

Getting to the Core

Math 6

Ratios & Proportional Relationships

Updated: May 8, 2013

Student Name _____ Period _____

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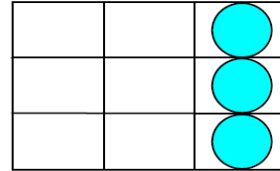
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Candies

This problem gives you the chance to:

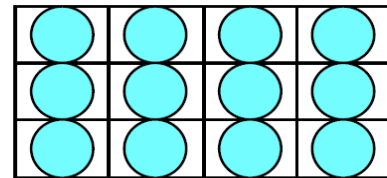
- work with fractions and ratios

1. This is Amy’s box of candies.
She has already eaten 6 of them.



What fraction of the candies has Amy eaten? _____

2. Valerie shares some of the 12 candies from this box.
She gives Cindy 1 candy for every 3 candies she eats herself.



How many candies does she give to Cindy?
Show how you figured this out. _____

3. In a packet of mixed candies there are 2 fruit centers for every 3 caramel centers.
There are 30 candies in the packet.

How many caramel centers are there?
Show how you figured this out. _____

4. Anthony makes candies.
First, he mixes 1 cup of cream with 2 cups of chocolate.
In all, he uses 9 cups of these two ingredients.
How many cups of chocolate does he use in this candy recipe? _____

Explain how you figured this out.

LINFLOWER SEEDS

This problem gives you the chance to:

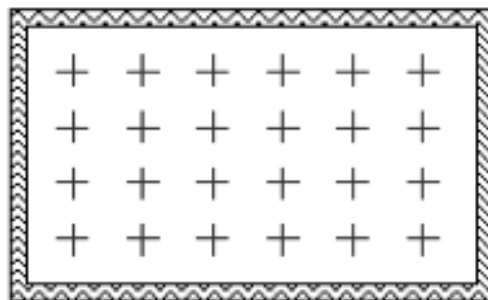
- show your understanding of proportional reasoning.

Tim grows linflowers from seeds. But not all of his seeds start to grow.

He has found that for every 100 seeds he sows, only about 75 start to grow.

1, Tim sows 20 linflower seeds. How many would you expect to start to grow? Explain your reasoning.

2. Tim sows 24 seeds in a box. Each cross marks the position of a seed.

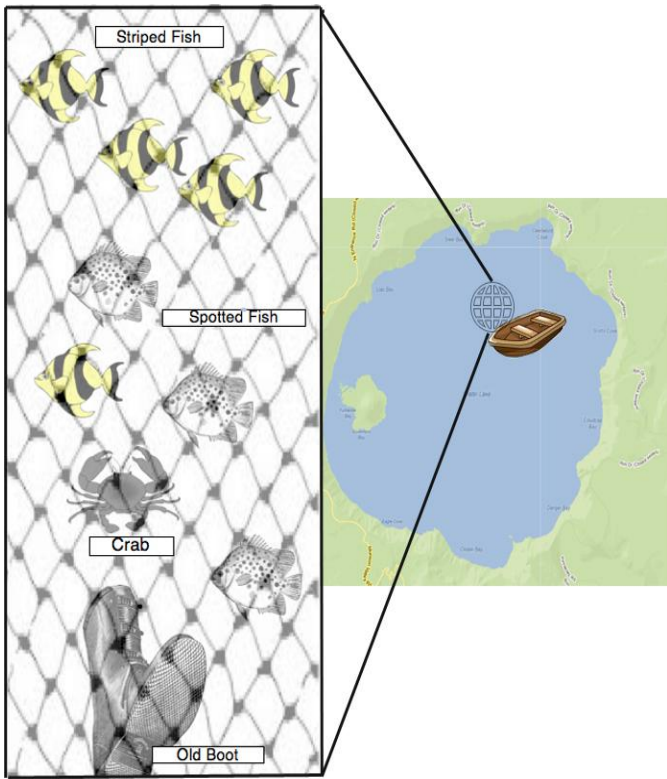


Guess which of the seeds start to grow. Draw circles around the crosses to show the seeds which do **not** start to grow. There is more than one correct answer to this question.

Explain your reasoning.

The Fishing Net

Part 1:



Scientists are concerned about the striped fish that live in this lake and want to investigate the biotic (living) organisms and the abiotic (non-living) factors in the lake. They decided to study an area of the lake to help them hypothesize about the condition of the entire lake.

They went fishing with a net in the lake. The diagram on the left shows a map of the lake and what they caught in the area of the circle on the map. Record your observations below.

- I see _____ striped fish; _____ spotted fish, _____ crab(s), and _____ in the net.
- I see _____ biotic (living) organisms and _____ abiotic (non-living) factors in the net.

Part 2: What can we learn from the net above? Use the diagram to answer questions 1 – 4 below.

1. There are _____ striped fish and _____ spotted fish in the net.
 - a. How does the number of striped fish compare with the number of spotted fish caught?

 - b. How could this sample help scientists predict the relationship between the striped fish and the spotted fish in the entire lake?

 - c. With the above information, can you make a prediction of the number of striped fish and spotted fish in the entire lake? Explain your reasoning.

2. There are _____ crabs and _____ items total in the net.
 - a. How many crabs are there compared to all of the items in the net?

b. Can this comparison help you predict the relationship between crabs and fish in the entire lake? Explain.

3. There are _____ living things and _____ non-living things in the net.

a. How many living things are there compared to non-living things in the net?

b. What can we conclude about the relationship between living and non-living things in the net? In the entire lake? Explain your reasoning.

4. How do the living things compare with the total number of items in the net? Using this relationship between the things in the net, what might we conclude about the relationship between living and non-living things in the entire lake? Explain your reasoning.

Part 3: Collaborative Discussions:

1. If scientists used their net many more times to fish the entire lake, what do you think they might catch? Predict how many striped fish, spotted fish, crabs, and non-living things you think we could count then? Explain your thinking.

_____ striped fish _____ spotted fish _____ crabs _____ non-living things

2. Knowing what we have sampled from the net, if scientists believe that a healthy lake should have at least two striped fish for each spotted fish, and at least five striped fish for every two crabs, what might we learn about the entire lake from what we see in the net?

3. Share your answers with your team. Be prepared to answer the following questions.

a. Look at questions 1 & 2. What are some differences or similarities in your answers compared to your group.

b. What are some common methods you and your group used in this activity?

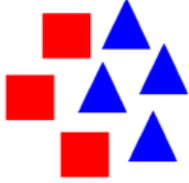
4. With your team, discuss and predict the math topic that we are about to investigate. Explain your thoughts.

Ratio Exploration

Use the discussion frames provided to help communicate your thoughts, ideas or questions.

Part 1: With a partner, answer questions 1 & 2 below.

1. Use the diagram below to answer the following questions:



a. Compare the number of squares to the number of triangles.

b. Compare the number of triangles to the number of squares.

c. What is the difference between the two questions above?

d. Can you make another comparison? Describe.

2. There are _____ girls and _____ boys in the classroom.

List 3 possible questions that could be asked using this information.

1. _____

_____.

2. _____

_____.

3. _____

_____.

Part 2: Main Idea: With a partner or in your group, answer the following question.

1. Where do you encounter similar comparisons in your everyday life? Provide at least 3 examples.

Definition of Ratio**Part 1:****What is Ratio?**

- A **ratio** is a comparison of two values or amounts.
- **Example:** If there are 13 boys and 15 girls at the Youth Club in your school, the **ratio** of
 - Girls to boys is 15 to 13
 - Boys to girls is 13 to 15
 - Girls to the club is 15 to 28
 - Boys to the club is 13 to 28.

How to represent a Ratio?

- There are multiple ways to represent Ratios:
 - Write "to"
 - Write : (colon)
- From the example given on the left, the ratio of girls to boys can be represented as
 - 15 to 13; say: 15 to 13
 - 15:13; say: 15 to 13
- Interpretation:
For every 15 girls in the club, there are 13 boys.

Part 2: Synthesizing Ratios

You have explored and hypothesized Ratios through Ratio Exploration and Definition of Ratios activities. During that work, you learned how to compare, read, and represent two quantities. With your team member, state your new understanding of Ratios. _____

Part 3: Collaboration: Now, with your team, apply your understanding of Ratio to answer problems 1 – 6 below.

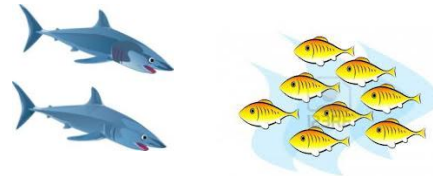
1. Use the diagram below, answer questions a & b.



a. What is the ratio of circles to stars? Express your answer using all of the above representations.

b. Fill in the blank:
For every _____ circles there are _____ squares.

2. Use the diagram below, answer questions a & b.















a. What is the ratio of sharks to fish? Express your answer using all of the above representations.

b. Fill in the blank:
For every _____ shark (s) there are _____ fish.

<p>3.</p> <p>a. What is the ratio of short haired students (shorter than shoulder length) to long haired students (longer than shoulder length) in your class? Express your findings in multiple representations.</p> <p>b. For every _____ there are _____.</p>	<p>4.</p> <p>a. What is the ratio of solid colored backpacks to multiple colored (or designed) backpacks in the classroom? Express your findings in multiple representations.</p> <p>b. For every _____ there are _____.</p>
---	---

5. Using the information in the table below:
- Create 4 ratio questions.
 - Include solutions for each problem, providing at least 2 representations for each ratio.

Question	Solution
1. What is the ratio of _____ to _____?	
2.	
3.	
4.	

6. Use the previous problems as a guide to create your own situation that involves ratios. Please also include all possible questions to the problem and be prepared to answer them.

Part 4: Ratio Definition Comprehension

<p>Definition in your own words</p>	<p>Facts/ Characteristics (Symbols, representations)</p>
<p>Examples (What does a ratio look like? – model, illustration, diagram)</p>	<p>Non-Examples (What does a ratio not look like?)</p>

Ratio

Ratios with M&Ms

Name _____ Period _____

Complete the following for questions 1-3.

- Write the ratios in two ways (using : and “to”)
- Fill in the sentence frame : For every _____ there are _____.

1. What is the ratio of blue M&M’s to green M&M’s?



2. What is the ratio of yellow M&M’s to red M&M’s.




3. What is the ratio of green and brown M&M’s to the ratio of yellow and red M&M’s.

4. Model the ratio 3:1. Use colored pencils to demonstrate three possible ways of representing the ratio.

5. Model the ratio 2 to 5. Use colored pencils to demonstrate 4 possible ways of representing the ratio.

Precision of Ratios

Part 1: In your group, discuss the following problems. Make sure all representations of Ratios are expressed in the table.

Diagram / Context	Ratio represented by "to"	Ratio represented by ":"	Ratio represented by " _ "
1. Write the ratio of circles to triangles. 	5 to 2	5:2	$\frac{5}{2}$
2. Write the ratio of triangles to circles. 	2 to 5	2:5	$\frac{2}{5}$
3. Write the ratio of hexagons to triangles. 			
4. Write the ratio of even numbers to odd numbers. 11, 9, 8, 4, 22, 10			
5.	2 to 7		$\frac{2}{7}$
6.		1 : 5	

Part 2: Discussion Points: (Answer the following questions with your group).

1. How many different ways are there to represent Ratios? List them.

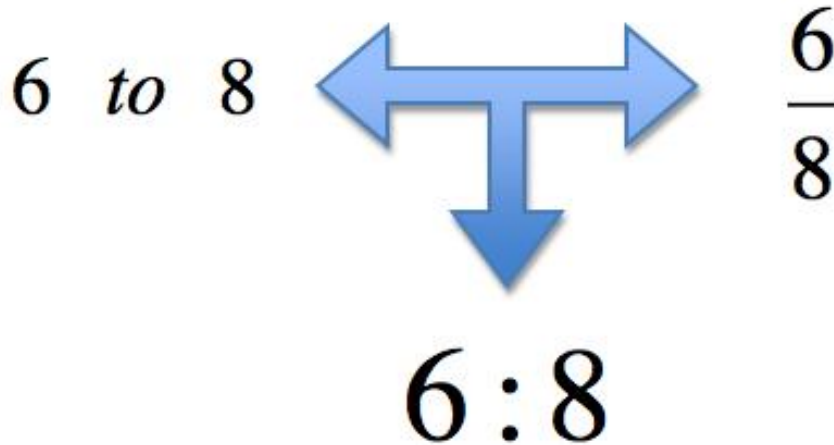
2. If you're given one representation, can you come up with the rest of the representations? Explain how.

Part 3: Problems 1 – 4 below. On your own or with a partner, complete the chart below.

Diagram / Context	Ratio represented by "to"	Ratio represented by ":"	Ratio represented by "—"
1. The ratio of pencils to markers in Raquel's backpack is 3 to 8.			
2. The ratio of iPhones being used by teenagers to iPhones produced is 120 to 133.			
3.		2:11	
4.			$\frac{9}{2}$

Generalization with Ratios

Part 1: With your partner, discuss the diagram.



In your own words, explain the meaning of the diagram above.

Part 2: Expressions of Ratios

What is Ratio?

- A **ratio** is a comparison of two values or amounts.
- Ratio is an expression to compare *part to whole*, *part to part*, or *whole to part*.
- **Example:** There are 13 boys and 15 girls in the Youth Club in your school, the **ratio** of
 - *part to part:* Girls to boys is 15 to 13
 - *part to part:* Boys to girls is 13 to 15
 - *part to whole:* Girls to the club is 15 to 28
 - *whole to part:* The number of members to boys is 28 to 13.

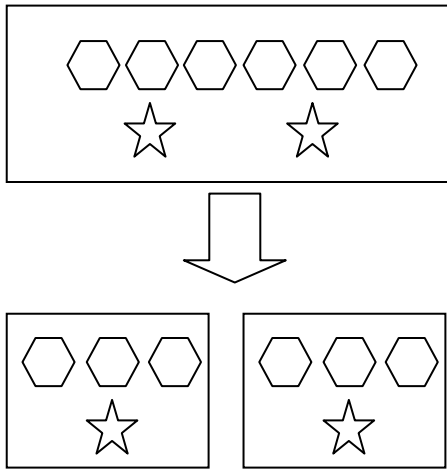
How to represent Ratios?

- There are multiple ways to represent Ratios:
 - c. Write “to”
 - d. Write : (colon)
 - e. Or write a fraction
- From the example given on the left, the ratio of girls to boys can be represented as
 - c. 15 to 13; say: 15 to 13
 - d. 15:13; say: 15 to 13
 - e. $\frac{15}{13}$; say: 15 to 13
- Interpretation:
For every 15 girls in the club, there are 13 boys.

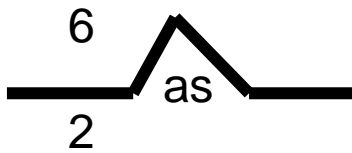
1. With your partner, write a “new learning” from the explanation above. Explain.

Part 3: In groups, discuss what is happening in the diagrams below and complete the bridge maps. Afterwards, answer the questions at the bottom of the page.

Diagram 1

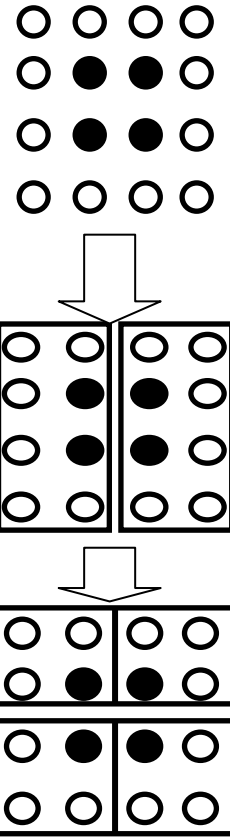


Hexagon

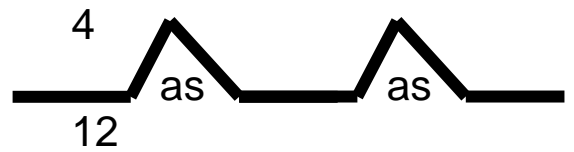


Star

Diagram 2



Filled



Explain what happens when a ratio can be divided into equal groups. _____



The ratio of strawberries to blueberries is 50 to 10. What is the end result after grouping? Explain your answer. _____

Preparing the Learner - Check Up Assignment

1. Write which operation you would use for the following problem and set up the operation.

Mrs. Quintero shared \$60 between her three children at Disneyland.

Operation: _____

Set up: _____

2. Write a word problem that can be answered with the following computation $120 \div 6$.

3. Divide 525 by 5

4. What is the difference between $20 \div 4$ and $4 \div 20$? Explain your answer.




5. Calculate $233 \div 7$ (Round your answer to the nearest tenth)

6. John sells a bag of 12 oranges for \$4.85. How much is each orange? (Round to the nearest cent)

Preparing the Learner – Conceptual Understanding and Skill Practice

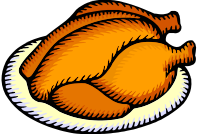


HOW MUCH DOES EACH ITEM COST?

Complete the following table. (Round to the nearest cent)

<p>1. 3 cupcakes for \$6.00</p> 	<p>2. 6 oranges for \$3</p> 	<p>3. 10 pens for \$15</p> 
<p>How much does each cupcake cost? Work this out mentally if you can.</p>	<p>How much does each orange cost? Work this out mentally if you can.</p>	<p>How much does each pen cost? Work this out mentally if you can.</p>
<p>What operation did you use to calculate this?</p>	<p>What operation did you use to calculate this?</p>	<p>What operation did you use to calculate this?</p>
<p>Set up the problem mathematically.</p>	<p>Set up the problem mathematically.</p>	<p>Set up the problem mathematically.</p>
<p>Compute the problem, showing all the steps.</p>	<p>Compute the problem, showing all the steps.</p>	<p>Compute the problem, showing all the steps.</p>

Preparing the Learner – Conceptual Understanding

Complete the following table. (Round to the nearest cent)

<p>4. 12 ounces of chicken for \$14.24</p> 	<p>5. 6 lb. of almonds for \$24.96</p> 	<p>6. A store sells glue sticks for \$2.78 for a pack of four.</p> 
<p>What operation will you use to find the price of one ounce?</p>	<p>What operation will you use to find the price of one pound?</p>	<p>What operation will you use to find the price of one glue stick?</p>
<p>Set up the problem mathematically.</p>	<p>Set up the problem mathematically</p>	<p>Set up the problem mathematically</p>
<p>Compute the problem, showing all steps.</p>	<p>Compute the problem, showing all steps.</p>	<p>Compute the problem, showing all steps.</p>

Preparing the Learner – Conceptual Understanding

Complete the following table. (Round to the nearest cent)

7. Sedgeway is selling 6 sodas for \$9.

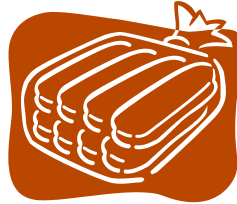


Set up the problem to find the cost of each soda.

Compute showing all steps.

How much does each soda cost?

8. Yummy is selling a bag of 8 hot dog buns for \$2.85.



Set up the problem to find the cost of each bun.

Compute showing all steps.

How much does each bun cost?

Preparing the Learner – Division Skills

Try these division problems on your own now. (Round to the nearest cent/hundredth where needed)

1. $387 \div 3$

2. $9248 \div 6$

3. $856 \div 8$

4. $\$9.37 \div 4$

5. $584 \div 7$


6. $4814 \div 12$

7. $\$37.05 \div 9$

8. $\$601.99 \div 11$

Preparing the Learner – Application of Division

Complete the following table.

Word Problem	<p>1. Make up a word problem for the expression $\\$2 \div 8$</p>	<p>2. Make up a word problem for the expression $\\$0.60 \div 4$</p>	<p>3. Make up a word problem that involves the operation of division for the picture below.</p>
Illustrate the expression			
	<p>What is the question?</p>	<p>What is the question?</p>	<p>What is the question?</p>
	<p>Answer the question.</p>	<p>Answer the question.</p>	<p>Answer the question.</p>

6.RP-2.1a
Rates Opening Problem

Name _____ Period _____

Directions: With your Group read about Hector's situation. Then come up with a reasonable time estimate for the scenario and explain your group's approach to this problem.



On Friday afternoon Hector's teacher told him he needed to finish reading his library book by Monday. Hector is wondering how he will ever finish the book in just one weekend.

According to a reading assessment that his teacher gave him, Hector knows that he can read approximately 150 words in 3 minutes.

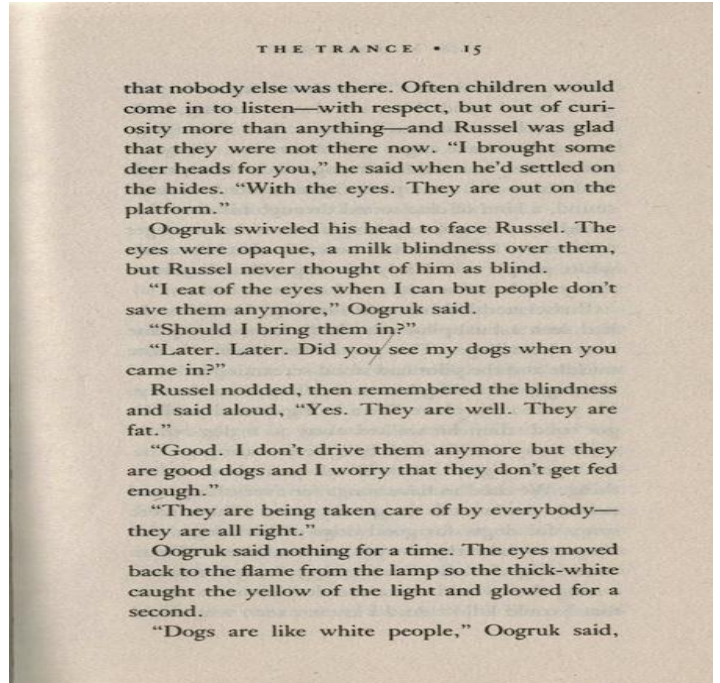
Hector had already read a little of the book. He's on page 15; the page is shown on the right. The book has a total of 205 pages.

With your group, think about how long it should take Hector to read the rest of the book. Come up with a plan to find a reasonable time estimate. Put your plan into action.

Approximately how many **hours** will it take Hector?

Do you think he will finish? _____




Explain what your group did to make your estimate.



Work Space:

Rates Exploration

Part 1: Directions: With you team, discuss and predict the following scenarios. Explain your reasoning (either by writing your thought or using the double-sided number line below).

<p>1) Given the ratio of \$3.50 per bag of five apples.</p>  <p><i>Predict:</i></p> <p>a) the cost of giving 30 students each an apple.</p> <p>b) the number of bags that \$28.00 can buy.</p> <p>c) the number of apples you can buy with \$28.00.</p>	<p>2) Given the ratio of seats: wheels on a tricycle is 1:3.</p>  <p><i>Predict:</i></p> <p>a) the number of wheels for 2 tricycles.</p> <p>b) the number of seats for 12 wheels.</p>
<p>3) Edwin runs two laps in 12 minutes.</p>  <p><i>Predict:</i></p> <p>a) The number of laps he could run in an hour.</p> <p>b) The time it would take to run one lap.</p> <p>c) The time it would take to run three laps.</p>	

Part 2: With your team, discuss and answer the following question.

4) What method did you develop for working out these problems? Explain. Did anyone in your group find a different method? If not, can you find a different way?

Part 1: Definition of Rates

Rates are ratios that remain equivalent as the value of the units change.

With a partner, come up with some examples of Rates.

Part 2: Synthesizing Rates

1. You have explored and hypothesized Rates through Rates Exploration and Definition of Rates activities. During that work, you learned how to compare, read, and represent two quantities. With your team member, state your new understanding of Rates.




2. List and describe (in 2 sentences) the methods that were used in Rates Explorations assignment.

Double-sided Number Line: (use student language to define.)

3. With you group, list, discuss, and write all methods you and your team members have used to solve Rates problems. Please be as descriptive and detailed as possible.

Part 3: Charts and Tables

There are multiple ways to solve a math problem. It is important to learn as many ways to solve a problem as possible in order for you to critique the understanding and explanation of others. Please see below another tool that could be used in solving Rates problems, called a **Chart or Table**. With your team, solve the following problems using both representations: Double-sided Number Line and Table.

<u>Problem</u>	<u>Double-sided Number Line</u>	<u>Table Representation</u>												
 <p>1) Given a ratio of pedals to handle bars on a tandem bicycle is 4:2. Predict... a)...the number of handle bars to 28 pedals. b)...the number of 20 handle bars to pedals.</p>		<table border="1"> <thead> <tr> <th data-bbox="1182 373 1336 457"><u>Handle Bars</u></th> <th data-bbox="1336 373 1490 457"><u>Pedals</u></th> </tr> </thead> <tbody> <tr> <td data-bbox="1182 457 1336 548">1</td> <td data-bbox="1336 457 1490 548">2</td> </tr> <tr> <td data-bbox="1182 548 1336 638">2</td> <td data-bbox="1336 548 1490 638">4</td> </tr> <tr> <td data-bbox="1182 638 1336 728">3</td> <td data-bbox="1336 638 1490 728">6</td> </tr> <tr> <td data-bbox="1182 728 1336 819">10</td> <td data-bbox="1336 728 1490 819">20</td> </tr> <tr> <td data-bbox="1182 819 1336 909">20</td> <td data-bbox="1336 819 1490 909">40</td> </tr> </tbody> </table>	<u>Handle Bars</u>	<u>Pedals</u>	1	2	2	4	3	6	10	20	20	40
<u>Handle Bars</u>	<u>Pedals</u>													
1	2													
2	4													
3	6													
10	20													
20	40													
 <p>2) A bag of 3 avocados costs \$2.40. Find... a)...the number of avocados you can purchase with \$12.00. b)...the number of avocados you can purchase with \$8.00. c)...the number of avocados you can purchase with \$4.80 . d)...the cost for 11 avocados.</p>														
 <p>3) My showerhead has a maximum flow rate of 5 gallons every two minutes. If you shower for... a)...20 minutes, how much water have you used? b)...<u>20 minutes a day</u>, how much water do you use in a week? (hint: 7 days a week)</p>														

4) Create a rate problem using the given table.

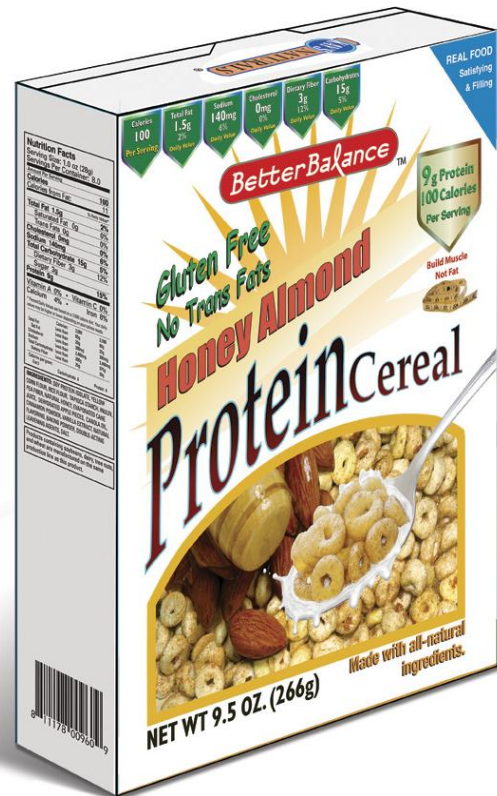
<u>Hours</u>	<u>Dollars</u>
1	
2	\$22.00
	\$27.50
5	\$55.00
11	

Part 4: Rates Definition Comprehension

Definition in your own words	Facts/characteristics
Examples	Non-examples

Rates

Directions: Read the situation below with your partner(s). Be prepared to discuss your thoughts.



You are at the supermarket shopping for your favorite cereal and you come across two options: a 12 oz (340 g) box that costs \$4.50 and a 9.5 oz (266 g) box for \$3.75.

3.



a. Which is a better deal?

b. How do you know? Explain your decision. Be ready to share why.

Brand A
\$3.75 for 20oz

Brand B
\$4.50 for 30oz

4.



Albert traveled 300 miles in 5 hours.



Benny traveled 250 miles in 4 hours.

a. Who is driving faster?

b. How do you know? Explain your decision. Be ready to share why.

5.	You are shopping for a new car. Which car will save you the most money in overall fuel costs?		
	Car A	Car B	Car C
Miles on a full tank of gas	340 miles	286 miles	320 miles
Tank Size	12 gallons	10 gallons	11 gallons

a. Which car is more fuel-efficient?

b. How do you know? Explain your decision. Be ready to share why.

Part 2: Hypothesize: With a partner or in your group, discuss and answer the following questions.

What is/are methods that you and your team members used in solving this type of problems? What is the method that is being used across these problems?

Part 1: Definitions

Rate Definition: A rate is a ratio that compares two quantities measured in different units.

Unit Rate Definition: A unit rate is a rate that has a denominator of 1.

Example: On average a person blinks a hundred times in four minutes. How many times does a person blink in one minute?

Solution: The unit rate is 25 blinks per minute.

Part 2: Synthesizing:

1. You have explored and hypothesized Rates through Unit Rate Exploration and Definition of Unit Rate activities. During that work, you learned how to read, make sense of the problems, and show solution to make the best decision. With your team member, state your new understanding of Unit Rates.

2. List and describe (in 2 sentences) the methods that were used in finding Unit Rates.

3. With you group, list, discuss, and write all methods you and your team members have used to solve Unit Rate problems. Please be as descriptive and detailed as possible.

Part 3: In your group show your understanding of Unit Rates by showing solution and answer to the following problems.

<p>1. John works 6 hours a day and earns \$150.00. Peter works 8 hours a day and earns \$160.00. Who earns more money per hour?</p>	<p>2. A box of 2 light bulbs costs \$5.96. A box of 3 light bulbs costs \$8.85. Which box is the better buy?</p>
<p>3. Cindy travels 10 miles in 40 minutes. Maria travels 15 miles in 30 minutes. Who is traveling faster?</p>	<p>4. Sergio's 3 acre property has 318 trees while Nick's 5 acre property has 525 trees. Who has the most trees per acre?</p>
<p>5. Six yards of rope costs \$5.50 while four yards costs \$4.75. Which has the lower unit price?</p>	<p>6. Three bunches of flowers can be bought for \$9.48. Four bunches can be bought for \$10.64. Which is the better buy?</p>

Part 4: With a partner, create a scenario where Unit Rate is applied. Be prepared to present to the whole group or class. (write worked out solutions on a separate piece of paper)

Use the space below for any diagrams or extra information.

Fray Model

Part 5: Unit Rate Definition Comprehension

Definition in your own words	Facts/characteristics
Examples	Non-examples

Unit Rate

6.RP-Generalization.a

Sorting Activity

Directions: Cut out each of the following problems into 12 strips.

- 1.) At the Santa Ana Zoo there are twelve monkeys for every three anteaters. If the Santa Ana Zoo is 20 acres and the San Diego Zoo is 100 acres, how many monkeys and anteaters are at the San Diego Zoo?

- 2.) If Luis can type 168 words in 4 minutes, what is his speed per minute?

- 3.) If a 16 oz jar of peanut butter costs \$8.00 and a 26 oz jar of peanut butter costs \$12.00, which would be the best deal?

- 4.) In the American flag there are 7 red stripes for every 6 white stripes. How many red stripes and white stripes are there in 120 American flags?

- 5.) If a frog can hop 48 feet in 4 seconds, how many feet can it hop per second?

- 6.) A bus drove 265 miles from Los Angeles to Las Vegas in 4 hours. If it traveled at a constant speed, how many hours will it take to travel to Salt Lake City from Las Vegas given that the distance from Las Vegas to Salt Lake City is 425 miles?

- 7.) Maribel sold some boxes of Girl Scout cookies. For every boy there were three girls that bought her cookies. She has sold cookies to 10 boys. How many girls does she expect to buy her cookies?

6.RP-Generalization.a

Sorting Activity

Directions: Cut out each of the following problems into strips.

- 8.) For every 4 two-point shots Kobe Bryant made, he made three three-point shots. If he makes 60 two-point shots, what can you conclude about the number of three-point shots he made last year?
- 9.) A car can travel 80 miles in 5 hours. How many miles can the car travel in one hour?
- 10.) Students attend school 180 days every year. What is the number of days students attend school compared to the number of days students do not attend school.
- 11.) Fifteen quarts of motor oil costs \$60. How much will you have to spend for 20 quarts?
- 12.) Represent the number of triangles to the number of circles in the diagram below.

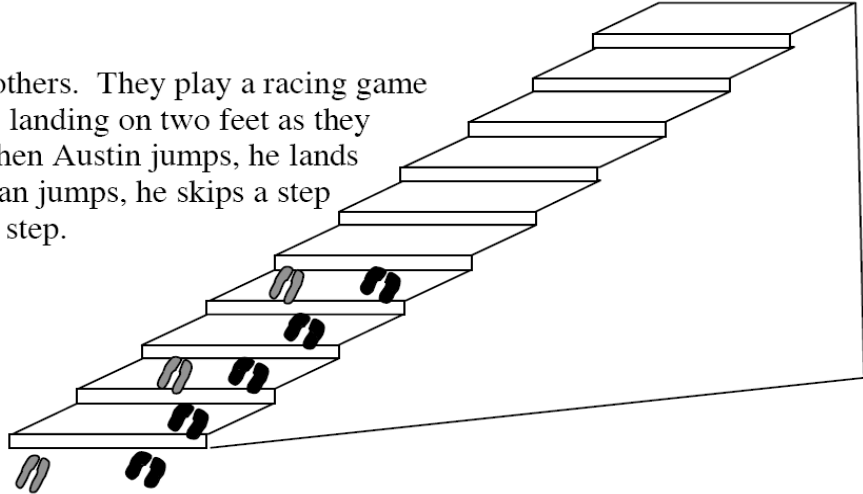


Problem of the Month

First Rate

Level A

Dylan and Austin are brothers. They play a racing game up the stairs. They jump landing on two feet as they race up the staircase. When Austin jumps, he lands on each step. When Dylan jumps, he skips a step and lands on every other step.



1. Who has to take more jumps to get to the top of the stairs?
2. When Dylan jumps up the staircase, how many jumps does he make?
3. When Austin jumps up the staircase, how many jumps does he make?
4. If Austin and Dylan each took 5 jumps, who would be farthest up the stairs?
5. At the end of the race who took less jumps?
6. Who do you think won the race? Explain your answer.

Level B

Tom and Diane start to race. Tom took 4 seconds to run 6 yards. Diane ran 5 yards in 3 seconds.



If they continued to run at the same speeds, who would get to 30 yards first? Show how you figured out.

Who runs faster? How can you compare their speeds?

Level C

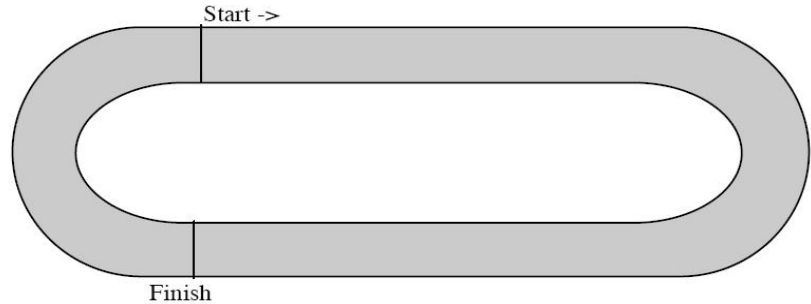
The Environmental Club at school attends an annual community clean-up event. They have recycling games. A team is assigned an area of land that is scattered with litter. The goal is for a pair of participants to clean up the area in the fastest time possible.



Tammy, working alone, could clean one-half the area in one hour. Her partner Melissa, working alone, could clean one-third of the area in one hour. During the contest when they work together, how long will it take them to clean the area? Explain how you found your solution.

Level D

You are an Olympic runner. You have just qualified to be in the finals of the 1,500-meter race. The track is 400 meters in an oval shape. The race is three and three-fourth laps around the track.



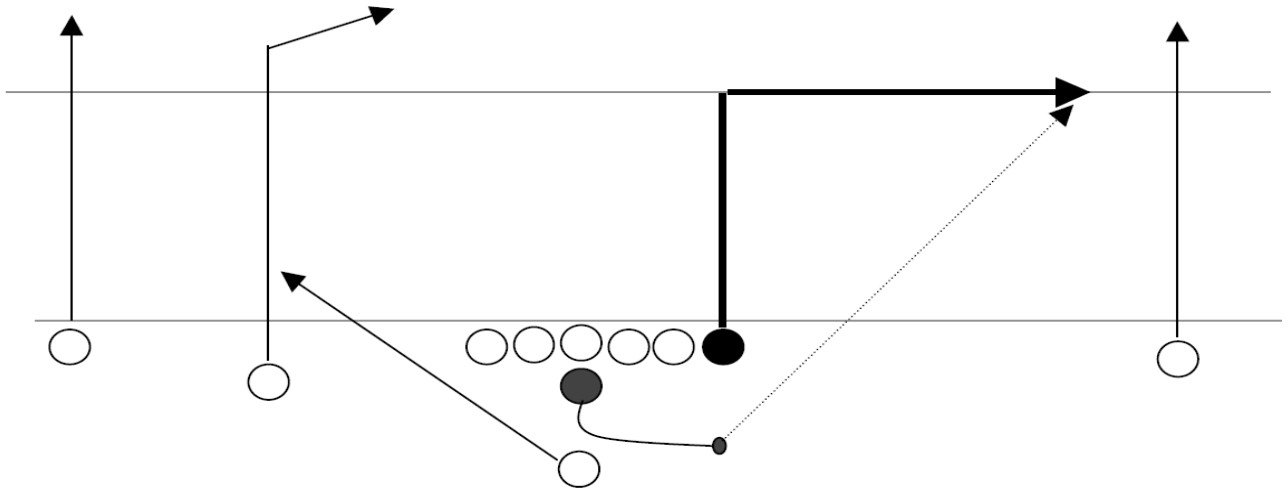
The favorite to win the race is a Kenyan, who holds the current best time, which is 3 minutes 29.4 seconds. The Kenyan runs a very steady race. Each of the Kenyan's lap times (400 meters) are within a second of each other.

You run a completely different type of race. You have a very strong kick, which means you usually lag behind for the first three laps to save energy and then when the leader has 300 meters to go you pour it on to win at the tape. You like to save energy in the first three laps, but you don't want to be more than 50 meters behind when you start your kick to the finish line.

Determine your strategy to win this race. What is the average speed you need to run the first part of the race? What is the average speed you need to run during your kick to win the race? How might your race change if the Kenyan runs two seconds faster?

Level E

It is third down, ten yards to go for a first down. The quarterback calls his favorite play, a roll out to the right and a square out pass to his tight end. See the diagram of the play below:



On the snap from center, the tight end runs straight ahead for ten yards, makes a sharp right turn and runs towards the side lines. The quarterback rolls to his right and stops directly behind where the tight end began, but six yards behind the line of scrimmage. The quarterback does not make the pass until after the tight end makes his break towards the sidelines. The tight end is running towards the sideline at a speed of 8 yards/sec. The quarterback tracks the receiver deciding when to throw the pass and the flight path of the ball. If the tight end makes the catch 12 yards after the break, how far does the quarterback throw the pass (in straight line) and at what rate is the distance between the receiver and quarterback changing?

Suppose the quarterback threw the pass sooner, and the receiver is running at the same speed. The distance the ball traveled was 17.3 yards. How many yards after the break was the ball caught and at what rate is the distance between the receiver and quarterback changing?

Given the constant speed of the receiver, consider several locations where the square out pass could be completed. Explain the relationship between the spot of the completion, the distance of the pass and at what rate is the distance between the receiver and quarterback changing?

Snail Pace

This problem gives you the chance to:

- work with distances, time and speeds in inches and minutes

These snails move very slowly. Here are their speeds.

Snail A
5 inches in 10 minutes

Snail B
3 inches in 20 minutes

Snail C
1 inch in 15 minutes

Snail D
6 inches in 30 minutes



1. How far can snail D travel in 1 hour? _____ inches

2. How far can snail C travel in half an hour? _____ inches

3. How far can snail B travel in 2 hours? _____ inches
Show how you figured this out.

4. Which snail moves more quickly than the others? _____
Explain how you figured this out.
