasks explains this; i.e., what was Person A doing differently than Person B?

Conclusions
All of the Task 1's are PROPORTIONAL. All of the Task 2's are NOT Proportional. In your own words or with pictures, explain what makes something proportional.

_____

_____

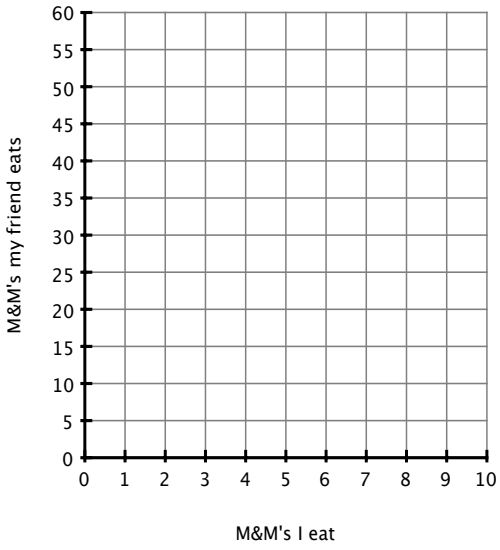
_____

Task 4: Two new Scenarios

SCENARIO A
You eat 3 M&M's every minute and your friend eats 12 M& M's every minute.

Question: Is the number of M&M's you eat proportional to the number of M&M's your friend eats? Why or why not? (Note: you can use the table below or sketch a graph to help).

# M&M's I eat each minute				
# M&M's my friend eats each minute				

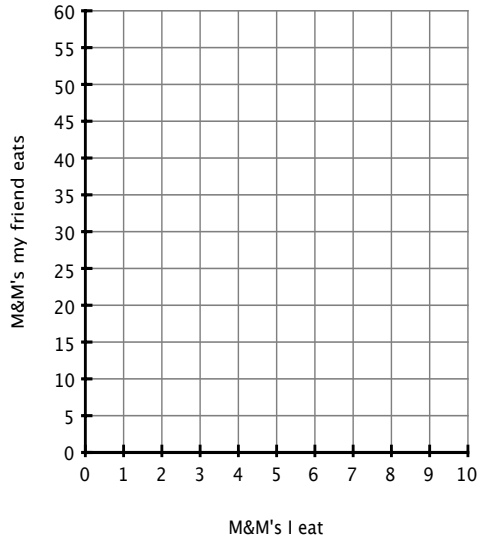


SCENARIO B

You eat 3 M&M's every minute. Your friend eats 10 M&M's the first minute, then 20 the second minute, then 30 the next and continues in this pattern.

Question: Is the number of M&M's you eat compared with your friend's eating proportional? Why or why not? (Note: you can use the table below or sketch a graph to help).

# M&M's I eat each minute				
# M&M's my friend eats each minute				



DAY 3: Proportional or Not?

Materials

Copies:
3.1 Understanding Proportions
3.2 Discovering a Proportion Property
3.3 Proportional or Not? (Teacher copy only)
3.4 Solving Proportion Challenge I
Ticket Out the Door Day 3

Supplies:
Posters to summarize big ideas (about 5)- optional
Markers for Poster Making

Objective

Students will solidify their understanding of proportionality by comparing and contrasting tables, fractions, graphs and scenarios. Students will "discover" that equivalent fractions are proportional.

Student Talk Strategy

Roundtable for 3.1
Report to a Partner for "Proportional or Not?"

Academic Language Use

Proportional- two lists of numbers are proportional if the numbers in one list are constant multiples of the numbers in the other list, with the same constant "of proportionality" for all the numbers. In this unit, students will come to understand this concept by doing activities (in which some are proportional and others are not) and comparing the tables and graphs to notice the constant multiplier.

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Activity Notes

20 minutes: Understanding Proportions

Note: The goal of the opening activity is to solidify students' understanding of proportion by comparing and contrasting what they have done in Days 1 & 2. It is okay if students connect better with one of the 4 methods of understanding proportions.

Pass out activity sheet 3.1. Give students 10 minutes to look at the 8 examples and write their summary statements. During this time, circulate and ask the students questions to guide them to see differences, such as "How is the first fraction related to the second fraction." "How is the top row increasing; is this the same or different than the bottom row?" "What is different about the graphs and how do they compare to the graphs from Days 1 & 2?". Then put the students into groups of 4. Explain to them that they will be doing a Roundtable. In this activity, the youngest student will begin by sharing 1 of the statements they wrote. The group will rotate clockwise, with each person sharing a statement that has not already been shared. While groups are doing this, circulate to find and ask some students who have insightful statements to be prepared

to share with the class. Give groups about 5 minutes for the Roundtable and then come back together as a class and have the selected students share.
Some key statements to look for are as follows:

- The two fractions are equivalent.
- You multiply the top and bottom numbers by the same number.
- The graph is a straight line that goes through (0,0).
- There is a constant rate or price

20 minutes: Discovering a Proportion Property
Pass out activity sheet 3.2. Give the students 1 minute to read the directions and then ask a few questions to make sure they understand, such as, "Why is there a question mark on top of each equal sign?" "What should you do if the fractions are equal?" What do you need to do if the proportions are not equal?" Have the students work with a partner to complete the page. Give them 10 minutes for this and then use random selection to have students share their answer and reasoning for each problem. Use the last 2 minutes to have the students answer the sentence at the bottom of activity sheet 3.2. Note: If you have a student who works ahead or who is willing to help, have him/her record the Big idea statements from 3.1 and 3.2 on posters to hang up in the room (as approved by you).

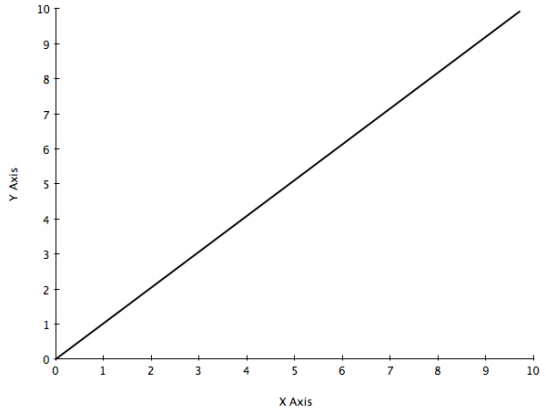
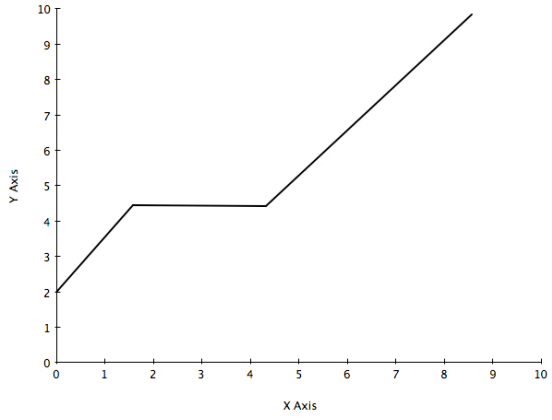
10 minutes: Proportional or Not?
Explain to the students that you will be putting up scenarios, tables, graphs or fractions and they need to decide if the information is proportional or not. Have them get into a group of 2. Tell the students that once you put up the problem, they will have 30 seconds to think about it and then they will use Report to a Partner to tell their partner what they think. After 1 minute for discussion, you will ask each pair to vote: thumbs up if it is proportional, thumbs down if it is NOT proportional and a sideways thumb if they can not tell.

5 minutes: Solving Proportion Challenge I
Pass out activity sheet 3.4. Explain to the students that this is a challenge to see if they can apply what they have learned so far to "solve" proportions. Allow students to work alone or with a partner to try to solve the problems. Circulate to assess and question the students and to provide them with feedback. Note: They will do this the next 2 days as well.

5 minutes: Ticket out the Door
Pass out the Ticket out the Door and collect it as soon as each student finishes (so that you can discuss mistakes with students as they turn it in).

Understanding Proportions

Directions:
Column A shows different ways to see relationships that ARE PROPORTIONAL and Column B shows relationships that are NOT proportional. Study the examples in each column to try to figure out what it is that makes some relationships proportional. Record 4 "big ideas" about what it means to be proportional.

<table>
<tr><th>Column A: PROPORTIONAL</th><th>Column B: NOT Proportional</th></tr>
<tr><td>Task 1: Compare a Table
<table><tr><td>x</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>3</td><td>6</td><td>9</td></tr></table></td><td>Task 1: Compare a Table
<table><tr><td>x</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>3</td><td>5</td><td>7</td></tr></table></td></tr>
<tr><td>Task 2: Compare Fractions
$\frac{4}{5} = \frac{12}{15}$</td><td>Task 2: Compare Fractions
$\frac{4}{5} \neq \frac{12}{13}$</td></tr>
<tr><td>Task 3: Compare Graphs
 
</td><td>Task 3: Compare Graphs
 
</td></tr>
<tr><td>Task 4: Compare scenarios
Chicken Tacos are on special: 3 tacos for $1.</td><td>Task 4: Compare scenarios
Carne Asada Tacos are on special: 2 tacos for $2 and then $.25 per taco after that.</td></tr>
</table>

Big Ideas: Record 4 Big Ideas you notice about what makes a relationship with numbers PROPORTIONAL. You can draw a picture to help explain your thinking.

Idea 1:

_____

_____

Idea 2:

_____

_____

Idea 3:

_____

_____

Idea 4:

_____

_____

Discovering a Proportion Property

Two equal fractions describe the same **PROPORTION**.

DIRECTIONS: Use your knowledge of equivalent fractions and reasoning to find out which eight problems are really equal. Scribble out the ? if you are sure the pair of fractions make a proportion. If the pair are NOT equivalent (meaning they are not proportional), put a line through the equal sign, ≠.

a $\frac{2}{6} \stackrel{?}{=} \frac{7}{21}$	b $\frac{4}{8} \stackrel{?}{=} \frac{6}{10}$	c $\frac{1}{9} \stackrel{?}{=} \frac{4}{36}$
d $\frac{6}{8} \stackrel{?}{=} \frac{5}{6}$	e $\frac{2}{5} \stackrel{?}{=} \frac{6}{15}$	f $\frac{4}{10} \stackrel{?}{=} \frac{6}{15}$
g $\frac{24}{8} \stackrel{?}{=} \frac{6}{2}$	h $\frac{9}{4} \stackrel{?}{=} \frac{3}{2}$	i $\frac{10}{6} \stackrel{?}{=} \frac{15}{9}$
j $\frac{3}{12} \stackrel{?}{=} \frac{2}{8}$	k $\frac{8}{10} \stackrel{?}{=} \frac{12}{20}$	l $\frac{12}{18} \stackrel{?}{=} \frac{2}{3}$

What relationship is always true about a **proportion,** $\frac{a}{b} = \frac{c}{d}$?

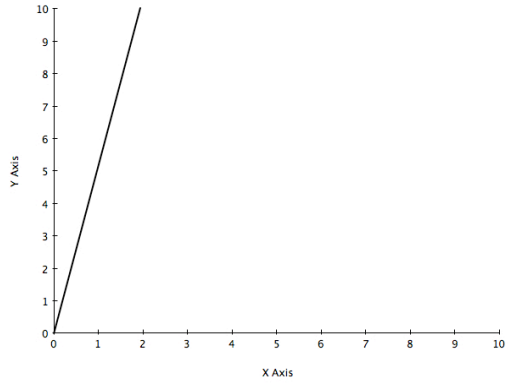
Proportional or Not?
(Teacher Copy)

Directions (for the teacher)

Explain to the students that you will be putting up scenarios, tables, graphs or fractions and they need to decide if the information is proportional or not. Have them get into groups of 2. Tell the students that once you put up the problem, they will have 30 seconds to think about it and then they will use Report to a Partner to tell their partner what they think. After 1 minute of discussion, you will ask each pair to vote: thumbs up if it is proportional, thumbs down if it is NOT proportional and a sideways thumb if they can not tell.

1. $\frac{5}{7} \stackrel{?}{=} \frac{15}{17}$

2.



3. Max swims 5 laps every 2 minutes. How many laps does he swim in 10 minutes?

4. Marcos swims 5 laps in 2 minutes, swims the next 5 laps in 4 minutes. and then continues to swim 5 laps every 4 minutes. How many laps does he swim in 10 minutes?

5.

x	0	5	10
y	0	10	20

6.

x	0	5	10
y	10	20	30

DAY 7: Writing Proportions

Materials

Copies: 7.1 Solving Proportions
7.2 Proportional or Not? II (Teacher copy only)
7.3 Double-Sided Number Line for Writing Proportions
Ticket Out the Door Day 7

Supplies: Calculators (1 per person or pair)

Objective

Students will learn to use a double-sided number line to set up a proportion from a word problem.

Student Talk Strategy

Think-Pair-Share for 7.2
Pair-Share for 7.3

Academic Language Use

Proportional- two lists of numbers are proportional if the numbers in one list are constant multiples of the numbers in the other list, with the same constant "of proportionality" for all the numbers. In this unit, students will come to understand this concept by doing activities (in which some are proportional and others are not) and comparing the tables and graphs to notice the constant multiplier.
Cross-products- a method for solving a proportion by setting the diagonals equal to one another.

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Activity Notes

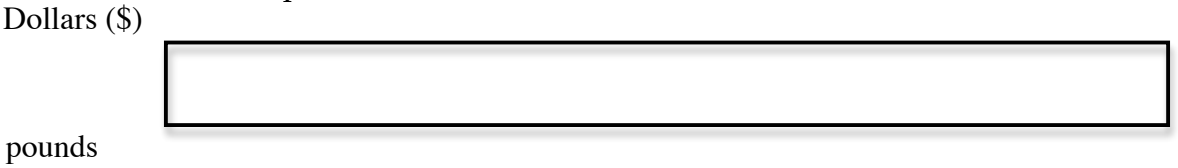
10 minutes: Practice Solving Proportions

Pass out activity sheet 7.1 and calculators. Give the students 2 minutes to solve #1 on their own and then have the discuss their answer with a neighbor while a student you select comes to the front to share his work. Give the students the remaining time to work on the activity sheet. Set the timer for 5 minutes in which the students need to work alone and then allow them to work with a partner (if they choose).

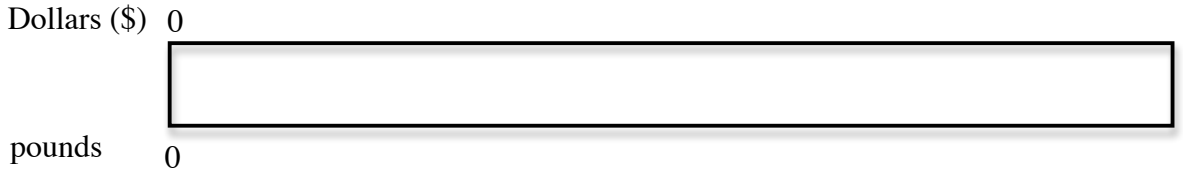
10 minutes: Proportional or Not?

Put students into groups of 2. Explain that you will be putting up a scenario (word problem) and they need to decide if the data are proportional or not. To do this, once you put up a problem from activity sheet 7.2, set the timer for 30 seconds for the students to think silently, and then allow 30 seconds to discuss with their partner. At the end of the minute, have each pair vote in front of their chests by showing thumbs up for "yes, it is proportional", thumbs down for "no, it is not proportional" and a sideways thumb for "we're not sure". Make sure to discuss each scenario by selecting students to share their reasoning.
Note: All problems are proportional except #'s 3, 6 & 8.

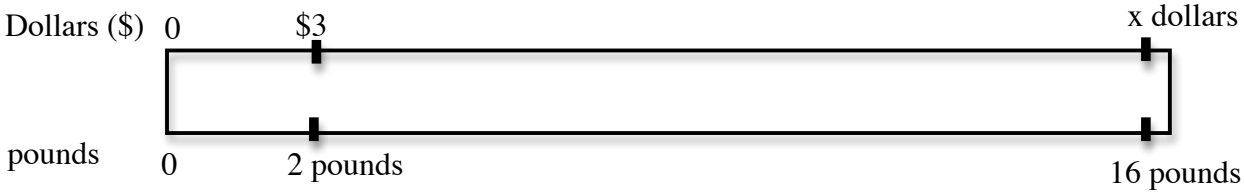
30 minutes: Using the Double-Sided Number Line to Write Proportions
Pass out activity sheet 7.3. Explain to the class that they will now be applying all they have learned to solve for a missing number in a proportion that comes from a word problem. Have a volunteer read problem #1 (note: this sheet includes all the problems that were proportional from 7.2) and three new ones.) Tell the students you will give them 30 seconds to think about whether they can use a proportion to solve and then take a vote (as you did in 7.2 above). Select a student at random to tell you what the two "things" you are comparing are in this scenario (i.e., money, laps, distance, etc). Show the students how to draw a number line to represent each "thing". For #1, this will be dollars and pounds.



Note: It does not matter which unit is on top or bottom.
Ask the students what number they should put at the left end of each number line (it should be 0) and add this onto your picture.

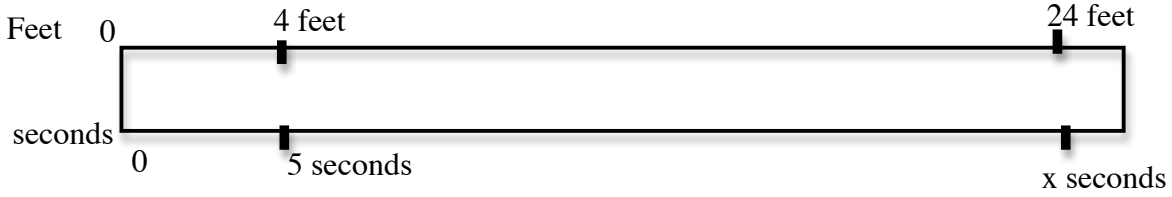


Select a student at random to tell you what other information the problem gives. In this case, we are told it is $3 for 2 pounds of apples and we want to know how much it will cost for 16 pounds? Select another student, at random, to tell you what numbers go on the pound line and about where. Select another student to tell you what numbers go on the Dollars line and where. Select a final student to tell you what it is you're looking for and mark this with an x (or other variable).



Ask a few questions to ensure the students understand, such as "Why is the 16 on the bottom line?" "How did I know where to put the $3?" Then, explain to the class you will be trying to come up with an estimate for x. Ask the class for ideas on how to get a decent estimate. Make sure the class agrees that the number must be greater than 3. Once you have some ideas on estimating and have picked a class estimate (note: the purpose of estimating is to help the students notice a ridiculous answer they may get from arithmetic errors), give the students 30 seconds to look at the diagram (above) and look for the proportion. Have them turn to their neighbor to tell them what proportion they see. Then, select a few students to share what they see and how they saw that. While there are many correct answers and you need to validate all of those, the most

common answer will be to see $\frac{\$3}{2lb.} = \frac{\$x}{16lb.}$. Give the students a minute to solve the proportion (either using cross-products or equivalent fractions).
Direct the students' attention to problem #2 and, again, have a volunteer read the problem. Give them 30 seconds to think silently and then vote if the problem can be solved using a proportion. Have the students draw and label a double number line for this problem (one line should be feet and the other seconds). Give them 45 seconds to do this and then have them share with a neighbor. Have a volunteer share what they wrote. Then ask the students to think about what information they have and fill in those numbers on their picture. See below for picture. Follow the same process of allowing 45 seconds alone and then having them check with a partner before you have a volunteer share with the class. Now give the students 30 seconds to predict what x will be. Finally, give the students 45 seconds to record the proportion they see and then have them check with a neighbor. After a student has shared, let the students solve the proportion. Give the students the remaining time to work with a partner on the problems. Remind them that for each problem, you want a picture with labels, and estimate, a proportion and a solution. While the class is working, circulate to question students to help them get started or to see any errors. Some good questions are, "What are the two things being compared?" "What number can you put on the left end of the # line?" "What other information does the problem tell you?" Find groups who are finishing fast and have them put their work up on the board so others can use it as help when needed.



10 minutes: Ticket out the Door
Pass out the Ticket out the Door and collect it as soon as each student finishes (so that you can discuss mistakes with students as they turn it in).

Solving Proportions

Directions: Solve each proportion for the missing number by using equivalent fractions or cross-products.

1. $\frac{27}{18} = \frac{\quad}{2}$

2. $\frac{\quad}{36} = \frac{1}{3}$

3. $\frac{6}{\quad} = \frac{3}{5}$

4. $\frac{8}{10} = \frac{48}{\quad}$

5. $\frac{6}{15} = \frac{\quad}{20}$

6. $\frac{\quad}{12} = \frac{15}{18}$

7. $\frac{3}{4} = \frac{42}{\quad}$

8. $\frac{\quad}{5} = \frac{2}{1}$

9. $\frac{12}{24} = \frac{\quad}{10}$

10. $\frac{\quad}{12} = \frac{6}{9}$

Proportional or Not- II

Teacher Directions: Show the students a problem, set the timer for 30 seconds for the students to think silently, and then allow 30 seconds to discuss with their partner. At the end of the minute, have each pair vote in front of their chests by showing thumbs up for "yes, it is proportional", thumbs down for "no, it is not proportional" and a sideways thumb for "we're not sure". Make sure to discuss each scenario by selecting students to share their reasoning.

1. Rick types 70 words in 2 minutes. At that rate, how many words can he type in 10 minutes?

2. The ratio of giraffes to elephants in the zoo is 3:1. If there are 33 giraffes in the zoo, how many elephants are in the zoo?

3. Cereal is on sale today. The special says, "but two, get one free". If 1 box of cereal costs $3.50, how much will 5 boxes cost?

4. Mark runs 3 miles in 15 minutes. At that rate, how far will he run in 45 minutes?

5. Bananas are on sale for 3 pounds for $2. At that price, how many pounds can you buy for $22?

6. Maria walks 2 laps in 5 minutes and then runs 2 laps in 3 minutes. If she continues to alternate walking and running at the same paces, how many laps will she complete in 20 minutes?

7. At a cupcake shop, they make 3 chocolate cupcakes for every 4 vanilla cupcakes. If they make 270 chocolate cupcakes, how many vanilla cupcakes will they make?

8. Lizette earns $10 in gas money for driving to babysit and then earns $8 for each hour she babysits the kids. How much money will she make for 5 hours of babysitting?

9. Xavier measured the length and width of a rectangle to be 11 cm and 7 cm, respectively. A rectangle that is similar to this rectangle has a width of 63 cm. How long is the rectangle?

10. Ming was planning a trip to Western Somoa. Before going, she did some research and found out that the exchange rate is 6 Tala for $2. How many Tala would she get if she exchanged $42?

Double-Sided Number Line for Writing Proportions

Directions: For each problem below, draw and label a double-sided number line, estimate the value of the unknown and then write and solve a proportion.

1. Apples are advertised as $3 for 2 pounds. How much will it cost for 6 pounds of apples?

Estimate:

Proportion:

2. Jeanette skips 4 feet in 5 seconds. At that rate, how ling will it take her to skip 24 feet?

Estimate:

Proportion:

3. The ratio of giraffes to elephants in the zoo is 3:1. If there are 33 giraffes in the zoo, how many elephants are in the zoo?

Estimate:

Proportion:

4. Mark runs 3 miles in 15 minutes. At that rate, how far will he run in 45 minutes?

Estimate:

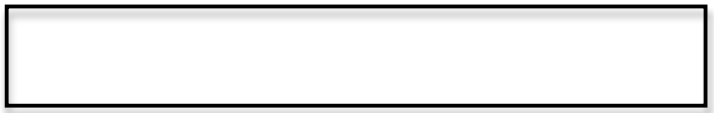
Proportion:

5. Bananas are on sale for 3 pounds for $2. At that price, how many pounds can you buy for $22?

Estimate:

Proportion:

6. Rick types 70 words in 2 minutes. At that rate, how many words can he type in 10 minutes?



Estimate:

Proportion:

7. At a cupcake shop, they make 3 chocolate cupcakes for every 4 vanilla cupcakes. If they make 270 chocolate cupcakes, how many vanilla cupcakes will they make?

Estimate:

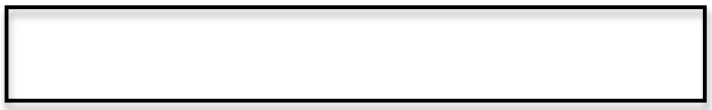
Proportion:

8. One package of socks costs $7. How many packages can you buy with $56?

Estimate:

Proportion:

9. Xavier measured the length and width of a rectangle to be 11 cm and 7 cm, respectively. A rectangle that is similar to this rectangle has a width of 63 cm. How long is the rectangle?



Estimate:

Proportion:

10. Ming was planning a trip to Western Somoa. Before going, she did some research and found out that the exchange rate is 6 Tala for $2. How many Tala would she get if she exchanged $42?

Estimate:

Proportion: