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| **Grade/Subject** | Grade 6/ Mathematics |
| **Unit Title** | Unit 3: Rates and Ratios |
| **Overview of Unit** | Understand ratio concepts and use ratio reasoning to solve problems. |
| **Pacing** | 26 days |

| **Background Information For The Teacher** |
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| **Connections to other grade levels:** A formal study of ratio and proportional relationships is only provided in grades 6 and 7. In 6th grade, students develop the concept of ratio and rate reasoning. In 7th grade, students focus heavily on proportions and proportional reasoning. In this unit, the focus is to connect ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems. This unit is the student's first introduction to percent which is described to them as a rate per 100. Students have not had any experience with ratio and rate in previous grades.<br>A ratio is a comparison of any two quantities which can be written as a to $b$, $\frac{a}{b}$, or $a:b$.<br><br>A rate is a ratio where two measurements are related to each other. When discussing measurement of different units, the word rate is used rather than ratio. Understanding rate, however, is complicated and there is no universally accepted definition. When using the term rate, contextual understanding is critical. Students need many opportunities to use models to demonstrate the relationships between quantities before they are expected to work with rates numerically.<br><br>A ratio is not always a comparison of part to whole; it can be part to part or whole to whole or whole to part. Fractions and part-to-whole ratios both represent a comparison of parts to wholes. This is the overlapping area when fractions are also ratios. Fractions are NOT ratios in terms of part-to-part or rate comparisons.<br><br>A unit rate emphasizes finding an equivalent ratio with a denominator of one.<br><br>A unit rate compares a quantity in terms of one unit of another quantity. Students will often use unit rates to solve missing value |

problems. Cost per item or distance per time unit are common unit rates, however, students should be able to flexibly use unit rates to name the amount of either quantity in terms of the other quantity. Students will begin to notice that related unit rates are reciprocals as in the first example. It is not intended that this be taught as an algorithm or rule because at this level, students should primarily use reasoning to find these unit rates.

A table requires the ability to use a multiplicative relationship to extend an initial ratio to equivalent ratios. When working backward, use the inverse operation, division. The table, when plotted on a coordinate plane, appears as a linear relationship. You can graph ordered pairs in ratio tables to solve problem.

In fifth grade, students will have:

- Analyzed patterns and relationships
- Created and used equivalent fractions
- Interpreted multiplication as scaling

Valuable site for creating number lines: http://www.math-aids.com

**Essential Questions (and Corresponding Big Ideas )**

*What is ratio and rate reasoning?*

- Ratios are not numbers in the typical sense. They cannot be counted or placed on a number line. They are a way of thinking and talking about relationships between quantities.

*How does a ratio help us to compare quantities?*

- A ratio helps us to understand the relationship between those two quantities.

*How does multiplication and division help us to understand ratios concepts and apply it to problem solving?*

- Reasoning about multiplication & division is critical to the understanding of ratio concepts & their application to solving real world problems.

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| **Core Content Standards** | **Explanations and Examples** |

**6.RP.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.**

*For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*

In this standard, students learn to compare two quantities or measures such as 6:1 or 10:2. These comparisons are called ratios. Students discover that ratios can be written and described in different ways. For instance, 6:1 uses a colon to separate values. Ratios can also be stated with words such as 6 to 1, or as a fraction such as 6/1. Standard 1 focuses on understanding the concept of a ratio, however, students should use ratio language to describe real-world experiences and use their understanding for decision-making.

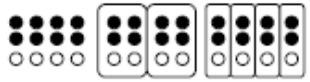
What the **teacher** does:

- Help students discover the ratio is a relationship or comparison of two quantities or measures. Ratios compare two measures of the same types of things such as the number of one color of socks to another color of socks or two different things such as the number of squirrels to birds in the park. Ratios compare parts to a whole (part:whole) such as 10 of our 25 students take music lessons. Ratios can also compare a part of one whole to another part of the same whole (part:part) such as the ratio of white socks in the drawer to black socks in the drawer is 4:6. Rations are expressed or written as a to b, a:b, or a/b.
- Compare a model ratio with real-world things such as pants to shirts or hot dogs to buns. Ratios can be stated as the comparison of 10 pairs of pants to 18 shirts and can be written as 10/8, 10 to 18 and simplified to 5/9, 5 to 9, or 5:9. Ensure that students understand how the simplified values relate to the original numbers.
- Ask students to create or find simple real-world problems to use in their leaning such as, "There are 2 Thoroughbred horses and 6 Appaloosas horses in the field. As a ratio of Thoroughbreds to Appaloosas it is 2/6 or 2 to 6 or 2:6 or simplified as 1/3, 1 to 3, or 1:3. Or there are 14 girls and 18 boys in our math class. As a ratio of girls to boys it is: 14/18, 14 to 18, or 14:18 or simplified as 7/9, 7 to 9, 7:9." Invite students to share their real-world examples of ratios and use ratio language to describe their finding such as, "for every vote

**6.RP.1.** A ratio is a comparison of two quantities which can be written as *a* to *b*, $\frac{a}{b}$, or *a:b*.

A rate is a ratio where two measurements are related to each other. When discussing measurement of different units, the word rate is used rather than ratio. Understanding rate, however, is complicated and there is no universally accepted definition. When using the term rate, contextual understanding is critical. Students need many opportunities to use models to demonstrate the relationships between quantities before they are expected to work with rates numerically.

A comparison of 8 black circles to 4 white circles can be written as the ratio of 8:4 and can be regrouped into 4 black circles to 2 white circles (4:2) and 2 black circles to 1 white circle (2:1).



Students should be able to identify all these ratios and describe them using "For every…., there are …"

What the **students** do:

- Understand that a ratio is a comparison between quantities.
- Determine when a ratio is describing part-to-part or part-to-whole comparison.
- Decide ratio relationships between two quantities using ration language.
- Use the different ration formats interchangeably (4: 5, 4 to 5, 4/5)

Misconceptions and Common Errors:

Some sixth graders may confuse the order of the quantities such as when asked to write the ratio of boys to girls in the sentence, "There are 14 girls and 18 boys in our math class." Instead of writing 18:14, some students may write 14:18. Other students may not recognize the difference between a part-to-part and a part-to-whole ratio such as, "There are 14 girls compared to 18 boys in the class (14:18 part-to-part); however, 14 of the 32 students in our class are girls (14:32 part-to-whole)." To address these common misconceptions, ask students to label the quantities they are comparing such as 14 girls/18boys.

candidate A received, candidate C received nearly three votes." The problems students select or write can also be used as cyclical reviews with distributed practice throughout the school year.

- Focus on the vocabulary terms, ratio, compare, and simplify.

**6.RP.2. Understand the concept of a unit rate *a/b* associated with a ratio *a:b* with *b* ≠ 0, and use rate language in the context of a ratio relationship.**

*For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger." (Expectations for unit rates in this grade are limited to non-complex fractions.)*

This standard focuses student learning on the concept of a unit rate as a special kind of ratio. Students compare different units of measure such as the amount of money, earned to the hours worked while babysitting and calculate unit rates by setting up ratios and simplifying them. Students understand situation in ratio form and write the unit that describes units or measures.

What the **teacher** does:

- Begin by exploring the difference between a ratio and a rate. Rate is a special ratio that compares two quantities with different units of measure. Share multiple examples for students to make sense of the concept for rate such as, "LaShanda babysat for $35 for 7 hours." Or, "Dad's new truck got 400 miles on 20 gallons of gas." Then explore the unit rate that expresses a ration as part-to-one. Generate examples such as "LaShanda is paid a unit rate of $5 per 1 hour for babysitting (5:1)" and "My dad's new truck gets 20 miles per gallon of gas (20:1)."
- Ask students to locate and share real-world examples of cost per item or distance per time in newspapers, ads, or other media. (Note that in sixth grade, students do not work with unit rates expressed as complex fractions. Both the numerator and denominator of the original ration will be whole numbers.)
- Model how to convert rates from fraction form to word form using per, each, or @ such as 360 miles/12 gallons of gas = 30 miles per gallon of gas. Allow students to talk with each other and their

6.RP.2. A unit rate compares a quantity in terms of one unit of another quantity. Students will often use unit rates to solve missing value problems. Cost per item or distance per time unit are common unit rates, however, students should be able to flexibly use unit rates to name the amount of either quantity in terms of the other quantity. Students will begin to notice that related unit rates are reciprocals as in the first example. It is not intended that this be taught as an algorithm or rule because at this level, students should primarily use reasoning to find these unit rates.

In Grade 6, students are not expected to work with unit rates expressed as complex fractions. Both the numerator and denominator of the original ratio will be whole numbers.

Examples:

• On a bicycle you can travel 20 miles in 4 hours. What are the unit rates in this situation, (the distance you can travel in 1 hour and the amount of time required to travel 1 mile)?

Solution: You can travel 5 miles in 1 hour written as $\frac{5\ mi}{1\ hr}$ and it takes $\frac{1}{5}$ of a hour

teacher to make sense of what they are learning and then write and share several rate conversion examples of their own.

- Focus on the following vocabulary terms: ratios, rates, unit rates, compare, and per/@. Math journals or exit slips at the end of math class with writing prompts such as "An example of a ratio and a problem that goes with it is ..." provide closure.
- Provide cyclical, distributed practice over time to continually review simple unit rate problems.

**6.RP.3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.**

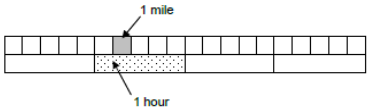
**a. Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.**

**b. Solve unit rate problems including those involving unit pricing and constant speed.** *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*

**c. Find a percent of a quantity as a rate per 100 (e.g., 30 percent of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.**

**d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing**

to travel each mile written as $\frac{\frac{1}{5}\,hr}{1\,mi}$. Students can represent the relationship between 20 miles and 4 hours.




• A simple modeling clay recipe calls for 1 cup corn starch, 2 cups salt, and 2 cups boiling water. How many cups of cornstarch are needed to mix with each cup of salt?

What the **students** do:

- Understand rate as a ratio that compares two quantities with different units of measure.
- Understand that unit rates are the ratio of two measurements or quantities in which the second term means "one" such as 60 miles per one hour.
- Interpret rate language with the @ symbol or with the words per and/or each.
- Solve unit rate problems.

Misconception and Common Errors:
Students often confuse the terms ratio, rate, and unit rate. Try using a paper foldable with vocabulary definitions to help student with these confusing terms. To make the foldable, divide an 8 ½ x 11 inch sheet of blank paper in half horizontally. Then fold it into thirds as if a letter is being folded to fit an envelope. Unfold an write a term on each of the sections. On the inside of the foldable, write the definitions that match each term. Students may want to cut on the vertical fold lines to flip up each section to practice the definitions.

**6.RP.3.** Examples:

• Using the information in the table, find the number of yards in 24 feet.

| Feet | 3 | 6 | 9 | 15 | 24 |
|---|---|---|---|---|---|
| Yards | 1 | 2 | 3 | 5 | ? |

There are several strategies that students could use to determine the solution to this problem.

o Add quantities from the table to total 24 feet (9 feet and 15 feet); therefore the number of yards must be 8 yards (3 yards and 5 yards).

o Use multiplication to find 24 feet:

1) 3 feet x 8 = 24 feet; therefore 1 yard x 8 = 8 yards, or

**quantities.**

In these standards the students use reasoning about multiplication and division to solve a variety of ratio and rate problems about quantities. They make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. They use tables to compare ratios and solve unit rate and constant speed problems. Problems involving finding the whole given a part and the percent such as 20% of a quantity means 20/100 are also a focus. For these standards, students can use equivalent ratio tables, tape diagrams, double number lines, or equations. Students connect ratios and fractions.

What the **teacher** does:

- Explore ratios and rates used in ratio tables and graphs to solve problems. Pose a ratio situation problem with students such as "3 CDs cost $45. What would 8 CDs cost? How many CDs can be purchased for $150.00?" To solve the problem, students can use ratios, unit rates, and multiplicative reasoning by creating and filling in the missing values on a chart. They should note that if three Cs cost $45, one CE will cost $15. Every CD purchased is an additional $15. $15 times the number of CDs=the cost. They write an equation such as C=$15n.

| # of CDs | Cost |
|---|---|
| | |
| | |
| 3 | $45 |
| | |
| | |
| | |
| | |
| 8 | ?? |

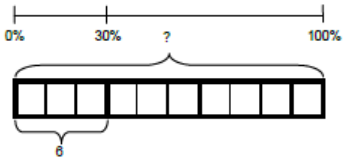
- Ask students to plot the points on a coordinate plane and draw conclusions about what is happening with the problem above. Students should reason that for every one movement to the right on the x-axis, the y-axis increase to 15x. Also, for every one movement to the left on the x-axis, the y-axis decreases by 15.
- Investigate unit rate problems, including unit pricing such as, "Quick Stop has 12 oz drinks for $.99. Stop Here has 16 oz drinks for $1.19. Which drink costs the least per ounce?" Assign students to create ratio and rate reasoning examples to compare and solve real-world problems. Students could use newspapers, store ads, or online ads

2) 6 feet x 4 = 24 feet; therefore 2 yards x 4 = 8 yards.

• Compare the number of black to white circles. If the ratio remains the same, how many black circles will you have if you have 60 white circles?

| Black | 4 | 40 | 20 | 60 | ? |
|---|---|---|---|---|---|
| White | 3 | 30 | 15 | 45 | 60 |

• If 6 is 30% of a value, what is that value? (Solution: 20)




• A credit card company charges 17% interest on any charges not paid at the end of the month. Make a ratio table to show how much the interest would be for several amounts. If your bill totals $450 for this month, how much interest would you have to pay if you let the balance carry to the next month? Show the relationship on a graph and use the graph to predict the interest charges for a $300 balance.

| Charges | $1 | $50 | $100 | $200 | $450 |
|---|---|---|---|---|---|
| Interest | $0.17 | $8.50 | $17 | $34 | ? |

What the **students** do:

- Create and interpret a table of equivalent ratios.
- Plot pairs of values from a table to a coordinate plane.
- Use a table to compare ratios and find missing values using ratios.
- Explain the difference between a ratio and unit rate.
- Understand that rate problems compare two different units such as revolutions per minute.
- Solve real-world problems using ratios and rates.

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to find the examples and make the comparisons. Ask students to use reasoning to determine the better buys.<br>
• Explore find a percent of a quantity as a rate per 100 such as 40% of quantity means 40/100 times the quantity. Nothing that percent is a re per 100, model how a percent can be represented with a hundreds grid by coloring in 40 units. Have students write this as a fraction (40/100), as a decimal (0.40), and as a percent (40%). Consider using a percent wheel or use double number lines and tape diagrams in which the whole is 100 to find the rate per hundred.<br>
• Solve problems involving finding the whole, given a part and the percent such as, “What is 40% of 60? 80% of what number is 300? Or 50 is 30% of what number?<br>
• Examine the process of how to use ratio reasoning to convert measurement units such as, “How many centimeters are in 5 feet?” Use the information that 1 inch = 2.54 centimeters. Represent the conversion of 12 inches = 1 ft as a conversion factor in ration form, 12-inches/1 foot. Then multiply 12 inches/1 foot x 5 ft/1 = 60 inches. Then 60 inches x 2.54 cm/1 inch = 152.4 cm.<br>
Note: Conversions can be made between units within a measurement system such as inches to feet or between systems such as miles to centimeters.<br>
• Allow students to talk with each other and their teacher to make sense of what they are learning.<br>
• Focus on the following vocabulary terms, ratios, rates, unit rates, equivalent ratios, percents, ratio tables, and tape diagrams.<br>
• Provide cyclical, distributed practice over time to continually practice unit rate problems.
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• Reason to determine the better buy.<br>
• Write a percent as a rate over 100, including percents greater than 100 and less than 1.<br>
• Find the percent of a number using rate methods.<br>
• Represent the relationship of part to whole to describe percents using models.<br>
• Convert units by multiplication or division.<br><br>
<u>Misconception and Common Errors:</u><br>
Some sixth graders misunderstand and believe that a percent is always a natural number less than or equal to 100. To help with this misconception, provide examples of percent amounts that are greater than 100% and percent amounts that are less than 1%. Try using a percent wheel for developing this understanding.
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<td>Standards for Mathematical Practice</td>
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Understand ratio concepts and use rati0 reasoning to solve problems.<br>6.RP.1, 6.RP.2, and 6.RP.3<br>
The focus for this cluster is the study of ratio concepts and the use of proportional reasoning to solve problems. Students learn how ratios and rates are used to compare two quantities or values and how to model and represent them. Sixth graders find out how ratios are used in real-world situations and discover solutions to percent problems using ratio tables, tape diagrams, and double number lines. Students also convert between standard units of measure.<br><br>
MP1. Make sense of problems and persevere in solving them.
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| **MP2. Reason abstractly and quantitatively.** | |
| **MP4. Model with mathematics.** | Sixth graders interpret and solve ratio problems.<br><br>Students solve problems by analyzing and comparing ratios and unit rates in tables, equations, and graphs. |
| **MP6. Attend to precision.** | Students model real-life situations with mathematics and model ratio problem situations symbolically. |
| **MP7. Look for and make use of structure.** | Students communicate precisely with others and use clear mathematical language when describing a ration relationship between quantities.<br><br>Sixth graders begin to make connections between covariance (the measure of how changes in one variable are associated with changes in a second variable), rates, and representations showing the relationships between quantities. |

| **K-U-D** | |
|---|---|
| **KNOW**<br>*Facts, formulas, information, vocabulary* | **DO**<br>*Skills of the discipline, social skills, production skills, processes (usually verbs/verb phrases)* |
| • ratios and rates<br>  ○ tables of equivalent ratios<br>  ○ missing values in tables<br>  ○ tape diagrams<br>  ○ double number line diagrams<br>  ○ equations<br>• pairs of values on a coordinate plane<br>• unit rate<br>  ○ unit pricing<br>  ○ constant speed<br>• percent<br>  ○ a quantity as a rate per 100 | • UNDERSTAND (ratios/the concept of a unit rate)<br>• DESCRIBE (ratio relationship)<br>• USE (ratio and rate reasoning/language)<br>• SOLVE (with and without context)<br>• MAKE (tables of equivalent ratios)<br>• FIND (missing values in tables)<br>• PLOT (pairs of values on the coordinate plane)<br>• SOLVE (unit rate problems)<br>• FIND (percent of a quantity as a rate per 100)<br>• SOLVE (problems finding the whole, given a part and the percent) |

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| ○ finding the whole, given a part and the percent<br>converting measurement units | CONVERT (measurement units) |

**UNDERSTAND**

*Big ideas, generalizations, principles, concepts, ideas that transfer across situations*

- Reasoning about multiplication & division is critical to the understanding of ratio concepts & their application to solving problems.
- A rate is a set of infinitely many equivalent ratios.

**Common Student Misconceptions for this Unit**

- Students often have difficulty setting up a ratio from a written problem.
- A point of confusion that may occur is that in our language structure, we tend to talk about unit rates by saying the output and then the input (miles per hour). This might feel backwards for students when they work with tables or graphs since they are typically oriented from input to output (hours per mile)

| Unit Assessment/Performance Task | DOK |
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| Unit 3 Test<br>Unit 3 Performance Task “At this Rate”<br>Unit 3 Performance Task “Ratios at School” | |

| Vocabulary |
| --- |
| Commission<br>Complex Fraction<br>Constant of Proportionality<br>Discount<br>Double Number Lines<br>Equation<br>Equivalent Ratios<br>Markdown<br>Markup<br>Percent<br>Proportion and percent proportion<br>Ratio<br>Ratio tables<br>Tape diagram/Bar Model<br>Unit rate |
| **Key Learning Activities/Possible Lesson Focuses (order may vary)** |
| The following activities are broken into "lessons," even though each may take more or less than one class period depending on school schedule.<br><br>These are ideas for lessons.<br><br>**Lesson sequence**<br><br>**Pre-assessment (Recall prior knowledge) and Pre-requisite skills review (if needed)**<br><br>***Learning Activity 1: Ratios and Ratio Language***: Provide students with a small amount of different colored objects (skittles, m&m's, colored counters, etc.). Have them name how many of each color they have as well as how many they have total. Ask them to compare different colors to each other, different colors to |

the total, and the total to different colors. Model the different ways of writing ratios (3 to 2, 3:2, or 3/2, and have). Have students record a variety of different ratios (part to part, part to whole, and whole to part). Have them explain what these mean (Ex: for every 3 blue m&m's, there are 2 red m&m's).

***Learning Activity 2: Equivalent Ratios***: Give students a recipe for something such as playdough or clay. Ask them how they would adjust the recipe if they were given different amounts of ingredients from what they are told to use in the original recipe or how they would adjust the recipe if they wanted to make twice as much, etc.

***Learning Activity 3: Ratios vs. Rates***: Provide students with unit cards (examples: 5 circles, 3 feet, 6 squares, 10 miles, 4 dollars, 2 hours etc.). Ask them to identify the unit on each card (example: shapes, feet, dollars, etc). Ask them to compare the cards that say 5 circles and 6 squares by naming the ratio of circles to squares, squares to circles, and squares to shapes. Then ask them to compare the cards that say 10 miles and 2 hours. Discuss the units in both situations. (In the first situation you are comparing shapes, where in the second situation you are comparing miles and hours). Explain that when you are comparing quantities with the same units, they are called ratios, but when they have different units they are called rates. Ask students if they can think of any rates that they are familiar with (miles per hour, miles per gallon, etc.).

***Learning Activity 4: Unit Rates***: Give students a problem that asks them to determine the better buy (Example: A 10 lb bag of flour for $5.98 or a 3 lb bag of flour for $1.92). Let them explore different options of how to come up with an answer. Have them write an explanation, supporting their answer with their work. Put students in small groups to compare their methods and answers. Allow students to adjust their answers based upon their discussions with their groups. Have students share their methods whole group. Discuss the vocabulary unit rate.

***Learning Activity 5: Solve Ratio and Rate Problems using Tables, Tape Diagrams, Double Number Lines, and Equations***

Present this scenario*:* If it took 7 hours to mow 4 lawns, at that rate how many lawns could be mowed in 35 hours? (Solution:20 lawns)

Use a table:

| Hours | 7 | 14 | 21 | 28 | 35 |
|---|---|---|---|---|---|
| Lawns | 4 | 8 | 12 | 16 | ? |

Use equivalent fractions- two equivalent ratios (a proportion):

$$\frac{hours}{lawns} = \frac{7hours}{4lawns} = \frac{35hours}{?lawns}$$

Bar Model:

----------35 hours ----------

| 7 | 7 | 7 | 7 | 7 |
|---|---|---|---|---|
| 4 | 4 | 4 | 4 | 4 |

4 lawns x 5 sections = 20 lawns

Assign groups of students with a real world problem similar to the lawn problem and ask them to solve it using any method they choose. Ask different groups to present their method to the class.

***Learning Activity 6: What is Percent?*** Provide students with hundreds grids that are partially shaded. Have them write the fraction of each grid that is shaded. Explain that percent means part of 100. Model how to write the percentage of each grid that is shaded. Students will continue to name the percentages

for the remaining models. Have students explain in writing what they thing percent means.

***Learning Activity 7: Converting Units of Measurement***:

Illuminations Activity: Measuring Up

Illuminations.nctm.org/LessonDetail.aspx?ID=U148

**Supplemental Materials and Resources**

*Literature connection:*
A Pizza the Size of the Sun by Jack Prelutsky
How Many Snails? by Paul Giganti, Jr.
Only One by Barbara Garrison
Pythagoras and the Ratios: A Math Adventure by Julie Ellis
Swamp Angel by Anne Isaacs

Interdisciplinary connections:
Science: conversion of measurement units

- Connected Math 2, Pearson/Prentice Hall
- Crosswalk Coach Mathematics Grade 6, Triumph
- Teaching the Common Core Math Standards, Jossey-Bass
- Big Ideas Math, A Common Core Curriculum, Larsen/Boswell
- Math in Focus, Cavendish
- On Core Mathematics, Houghton Mifflin Harcourt
- www.georgiastandards.org 6th grade Unit 2: Rate, Ratio, and Proportional Reasoning Using Equivalent Fractions
- Websites with Ratio, Rate and Proportion Activities:

http://gomaisa.org/sites/default/files/6th-Grade-Unit-2-Lesson-Worksheet.PDF

http://gomaisa.org/sites/default/files/6th-Grade-Estimation-Jar-Ratios.PDF

http://www.helpingwithmath.com/printables/worksheets/ratio_proportion/6rp2ratio_rates01.htm

http://illustrativemathematics.org/illustrations/76

http://illustrativemathematics.org/illustrations/496

http://illustrativemathematics.org/illustrations/61

http://illustrativemathematics.org/illustrations/62

http://illustrativemathematics.org/illustrations/63

http://illustrativemathematics.org/illustrations/65

http://illustrativemathematics.org/illustrations/66

http://dnet01.ode.state.oh.us/IMS.ItemDetails/LessonDetail.aspx?id=0907f84c80530b51

http://illustrativemathematics.org/illustrations/68

http://illustrativemathematics.org/illustrations/67

http://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.NUMB&ID2=AB.MATH.JR.NUMB.RATE

http://mathforum.org/escotpow/puzzles/fish/applet.html

http://math.rice.edu/~lanius/proportions/

http://www.learnalberta.ca/content/mesg/html/math6web/index.html?page=lessons

http://www.mathplayground.com/ThinkingBlocks/thinking_blocks_ratios_1.html

http://illuminations.nctm.org/LessonDetail.aspx?id=L284

http://illuminations.nctm.org/LessonDetail.aspx?id=L781

http://schools.nyc.gov/Academics/CommonCoreLibrary/TasksUnitsStudentWork/default.htm

http://illustrativemathematics.org/illustrations/549

http://illustrativemathematics.org/illustrations/77

http://www.helpingwithmath.com/printables/worksheets/ratio_proportion/6rp2ratio_rates02.htm

Creating equivalent ratios: http://www.arcademics.com/games/ratio-stadium/ratio-stadium.html

Jeopardy review for ratios, rates, and proportions: http://www.quia.com/cb/158527.html

**Tools/Manipulatives**

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| Number lines | Percent grids | Cereal boxes |
| Calculators | Place Value Blocks | Copies Restaurant Menus |
| Unifix cubes (red and blue) | Strips of paper | Graph paper |

**Suggested Formative Assessment Practices/Processes**

Teacher created quizzes and exit slips

Card sorts: Write different comparisons on index cards and students must determine if they

should be compared using a ratio or a rate. (example: boys to girls and miles per hour)

Exit slip: Which is the better buy? A 5 pound bag of flour for $6.85 or a ten pound bag of flour for $12.90? What is the difference in price per pound between the two different options?

Create the Problem: Come up with two comparisons that could fit the ratio 3:4 OR come up with 3 rates that would have a unit rate of $2.50 per item.

Friendly Talk Probe: Students were asked to solve the following problem – If it took 7 hours to mow 4 lawns, how many lawns could be mowed in 35 hours? Tell how 3 different students decided to solve the problem (example: Student A set up a table comparing hours and lawns mowed, Student B set up equivalent fractions to find a ratio equivalent to 35: 7. Student C drew a bar model). Explain

which strategy you would use and why. (Students can include their own strategy that none of the other students used). Teacher created exit slips, teacher created quizzes

Think-Pair-Share: Students discuss their observations about the relative location of numbers on a number line in relation to their magnitude before sharing their ideas with the class.

Agreement Circles: The teacher creates a set of statements (both true and false) related to the topic (example: when plotting a point on a coordinate grid, it does not matter which way you move first). Students stand in a circle and the teacher reads a statement. Give students a few seconds to think. If they agree with the statement, they move to the center of the circle.

Fist to Five: Have students self-assess how well they understand the concept with a show of fingers (from 0-5, 0 = no

understanding, up to 5, which = a complete understanding).

| **Differentiation and Accommodations** |
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| • Provide graphic organizers<br>• Provide additional examples and opportunities for repetition<br>• Provide tutoring opportunities<br>• Provide retesting opportunities after remediation (up to teacher and district discretion)<br>• Teach for mastery not test<br>• Teaching concepts in different modalities<br>• Adjust homework assignments |