

Week of: April 27 to May 3, 2020

Grade: 8

Content: Math

Learning Objective Blurb:

Greetings 8th graders! We hope you are safe and well with your families!

This week Students use ratios to analyze proportional relationship representations. They write equivalent ratios, write equations, create a table of values, and graph proportional relationships. Then, students analyze two scenarios involving proportional relationships represented in different forms.

We've included some video links to help you if you get stuck! This work will not be graded, just do your best and have fun!

Video Links:

Khan Academy: Proportional Relationships:

<https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions#cc-8th-graphing-prop-rel>

Carnegie Learning :

Video 1: Representations of Proportional Relationships:

<https://docs.google.com/spreadsheets/d/1kWYOAnNLCrNWCP7ioauKGWeTynblleT-SXZSgl6BTQ/edit?ts=5e703d2c#gid=1516865476&range=F17>

Video 2: More Representations of Proportional Relationships:

<https://docs.google.com/spreadsheets/d/1kWYOAnNLCrNWCP7ioauKGWeTynblleT-SXZSgl6BTQ/edit?ts=5e703d2c#gid=1516865476&range=F18>

Practice Activities:

On-Line

All students now have access to an on-line program called Mathia!

Mathia- If you are already in Mathia, please continue to work in the program.

If you are new to Mathia: Please see the log-in information attached.

Family Guide below

Printable Resources:

Skills Practice: Module 2, Topic 1, Lesson1 Post-Secondary Proportions: see below

Enrichment Resources:

Carnegie Learning: Topic 2 Proportions vs. Linear Relationships: see below

Module 2: Developing Function Foundations

TOPIC 1: FROM PROPORTIONS TO LINEAR RELATIONSHIPS

In this topic, students build on their knowledge of ratio and proportional relationships to develop connections between proportional relationships, lines, and linear equations. Students compare proportional relationships represented in different ways to ensure a firm understanding of the meaning of proportionality. Students then use similar triangles to explain why the slope of a line is always the same between any two points on the line.

Where have we been?

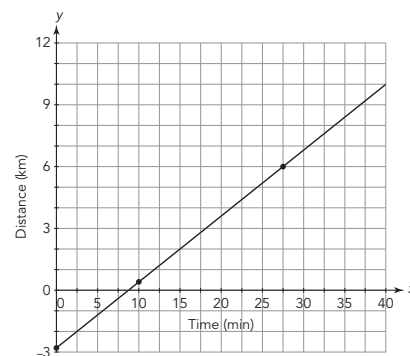
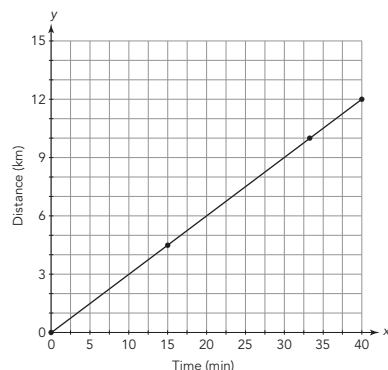
In grade 6, students developed their understanding of ratio. The next year, they determined characteristics of scenarios, tables, graphs, and equations of proportional relationships. Students review their prior knowledge of ratios and proportional relationships, including unit rate and the constant of proportionality.

Where are we going?

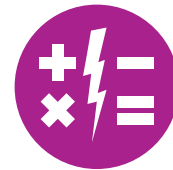
This topic establishes an important link from a major concept of middle school mathematics, ratios and proportional relationships, to a major focus of high school mathematics, functions. In the next topic, students will increase their familiarity and flexibility with determining slope and writing equations of linear relationships from different representations and in different forms.

Using Graphs to Show Proportional and Non-Proportional Relationships

Both of these graphs show linear relationships between time and distance. They both show speeds. The graph on the left shows a proportional linear relationship, because the graph is a straight line through the origin. The graph on the right shows a non-proportional relationship.



Myth: There is one right way to do math problems.



Employing multiple strategies to arrive at a single, correct solution is important in life. Suppose you are driving in a crowded downtown area. If one road is backed up, then you can always take a different route. If you know only one route, then you're out of luck.

Learning mathematics is no different. There may only be one right answer, but there are often multiple strategies to arrive at that solution. Everyone should get in the habit of saying: *Well, that's one way to do it. Is there another way? What are the pros and cons?* That way, you avoid falling into the trap of thinking there is only one right way because that strategy might not always work or there might be a more efficient strategy.

Teaching students multiple strategies is important. This helps students understand the benefits of the more efficient method. In addition, everyone has different experiences and preferences. What works for you might not work for someone else.

#mathmythbusted

Talking Points

You can further support your student's learning by asking them to take a step back and think about a different strategy when they are stuck.

Questions to Ask

- What strategy are you using?
- What is another way to solve the problem?
- Can you draw a model?
- Can you come back to this problem after doing some other problems?

Key Terms

constant of proportionality

In a proportional relationship, the ratio of all y -values to their corresponding x -values is constant. This ratio, $\frac{y}{x}$, is called the constant of proportionality.

slope

In any linear relationship, slope describes the direction and steepness of a line. In a proportional relationship, the constant of proportionality and the slope are the same.

Post-Secondary Proportions

Representations of Proportional Relationships

1

WARM UP

Determine each equivalent ratio.

1. $\frac{7}{16} = \frac{x}{48}$

2. $\frac{t}{90} = \frac{5}{9}$

3. $\frac{10}{p} = 1$

4. $250 = \frac{1000}{q}$

LEARNING GOALS

- Represent proportional relationships with tables, lines, and linear equations.
- Compare graphs of proportional relationships.
- Compare two different proportional relationships represented in multiple ways.

KEY TERMS

- proportional relationship
- constant of proportionality

You have studied proportional relationships in previous courses. How can you represent and compare proportional relationships using graphs, tables, and equations?

Representing Proportional Relationships



Use the findings of the enrollment study to make predictions.

1. Determine the number of enrolled female students for each given total number of enrolled students. Explain your reasoning.

- a. 15 total students b. 250 total students
- c. 4000 total students

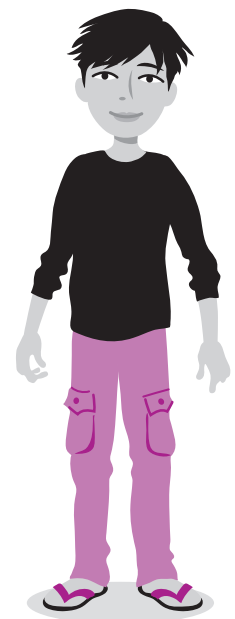
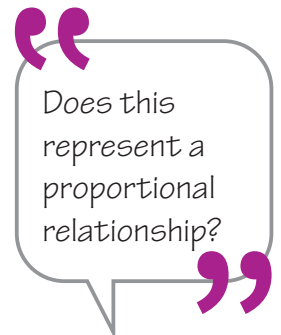
2. Compare the total number of enrolled students to the number of enrolled male students.

a. Complete the table.

| Total Students Enrolled in a University | Male Students Enrolled in a University |
|---|--|
| 0 | |
| 250 | |
| 6000 | |
| | 6000 |

b. Explain how you calculated each value.

3. Determine the number of female students if 800 enrolled students are male. Show all work and explain your reasoning.



4. Choose the correct equation to match each description.
Then compare the equations.

$$y = \frac{2}{5}x$$

$$y = 2x + 3$$

$$y = \frac{2}{3}x$$

$$y = \frac{3}{2}x$$

$$y = \frac{3}{5}x$$

$$y = \frac{5}{2}x$$

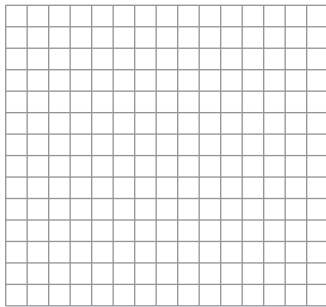
$$y = 2x + 5$$

$$y = 3x + 2$$

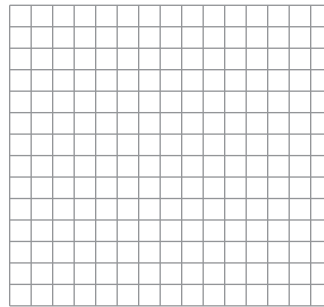
- a. the number of female students enrolled, y , for x total number of students enrolled
- b. the number of male students enrolled, y , for x total number of students enrolled
- c. the number of female students enrolled, y , for x male students enrolled
- d. the number of male students enrolled, y , for x female students enrolled
- e. Describe the similarities and differences in each of the correct equations.

5. Create graphs that display each ratio. Then compare the graphs.

a. the total number of female students enrolled, y , with respect to the total number of students enrolled, x



b. the total number of male students enrolled, y , with respect to the total number of students enrolled, x



c. Describe the similarities and differences of the two graphs.

In this lesson, you are studying relationships that are proportional. A **proportional relationship** is one in which the ratio of the inputs to the outputs is constant. For example, the ratio of women to men at a university is 3 : 2. Proportional relationships are always written in the form $y = kx$, where x represents an input value, y represents an output value, and k represents some constant that is not equal to 0. The constant k is called the **constant of proportionality**.

6. Identify the constant of proportionality for each relationship in Question 4.

7. Identify the constant of proportionality, or rate of change, for each graph in Question 5. Then explain how to determine k from a graph.

You will sometimes hear a proportional relationship referred to as a direct variation.



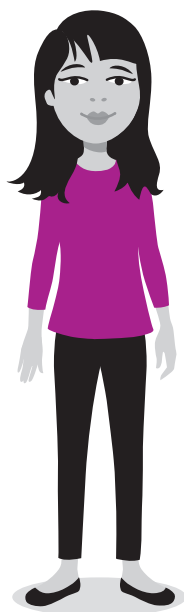
ACTIVITY
1.2

Comparing Ratios and Graphs

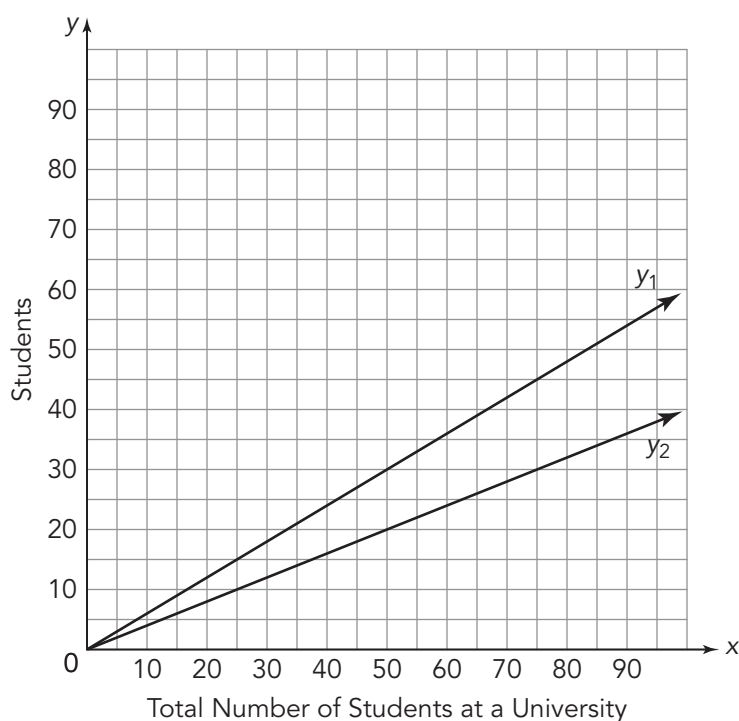


Graphs provide a variety of information about relationships between quantities.

Can you determine proportionality or dependence?



1. Examine the lines graphed on the coordinate plane. What can you determine about the relationships between the quantities by inspecting the graph?



The lines y_1 and y_2 each represent a proportional relationship. One line represents the proportional relationship between the number of females enrolled and the total number of students. The other line represents the proportional relationship between the number of males enrolled and the total number of students.

2. Determine which line represents each relationship.
Explain your reasoning.

a. the number of females enrolled in a university

b. the number of males enrolled in a university

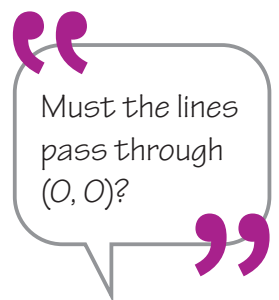
The ratio of the number of students who enjoy music to the total number of students is slightly more than the ratio of female students to the total number of students.

3. Draw a line on the coordinate plane that might represent the ratio of the number of students who enjoy music to the total number of students. Label this line y_3 . Explain your reasoning.

In a linear relationship, any change in an independent variable will produce a corresponding change in the dependent variable.

The ratio of students who work full-time to total students is less than the ratio of male students to total students.

4. Draw a line on the coordinate plane that might represent the ratio of students at a university who work full-time to the total number of students. Label this line y_4 . Explain your reasoning.



5. Of the lines on the coordinate plane, which is the steepest?
How does this relate to the ratios?





Daisa attends college in another state. During summer break, she drives home from college to visit her family and friends.

Daisa's Drive Home

| Time (hours) | Distance (miles) |
|--------------|------------------|
| 3 | 180 |
| 2 | 120 |
| 1.5 | 90 |
| 2.5 | 150 |

1. Daisa decides to keep track of the time it takes her to drive home from school. She records her distance after various numbers of hours. Her data are shown in the table.

a. Does this table represent a proportional relationship? Explain your reasoning.

b. Write a ratio for distance to time.

c. Write the unit rate for distance per 1 hour.

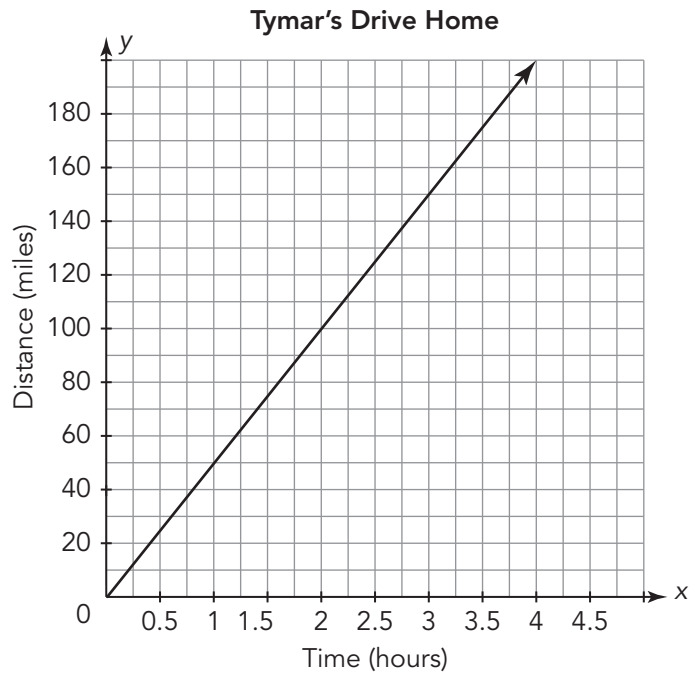
Unit rate is a comparison of two quantities in which the denominator has a value of one unit.

One of Daisa's high school classmates, Tymar, attends college with Daisa. He also drives home during the summer break but takes a different route.

2. Analyze the graph of his trip.

- a. Does the graph represent a proportional relationship? Explain your reasoning.

- b. Who drives faster—Daisa or Tymar? Explain your reasoning.



A third friend, Alisha, offers to drive Daisa and Tymar home for spring break so that they can share the cost of gas money. When asked how fast she drives, Alisha reported that the distance traveled, y , for the time, x , can be expressed as $y = 57x$.

3. Does Alisha's equation represent a proportional relationship? Explain your reasoning.

4. Compare the representations of the three friends.

- a. Who drives the fastest? Explain your reasoning.

- b. Rank the friends in order from the slowest driver to the fastest driver.



Students in a sculpting class at a university are working in teams to create modeling clay. The students learned that they can make different types of clay by changing the ratio of flour to water. Their recipes are shown in the table.

| | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6 | Group 7 |
|-------|----------|---------|----------|---------|---------|-----------|---------|
| Flour | 2.5 cups | 3 cups | 7.5 cups | 4 cups | 12 cups | 3.75 cups | 5 cups |
| Water | 1 cup | 2 cups | 3 cups | 2 cups | 8 cups | 1.5 cups | 2 cups |

- How many different recipes for clay did the students create? Show all work and explain your reasoning.

The art professor would like all of the projects to include the same shade of orange. The students have learned that orange paint is created by mixing red and yellow paints. Three groups presented suggestions for the shade of orange to be used for the art projects.

| Avi's Group | Zander's Group | Paul's Group | | | | | | | | | | |
|---|--|-------------------|----------------------|---|-----|---|---|----|---|----|------|--|
| $y = \frac{4}{5}x$, where x is the amount of red paint and y is the amount of yellow paint | <table border="1"> <thead> <tr> <th>Red Paint (parts)</th> <th>Yellow Paint (parts)</th> </tr> </thead> <tbody> <tr> <td>6</td> <td>1.5</td> </tr> <tr> <td>8</td> <td>2</td> </tr> <tr> <td>12</td> <td>3</td> </tr> <tr> <td>15</td> <td>3.75</td> </tr> </tbody> </table> | Red Paint (parts) | Yellow Paint (parts) | 6 | 1.5 | 8 | 2 | 12 | 3 | 15 | 3.75 | |
| Red Paint (parts) | Yellow Paint (parts) | | | | | | | | | | | |
| 6 | 1.5 | | | | | | | | | | | |
| 8 | 2 | | | | | | | | | | | |
| 12 | 3 | | | | | | | | | | | |
| 15 | 3.75 | | | | | | | | | | | |

2. Explain how you know that each group's proposal represents a proportional relationship.

a. Avi's Group

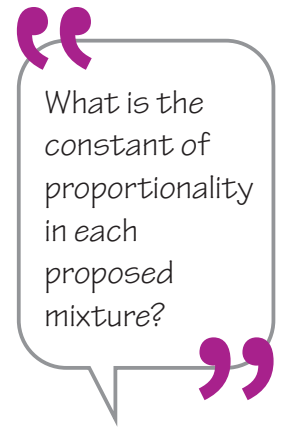
b. Zander's Group

c. Paul's Group

The greater the ratio of yellow to red paint used, the lighter the shade of orange paint.

3. Rate the group's proposals from lightest orange to deepest orange. Explain your reasoning.

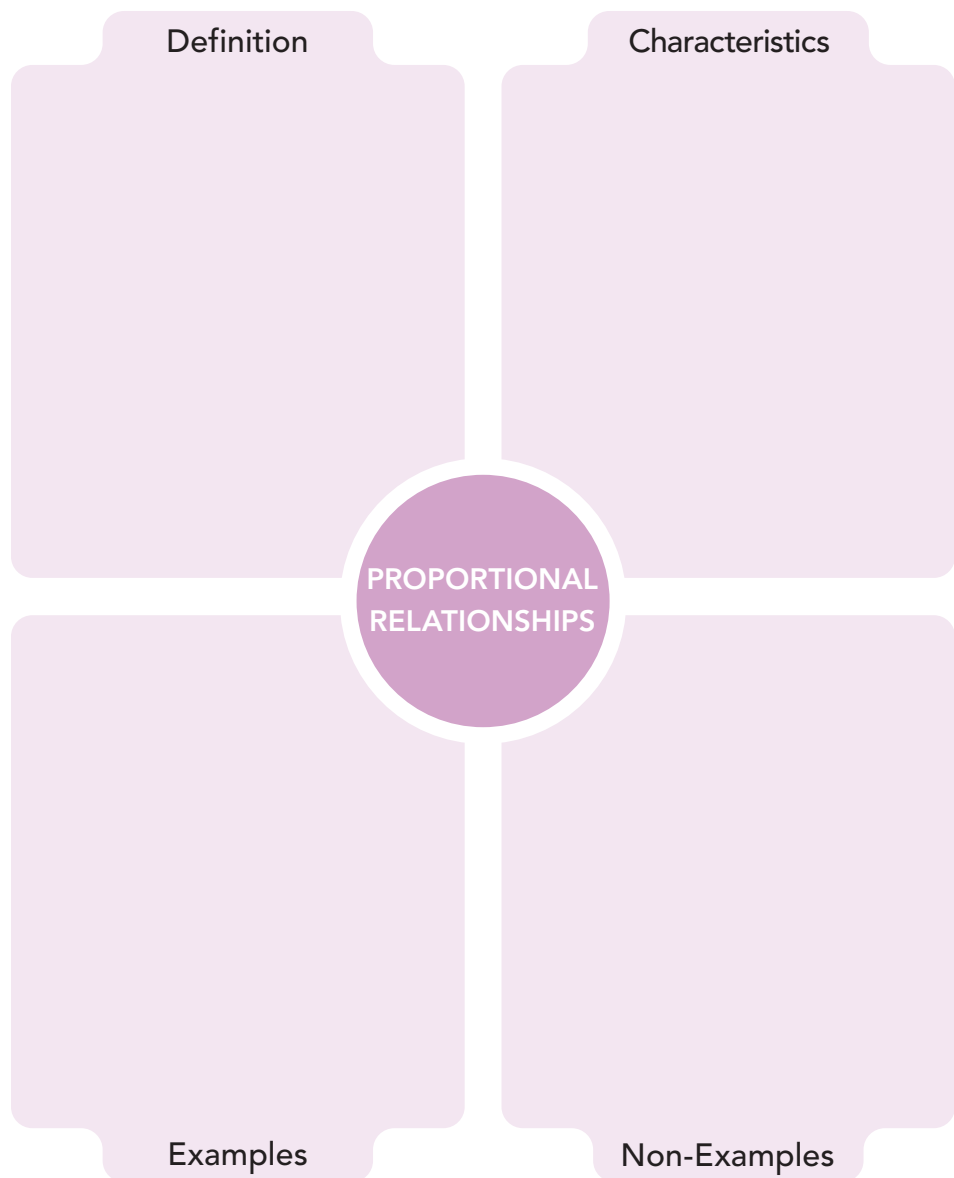
4. Write an equation, where x is the amount of red paint and y is the amount of yellow paint, that would create a shade of orange that is between the two deepest shades. Explain your reasoning.



TALK the TALK **Proportional Relationships**

All of the relationships in this lesson are examples of proportional relationships.

1. Complete the graphic organizer to summarize proportional relationships. Include characteristics, examples, and non-examples using tables, equations, and graphs.



Assignment

Write

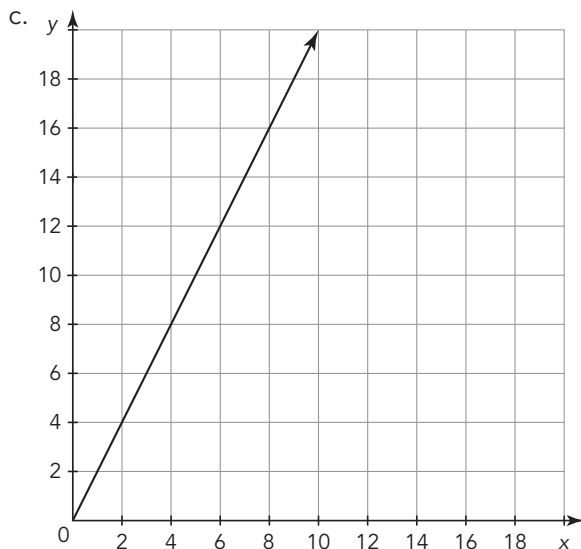
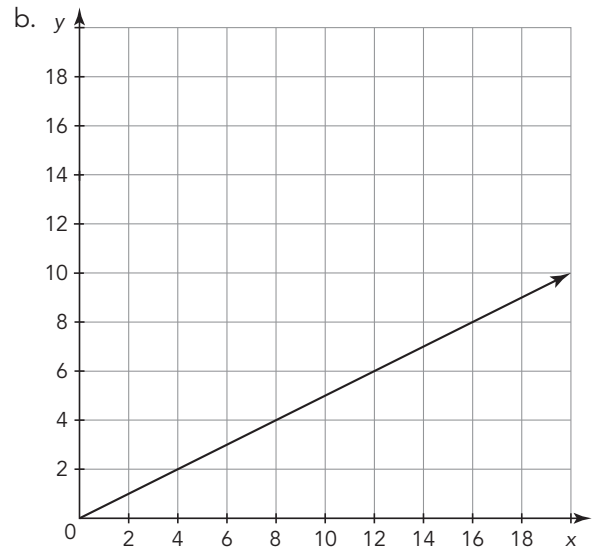
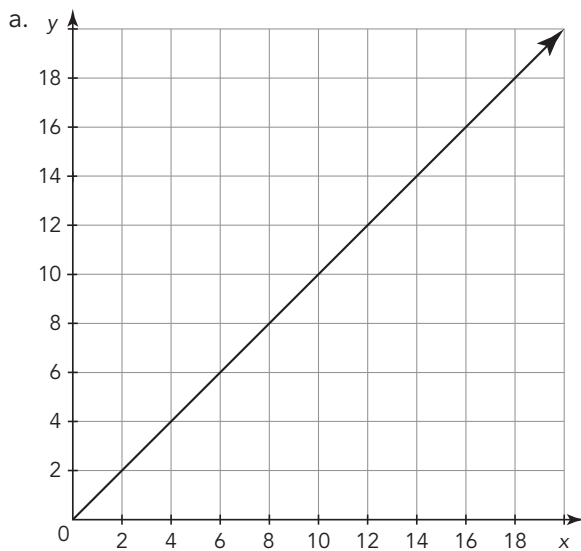
Explain how to compare proportional relationships represented in different forms.

Remember

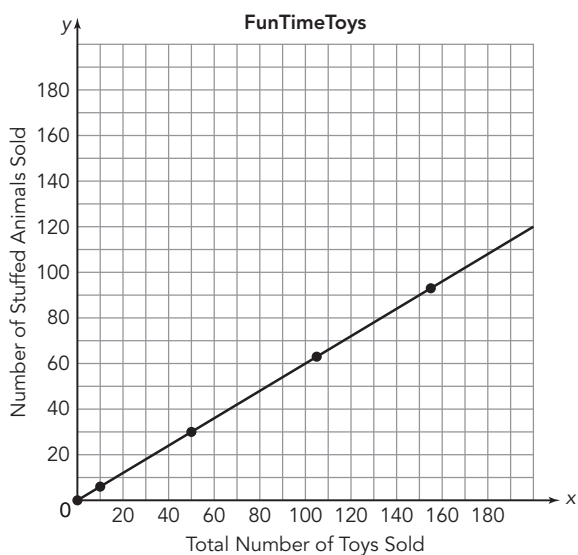
Proportional relationships can be represented using tables, graphs, and equations. In a table, all the ratios of corresponding x - and y -values must be constant. On a graph, a proportional relationship is represented as a linear graph passing through the origin. The equation for a proportional relationship is written in the form $y = kx$, where k is the constant of proportionality.

Practice

1. Determine the constant of proportionality represented in each graph.



2. Determine the constant of proportionality for each proportional relationship. Assume that y represents all of the outputs and x represents all of the inputs.
- a. $2x = 10y$ b. $\left(\frac{3}{5}\right)y = 8x$
c. $\frac{y}{10} = 10x$ d. $\left(\frac{1}{2}\right)x = y$
3. Melanie collects coins from all over the world. She is reorganizing her collection into coins from Europe and coins from other parts of the world. After sorting the coins, she comes to the conclusion that six out of every ten of the coins in her collection come from Europe.
- a. Write a ratio for the number of European coins to the total number of coins, the number of non-European coins to the total number of coins, and the number of European coins to the number of non-European coins.
- b. Melanie has 230 coins in her collection. Determine the number of European and non-European coins that she has in her collection.
- c. Melanie adds to her collection while keeping the same ratio of coins and now has 180 European coins. Determine the number of non-European coins and the total number of coins in her collection.
- d. Write an equation to determine the number of European coins, E , if Melanie has t total coins. Show your work and identify the constant of proportionality.
- e. Write an equation to determine the number of non-European coins, N , if Melanie has t total coins. Show your work and identify the constant of proportionality.
- f. Graph your equations from parts (d) and (e) on a coordinate plane. Label the axes of each graph.
4. Three competing toy stores review their inventory. FunTimeToys creates a graph to represent the relationship between the total number of toys sold and the number of stuffed animals sold. Toy Soldiers writes an equation and The Toy Box creates a table to represent the same information.



Toy Soldiers $y = \frac{1}{2}x$

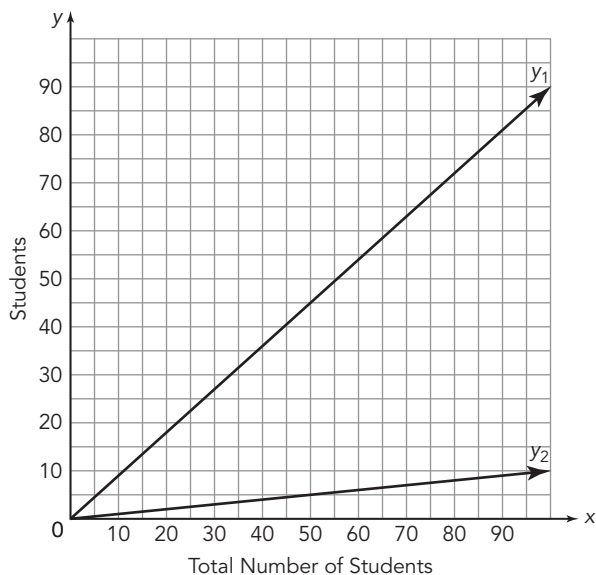
The Toy Box

| Total Number of Toys Sold | Number of Stuffed Animals Sold |
|---------------------------|--------------------------------|
| 0 | 0 |
| 12 | 8 |
| 54 | 36 |
| 102 | 68 |
| 156 | 104 |

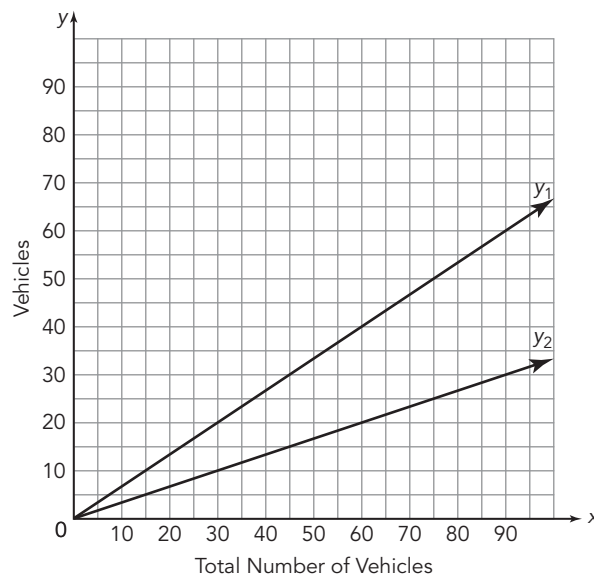
Fluffy Stuffy Stuffed Animals wants to sell their stuffed animals in a local toy store. In which store should they sell their products if they hope to make the most money? Explain your reasoning.

5. Analyze each scenario and graph.

A voice instructor notices that only one out of every ten of her students can sing soprano.



A store owner notices that in his parking lot, two out of every six vehicles are trucks.



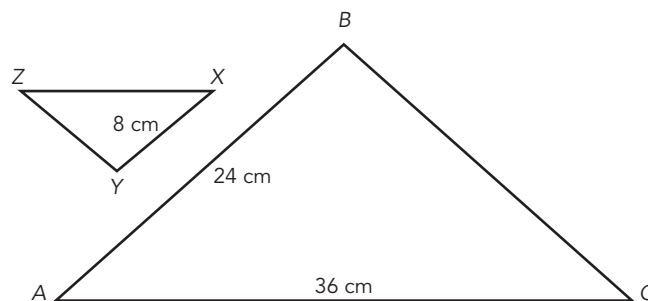
- Identify the proportional relationship represented by each line as it relates to the scenario. Explain your reasoning.
- Write an equation that has a constant of proportionality between those represented on the graph. Explain what relationship is represented by your equation.

Stretch

Consider the relationship between the side length of a square and the area of the square. Does this represent a proportional relationship? Use a table of values, equation, and graph to justify your answer.

Review

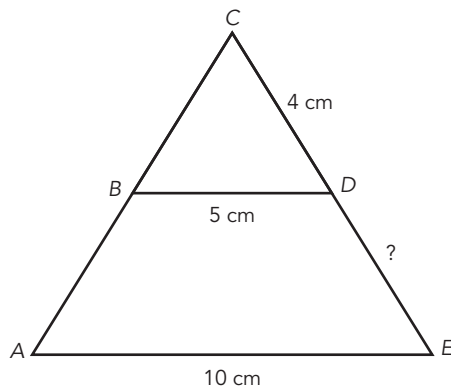
- In the diagram, $\triangle ABC \sim \triangle XYZ$. State the corresponding sides and angles.



2. In the diagram, $\overline{BD} \parallel \overline{AE}$.

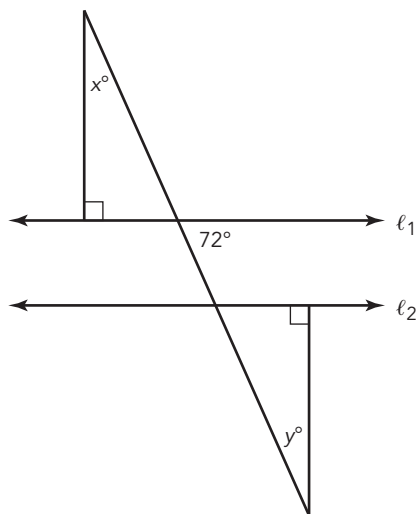
a. Explain why $\triangle BDC \sim \triangle AEC$.

b. Determine the length of \overline{DE} .

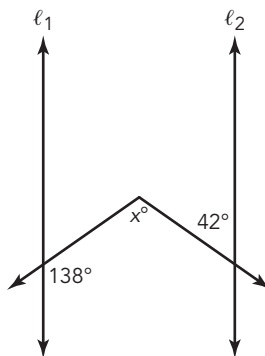


3. Solve for each unknown angle measure given that $l_1 \parallel l_2$.

a.

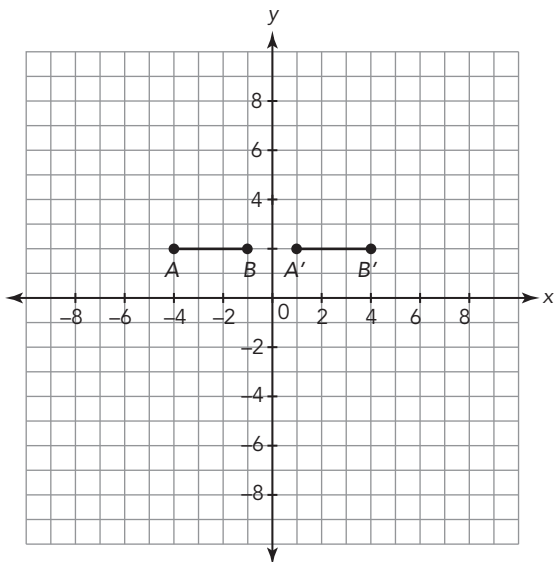


b.

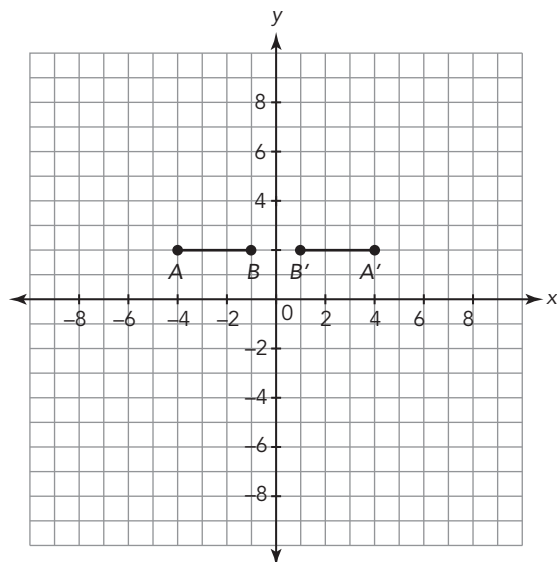


4. Describe a transformation or sequence of transformations to generate line segment $A'B'$ from original line segment AB .

a.



b.



Topic 1

From Proportions to Linear Relationships

Name _____ Date _____

I. Modeling with Integer Rates of Change

A. Solve each problem.

- 1.** Violet is trying to start an Intramural Club at her school. The principal tells her she must get signatures from students to show support. Each filled sheet contains 25 signatures.
 - a.** Write an equation to represent the number of signatures Violet gets given a certain number of filled sheets.
 - b.** The principal tells Violet she must have 7 sheets filled with signatures. If she fills all of these, how many signatures will she have in all?
 - c.** On Tuesday, Violet has 225 signatures. How many sheets has she filled?
 - d.** What is the unit rate in this situation? What does it represent?
- 2.** Ada has started a business making doghouses. Her local hardware store saw her work and wants to buy as many as she can build for \$45 per doghouse.
 - a.** Write an equation to represent the amount of money Ada receives given a certain number of doghouses built.
 - b.** Ada believes she can build 5 doghouses in a week. How much money will she receive from the hardware store if she meets this goal?
 - c.** Ada surpassed her goal and received \$360 from the hardware store. How many doghouses did she build?
 - d.** What is the rate of change in this situation? What does it represent?

- 3.** Marcos uses a fitness tracker to determine the number of calories he burns while running. He burns about 110 calories per mile of running.
- Write an equation to represent the number of calories Marcos burns given a certain number of miles he runs.
 - Marcos runs 5 miles on Saturday. How many calories did he burn while running?
 - After a run on Sunday, Marcos's fitness tracker shows he burned 385 calories. How many miles did he run?
 - What is the rate of change in this situation? What does it represent?
- 5.** Elizabeth wants to increase the number of kumquat trees in her orchard, which she has divided into equal size units of land. Each kumquat tree will take up four units of land.
- Write an equation to represent the number of units of land used given a certain number of kumquat trees planted.
 - Elizabeth plants 25 kumquat trees. How many units of land will be used?
 - If one hundred thirty-two units of land in the orchard are used for kumquat trees, how many kumquat trees did Elizabeth plant?
 - What is the unit rate in this situation? What does it represent?
- 4.** Dr. Betz, a vet, is running a free rabies clinic for her town. She estimates it will take her six minutes for each animal she treats.
- Write an equation to represent the time in minutes Dr. Betz works at the clinic given a certain number of animals treated.
 - After treating 11 animals, how many minutes has Dr. Betz worked at the clinic?
 - Dr. Betz has been working at the clinic 1 hour and 42 minutes. How many animals has she treated?
 - What is the constant of proportionality in this situation? What does it represent?
- 6.** Antonio works at the circus making balloon animals, charging \$3 for a balloon animal.
- Write an equation to represent the total amount Antonio receives for a certain number of balloon animals made.
 - Antonio sells twenty-one balloon animals by lunchtime. Determine the total amount of money he receives.
 - How many balloon animals would Antonio need to sell in order to make \$117?
 - What is the constant of proportionality in this situation? What does it represent?

Name _____ Date _____

- 7.** Russell will only read what he considers are “perfect books.” A perfect book has exactly 350 pages.
- Write an equation to represent the number of pages Russell reads given a certain number of “perfect books” read.
 - During July, Russell read 9 “perfect books.” How many pages did he read in July?
 - In August, Russell read a total of 5600 pages. How many “perfect books” did he read in August?
 - What is the unit rate in this situation? What does it represent?
- 9.** Michelle works at a souvenir shop, where she earns \$8 an hour.
- Write an equation to represent the amount Michelle earns given a certain number of hours she works.
 - Michelle worked 25 hours this week. How much did she earn?
 - If Michelle wants to earn \$300 next week, how many hours must she work?
 - What is the unit rate in this situation? What does it represent?
- 8.** For each painting that Alita’s art studio displays, she puts up two small signs interpreting the painting and presenting the painter’s biography.
- Write an equation to represent the number of signs Alita puts up given a certain number of paintings on display.
 - If there are 11 paintings on display, determine the total number of signs.
 - Alita put up 52 signs around the art studio. How many paintings are on display?
 - What is the rate of change in this situation? What does it represent?
- 10.** Autumn creates custom bracelets as a hobby and sells them for \$7.00 per bracelet.
- Write an equation to represent the amount of money Autumn makes given a certain number of bracelets sold.
 - Autumn sells 10 bracelets. How much money does Autumn make?
 - Autumn has made \$126. How many bracelets has she sold?
 - What is the rate of change in this situation? What does it represent?

- 11.** Hunter has lost his locker combination. It takes him 10 seconds to try each of the combinations he can think of.
- Write an equation to represent the number of seconds that have passed given a certain number of combinations tried.
 - Hunter has tried 30 combinations. How many minutes has he spent trying combinations?
 - It took Hunter five and a half minutes to open his locker. How many combinations did he try?
 - What is the rate of change in this situation? What does it represent?
- 12.** A computer keyboard manufacturer needs to keep track of the number of keyboards produced and the number of square buttons used in the process. Each keyboard needs fifty-five square buttons for letters, numbers, punctuation, and other functions.
- Write an equation to represent the number of square buttons used to produce a certain number of keyboards.
 - An assembly machine produced 28 keyboards in an hour. How many square buttons were used?
 - Another assembly machine used 3300 square buttons during production. How many keyboards did it produce?
 - What is the constant of proportionality in this situation? What does it represent?

Name _____ Date _____

II. Modeling with Fractional Rates of Change

A. Solve each problem.

1. Stephen is making curtains for several windows in his aunt's house. He determines that he needs 8.5 yards of fabric for each window.
 - a. Write an equation to represent the number of yards of fabric needed given a certain number of windows.
 - b. Stephen counts 9 windows downstairs in his aunt's house. How much fabric will he need to make curtains for those windows?
 - c. Stephen orders 161.5 yards of fabric for all the windows in his aunt's house. How many windows are in his aunt's house?
 - d. What is the rate of change in this situation? What does it represent?
2. Melissa is given a bunch of nickels as her change after buying a snack. To figure out how much money she has been given, she starts counting the nickels.
 - a. Write an equation to represent Melissa's total change in dollars given a certain number of nickels received.
 - b. Melissa has counted 6 nickels so far. How much change is this in dollars?
 - c. Melissa was supposed to get back \$0.45 in change. If she received correct change, how many nickels should she have received?
 - d. What is the constant of proportionality in this situation? What does it represent?

- 3.** A citizen's group pays Ryan to collect signatures to stop a local park from being sold to an industrial developer. He earns \$0.15 per signature.
- Write an equation to represent how much money Ryan earns given a certain number of signatures collected.
 - How much will Ryan earn if he collects 60 signatures?
 - How many signatures did Ryan collect if he earned \$35.25?
 - What is the rate of change in this situation? What does it represent?
- 5.** Takira is a translator who was hired to translate documents for a legal firm. In order to meet her deadline, she can only spend $\frac{1}{2}$ hour on each document she translates.
- Write an equation to represent the number of hours spent on the project given a certain number of documents translated.
 - If Takira completes 14 documents on Tuesday, how many hours has she spent on the project?
 - By the time she reaches her deadline, Takira has worked 19 hours on the project. How many documents did she translate?
 - What is the constant of proportionality in this situation? What does it represent?
- 4.** Walter is swimming laps during swim team practice. He knows it takes him about 1.75 minutes to swim each lap.
- Write an equation to represent the total time in minutes Walter swims given a certain number of laps.
 - Walter's coach asks him to swim 16 laps. How many minutes did he swim?
 - At the end of swim team practice, Walter had been swimming for a total of 38.5 minutes. How many laps did he swim?
 - What is the unit rate in this situation? What does it represent?
- 6.** The Drama Club is selling small bags of popcorn at an outdoor movie to raise money for their club. The club raises \$3.75 for each bag it sells.
- Write an equation that represents the total amount raised by the club given a certain number of bags of popcorn sold.
 - The club sells 215 bags of popcorn before intermission. How much money did it raise?
 - At the end of the movie, the club had raised \$1200. How many bags of popcorn did it sell?
 - What is the unit rate in this situation? What does it represent?

Name _____ Date _____

- 7.** Maria plants a tree and waters it every day with $\frac{1}{3}$ gallon of water.
- Write an equation that represents the total number of gallons of water the tree receives given a certain number of days since being planted.
 - How much water has the tree received 9 days after being planted?
 - As of today, Maria's tree has received $5\frac{1}{3}$ gallons of water. How many days has it been since the tree was planted?
 - What is the rate of change in this situation? What does it represent?
- 9.** Coach Antonio is forming a baseball team. The tryouts are tough. The coach predicts that only $\frac{2}{3}$ of the players trying out will make the team.
- Write an equation to represent the number of players who are predicted to make the team given a certain number of players who try out.
 - If there were eighty-one players who tried out, how many players are predicted to make the team?
 - If the coach's prediction is true and twenty-four players actually make the team, how many players tried out?
 - What is the unit rate for this situation? What does it represent?
- 8.** Ebony runs laps around the track at school. Each lap is 0.25 mile.
- Write an equation to represent the total distance in miles Ebony runs given a certain number of laps.
 - Ebony has finished 8 laps so far. How far has she run?
 - Ebony's pedometer says that she has run a total of 2.5 miles since she started running laps. How many laps has she run?
 - What is the unit rate in this situation? What does it represent?
- 10.** Felix opens a brand new savings account to store money earned at his new part-time job. At this new job he gets a weekly paycheck of \$140 and he plans to deposit \$32.75 from each paycheck he gets.
- Write an equation to represent the amount of money saved given a certain number of deposits.
 - How much money will be in Felix's savings account after he makes 15 deposits?
 - How many deposits will Felix need to make in order to save a total of \$786?
 - What is the rate of change in this situation? What does it represent?

- 11.** For her consulting business, Joanna frequently drives to other cities to visit clients. Her frequent traveler pass allows her to pay a discounted toll rate of \$0.10 per mile on the toll road.
- Write an equation to represent the amount of the toll bill given a certain number of miles driven on the toll road.
 - Joanna travels one hundred eighty miles on the toll road. Determine her toll bill.
 - On one trip, Joanna paid \$6.50 in tolls. How many miles did she travel on the toll road?
 - What is the rate of change in this situation? What does it represent?
- 12.** Inez is the head coach of the Rockford IceHogs. She is trying to calculate the number of games the IceHogs need to win to make the playoffs. The team has not played very well this season and she predicts they will win $\frac{1}{8}$ of their remaining games.
- Write an equation to represent the number of games the team is predicted to win given a certain number of games played.
 - If the IceHogs play 32 more games, how many of those games does the coach predict they will win?
 - If the coach's prediction comes true and the IceHogs win five games, how many more games did they play this season?
 - What is the rate of change for this situation? What does it represent?

Name _____ Date _____

III. Modeling using the Distributive Property over Division

A. Solve each problem.

1. Noah is going to purchase two items at an electronics store. The first is a computer for which Noah will be in debt for \$550. He is still trying to decide how much he wants to spend on the second item, a printer. The bank has offered him 4 months of no interest. How much will he owe each month if he is in a 4-month payment plan, making equal payments each month?
 - a. Write an equation to represent the amount Noah will owe each month given a certain price for the printer.
 - b. If the printer purchase adds \$170 of debt, how much will he owe each month?
 - c. If Noah pays \$160 each month by participating in the bank's plan, how much debt is added for the printer purchase?
 - d. What is the rate of change in this situation? What does it represent?

2. The Harrison campsite has 10 volleyball courts. Every year, all the campers are invited to participate in a volleyball competition, but typically several of the campers opt out of playing and come to watch instead. The camp director divides the willing participants evenly among the courts where they decide who will play on what team. This year, there are 110 campers at the site.
 - a. Write an equation to represent the number of campers per court given a certain number of campers who opt out.
 - b. How many participants will be playing on each court if 40 campers decide to opt out of the competition and watch?
 - c. If six campers will be playing on each court, how many campers opted out?
 - d. What is the rate of change in this situation? What does it represent?

- 3.** For the past 5 weeks, Santo has saved his allowance. He received 300 dollars in allowance, but he paid his little brother to do his chores for him.
- Write an equation to represent the amount Santo saved per week given a certain amount paid to his brother.
 - If he paid his brother a total of \$50, how much did he save each week?
 - If he saved \$42 per week, how much did he pay his brother?
 - What is the rate of change in this situation? What does it represent?
- 5.** Your school is getting more balances to use in the science labs. The school already had 25 balances. All of the balances must be distributed evenly across the 5 labs.
- Write an equation to represent the number of balances per lab given a certain number of additional balances received by the school.
 - If your school gets 60 more balances, how many will each lab get?
 - How many balances would your school need to receive to reach the goal of 19 balances per lab?
 - What is the rate of change in this situation? What does it represent?
- 4.** You would like to find the average change in a stock value for 2 consecutive days. On Day 1 the stock decreased by \$2.
- Write an equation to represent the average change in value given a certain change in value on Day 2.
 - What is the average change in value if the stock decreases by \$6 on Day 2?
 - If the average change in value is a decrease of \$2, what was the change in value of the stock on Day 2?
 - What is the rate of change in this situation? What does it represent?
- 6.** Michael donates clay to his local school's art program. The school already has 65 pounds of clay. The clay is evenly distributed among 5 art students.
- Write an equation to represent the number of pounds of clay each student receives given a certain number of pounds of clay donated by Michael.
 - If Michael donates one hundred ninety-five pounds of clay, how many pounds of clay are given to each student?
 - How many pounds of clay did Michael donate if each student is given forty-one pounds of clay?
 - What is the rate of change in this situation? What does it represent?

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- 7.** A local radio DJ has chartered 2 buses for a trip to the Rock and Roll Hall of Fame. The first one hundred tickets won their seats via a radio call-in contest, but the DJ is selling bus tickets to other interested rock fans. The DJ plans to distribute passengers evenly among the 2 buses.
- Write an equation to represent the number of passengers per bus given a certain number of bus tickets sold.
 - If 56 bus tickets are sold, how many passengers will ride on each bus?
 - If the capacity of each bus is 88 passengers, how many tickets can the DJ sell in order to fill both buses completely?
 - What is the rate of change in this situation? What does it represent?
- 8.** Mary breaks down paper products for a recycling company. Mary can typically break down about 100 pounds of paper in an hour. She had been given a large bin of paper products to work on this morning, but since she is only working part-time today, she gave 300 pounds of the paper to a co-worker.
- Write an equation to represent the time in hours it takes Mary to break down the paper products given a certain number of pounds of paper she started with.
 - How many hours will it take Mary to process the remaining items if she started with seven hundred pounds of paper products?
 - If Mary processes the remaining items in three hours, how many pounds of paper products was she originally given?
 - What is the rate of change in this situation? What does it represent?

- 9.** The Glenwood Lightning youth soccer team always has orange slices as their half-time snack. Another team had 12 orange slices left-over from their snack, so they gave the orange slices to the Glenwood Lightning. At half-time, the other team's left-over orange slices and all the orange slices brought by the parents of the team members were divided equally among the 8 players on the team.
- Write an equation to represent the number of orange slices each player will get given a certain number of orange slices brought by the parents of the team members.
 - The parents brought 44 orange slices. Determine how many slices each player got.
 - If each player was given 6 orange slices, determine how many orange slices the parents brought.
 - What is the rate of change in this situation? What does it represent?
- 10.** The waste water coming out of a factory is stored in a concrete pool where the sun can evaporate 7 tanks of water before Saturday. On Saturday, 2 identical valves are opened in the bottom of the pool to empty it into a river. Inspectors are interested in the amount of water drained per valve this way.
- Write an equation to represent the number of tanks drained per valve given a certain number of tanks of waste water put into the pool before Saturday.
 - If 39 tanks of waste water were put into the pool this week, then how many tanks per valve were drained?
 - How much waste water would have to be produced to result in 12 tanks per valve drained?
 - What is the rate of change in this situation? What does it represent?

Name _____ Date _____

- 11.** You are the bookkeeper for a small business. At the end of each month, you are required to total the amount of payments the business receives and distribute the money evenly to the 3 business accounts. In the first week of the month the business receives a total of \$1260 in payments.
- Write an equation to represent the amount of money added to each account given a certain amount of money received after the first week.
 - During the second week, the business receives another \$1830 in payments. How much will be added to each of the businesses accounts so far this month?
 - At the end of the month, a total of \$1430 had been added to each account. How much was received in payments after the first week of the month?
 - What is the rate of change in this situation? What does it represent?
- 12.** Estelle is making 6 charm bracelets. She bought several packs of charms that she plans to distribute evenly among the 6 bracelets. However, after she opened the packs, she noticed that 24 of the charms were either damaged or broken.
- Write an equation to represent the number of charms Estelle can put on each bracelet given a certain number of original charms.
 - If Estelle had a total of one hundred two charms to begin with, how many did she attach to each bracelet?
 - If Estelle uses thirty charms for each bracelet, how many charms did she start with?
 - What is the rate of change in this situation? What does it represent?