6th Grade Mathematics

Ratios & Proportional Relationships: Understand ratio concepts and use ratio reasoning to solve problems

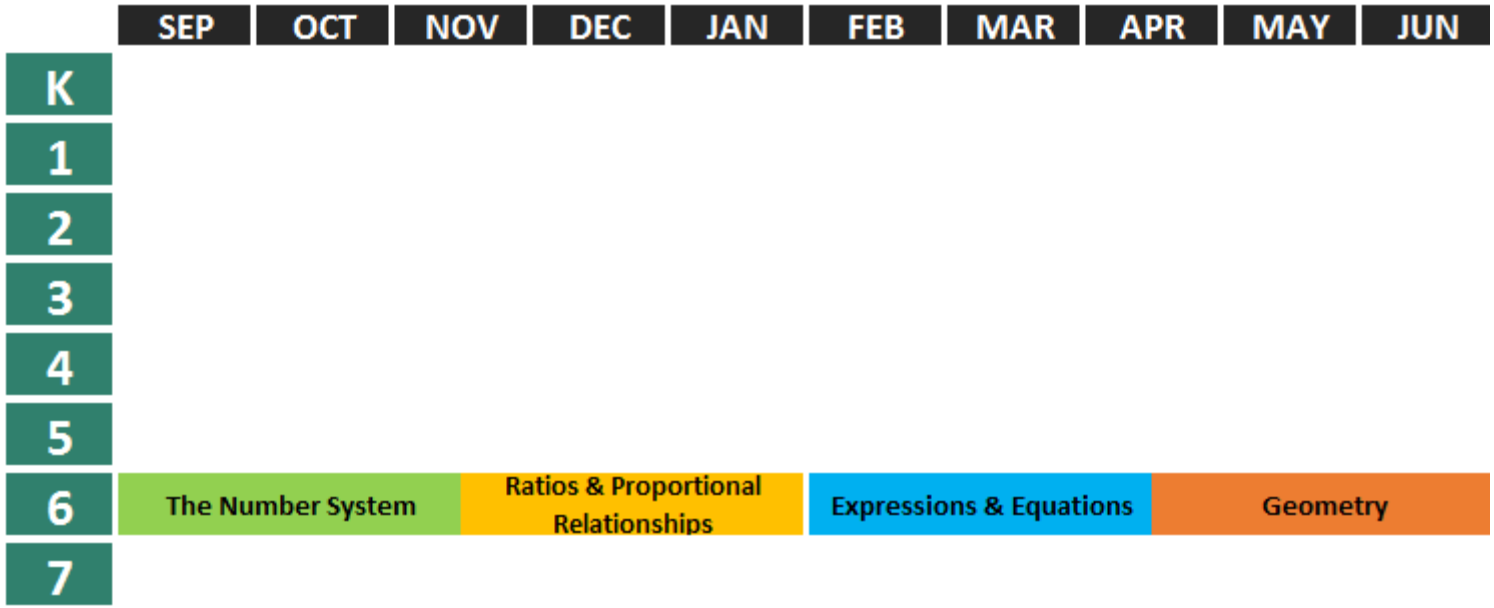
Unit 2 Curriculum Map – Math in Focus

ORANGE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

A STORY OF UNITS



The Number System: Division of fractions, computation of multi-digit numbers, and the system of rational numbers

Ratios & Proportional Relationships: Understand ratio concepts and use ratio reasoning to solve problems

Expressions & Equations: Arithmetic with algebraic expressions, solve simple equations/ inequalities, and analyze relationships

Geometry: Solve real-world and mathematical problems involving area, surface area, and volume

Table of Contents

Unit Overview

In this unit students will …

- Strengthen sense of and understanding of proportional reasoning
- Develop and use multiplicative thinking
- Develop the understanding that a ratio is a comparison of two numbers or quantities
- Find percent using the same processes for solving rates and proportions
- Solve real-life problems involving measurement units that need to be converted

Enduring Understandings

- A ratio is a number that relates two quantities or measures within a given situation in a multiplicative relationship (in contrast to a difference or additive relationship).
- Rations can express comparisons of a part to whole, (a/b with $b \neq 0$)
- Fractions are part-whole ratios, meaning fractions are also ratios. Percentages are ratios and are sometimes used to express ratios.
- Both part-to-whole and part-to-part ratios compare two measures of the same type of thing. A ratio can also be a rate.
- A rate is a comparison of the measures of two different things or quantities; the measuring unit is different for each value.
- Ratios use division to represent relations between two quantities.

Pacing Guide

Activity	New Jersey Student Learning Standards (NJSLS)	Estimated Time
Chapter 1		
Chapter 4 Recall Prior Knowledge / Pre-Test (MIF)	6.RP.1, 6.RP.3, 6.RP.3a, 6.RP.3d	1 Block
Chapter 4 (MIF) Transition Lesson	6.RP.1, 6.RP.3, 6.RP.3a, 6.RP.3d	1 Block
Chapter 4 (MIF) Lesson 4.1	6.RP.1, 6.RP.3d	2 Blocks
Chapter 4 (MIF) Lesson 4.2	6.RP.3a	2 Blocks
Chapter 4 (MIF) Lesson 4.3	6.RP.3a	2 Blocks
Chapter 4 (MIF) Wrap-Up / Review	6.RP.1, 6.RP.3, 6.RP.3a, 6.RP.3d	2 Blocks
Chapter 4 Assessment (MIF) *Optional*	6.RP.1, 6.RP.3, 6.RP.3a, 6.RP.3d	1 Block *Optional*
Total Time		**11 Blocks**

Major Work Supporting Content Additional Content

Activity	New Jersey Student Learning Standards (NJSLS)	Estimated Time
Chapter 2		
Chapter 5 Recall Prior Knowledge / Pre-Test (MIF)	6.NS.1, 6.NS.2, 6.RP.1, 6.RP.3d	1 Block
Chapter 5 (MIF) Transition Lesson	6.NS.1, 6.NS.2, 6.RP.1, 6.RP.3d	1 Block
Chapter 5 (MIF) Lesson 5.1	6.RP.2, 6.RP.3	2 Blocks
Chapter 5 (MIF) Lesson 5.2	6.RP.3, 6.RP.3b	2 Blocks
Chapter 5 (MIF) Wrap-Up / Review	6.NS.1, 6.NS.2, 6.RP.1, 6.RP.2, 6.RP.3, 6.RP.3b, 6.RP.3d	2 Blocks
Chapter 5 Assessment (MIF) *Optional*	6.NS.1, 6.NS.2, 6.RP.1, 6.RP.2, 6.RP.3, 6.RP.3b, 6.RP.3d	1 Block *Optional*
Unit 2 Assessment 1		1 Block
Total Time		**9 Blocks**

Major Work Supporting Content Additional Content

Activity	New Jersey Student Learning Standards (NJSLS)	Estimated Time
Chapter 3		
Chapter 6 Recall Prior Knowledge / Pre-Test (MIF)	6.RP.3, 6.RP.3c	1 Block
Chapter 6 (MIF) Transition Lesson	6.RP.3, 6.RP.3c	1 Block
Chapter 6 (MIF) Lesson 6.1	6.RP.3, 6.RP.3c	2 Blocks
Chapter 6 (MIF) Lesson 6.2	6.RP.3c	2 Blocks
Chapter 6 (MIF) Lesson 6.3	6.RP.3c	2 Blocks
Chapter 6 (MIF) Lesson 6.4	6.RP.3c, 7.RP.3	2 Blocks
Chapter 6 (MIF) Lesson 6.5	6.RP.3c, 7.RP.3	2 Blocks
Chapter 6 (MIF) Wrap-Up / Review	6.RP.3, 6.RP.3c, 7.RP.3	2 Blocks
Chapter 6 Assessment (MIF) *Optional*	6.RP.3, 6.RP.3c, 7.RP.3	1 Block *Optional*
Unit 2 Assessment 2		1 Block
Total Time		**15 Blocks**

Major Work Supporting Content Additional Content

Unit 1 Overview		
Activity	**New Jersey Student Learning Standards (NJSLS)**	**Estimated Time**
Chapter 4 (MIF)	6.RP.1, 6.RP.3, 6.RP.3a, 6.RP.3d	11 Blocks
Chapter 5 (MIF)	6.NS.1, 6.NS.2, 6.RP.1, 6.RP.2, 6.RP.3, 6.RP.3b, 6.RP.3d	9 Blocks
Chapter 6 (MIF)	6.RP.3, 6.RP.3c, 7.RP.3	15 Blocks
Solidify Unit 1 Concepts / Project Based Learning		5 Blocks
Total Time		**40 Blocks**

Major Work Supporting Content Additional Content

Pacing Calendar

Please complete the pacing calendar based on the suggested pacing (*see Pacing Guide on pages 3-4)*.

NOVEMBER						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
			1	**2**	**3**	**4**
5	**6**	**7**	**8**	**9**	**10**	**11**
12	**13**	**14**	**15**	**16**	**17**	**18**
19	**20**	**21**	**22**	**23**	**24**	**25**
26	**27**	**28**	**29**	**30**		

DECEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

JANUARY

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	*15*	*16*	*17*	*18*	*19*	20
21	*22*	*23*	*24*	*25*	*26*	27
28	*29*	*30*	*31*			

Math Background

Chapter 4: Ratio

In this chapter, students will

- Extend concepts learned with fractions to ratios. Along with writing equivalent ratios and writing ratios in simplest form, they learn to use comparison models and unitary method to solve many types of ratio problems.

- In addition to solving ratio problems involving two quantities, students will solve problems involving three quantities.

  Ex: A band includes students from 6th grade, 7th grade, and 8th grade in the ratio 4: 3: 5. There are 156 students in the band. How many students are in 8th grade?

- Students will solve problems involving two related sets of ratios.

  Ex: The ratio of Ty's age to Kim's age is 3:4. The ratio of Kim's age to Luz's age is 8:5. Luz is 10 years old. How old is Ty?

- Students will also solve problems involving ratios that change.

  Ex: Last year, the ratio of Ariel's CDs to Dora's was 2:5. This year, Ariel got another 99 CDs and Dora got 33. The ratio is now 5:6 and Ariel has the same number of CDs as Dora had last year. How many CDs does Ariel have this year

Chapter 5: Rates

In this chapter, students will extend their knowledge of ratios to the concept of rates.

- Use the unitary method and bar models to find rates and unit rates, while solving real-world rate problems.
- Students will encounter three types of rates: unit rates, rates that vary over time, and average rates.
- Bar models help students to visualize more complex rate problems. The unitary method provides them with a solution strategy that works.
- Through the use of word problems and a table, students will work with the formula d = s x t, or distance = speed x time.

  A car travels at a speed (*s*) of 40 miles per hour. Find the distance (*d*) the car travels in each (*t*).

- Average speed problems are used in business, science, and other applications, and the idea of a rate forms a basis for calculus.
- Determine average speed by dividing the total distance by the total time.

Chapter 6: Percent

In this chapter, students learn to

- Use bar models to visualize percent and solve problems using both unitary method and traditional method.
- Students learn that percent means “per hundred” or “out of 100,”
- Understand the concept of *base*, and that percent has a base of 100.
- Given a part of a whole, students use a bar model and the unitary method to find the percent represented by the part.
- Find a part given its percent and the whole / Find the whole given a part and its percent.
- Determine percent decrease and increase/ Find amount of increase or decrease.

PARCC Assessment Evidence Statements

NJSLS	Evidence Statement	Clarification	Math Practices	Calculator ?
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."	i) Expectations for ratios in this grade are limited to ratios of non-complex fractions. (See footnote, CCSS p 42.) The initial numerator and denominator should be whole numbers.	MP. 2	No
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."	i) Expectations for unit rates in this grade are limited to non-complex fractions. (See footnote, CCSS p 42.) The initial numerator and denominator should be whole numbers.	MP. 2	No
6.RP.3a	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	The testing interface can provide students with a calculation aid of the specified kind for these tasks. i) Expectations for ratios in this grade are limited to ratios of non-complex fractions. (See footnote, CCSS p 42.) The initial numerator and denominator should be whole numbers.	MP. 2 MP. 4 MP. 5 MP. 7 MP. 8	Yes

	plane. Use tables to compare ratios.			
6.RP.3b	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. 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?	i) See ITN Appendix F, Table F.c, "Minimizing or avoiding common drawbacks of selected response," specifically, Illustration 1 (in contrast to the problem "A bird flew 20 miles in 100 minutes. At that speed, how long would it take the bird to fly 6 miles?") ii) The testing interface can provide students with a calculation aid of the specified kind for these tasks. iii) Expectations for unit rates in this grade are limited to non-complex fractions. (See footnote, CCSS p 42) iv) The initial numerator and denominator should be whole numbers.	MP. 2 MP. 8 MP. 5	Yes
6.RP.3c 1	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. c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity).	i) The testing interface can provide students with a calculation aid of the specified kind for these tasks. ii) Pool should contain tasks with and without contexts iii) Expectations for ratios in this grade are limited to ratios of non-complex fractions. (See footnote, CCSS p 42.) The initial numerator and denominator should be whole numbers.	MP. 2 MP. 7 MP. 5 MP. 8	Yes

6.RP.3c-2	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. c. Solve problems involving finding the whole, given a part and the percent.	i) The testing interface can provide students with a calculation aid of the specified kind for these tasks. ii) Expectations for ratios in this grade are limited to ratios of non-complex fractions. (See footnote, CCSS p 42.) The initial numerator and denominator should be whole numbers.	MP. 2 MP. 7 MP. 5 MP. 8	Yes
6.RP.3d	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. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	i) Pool should contain tasks with and without contexts ii) Tasks require students to multiply and/or divide dimensioned quantities iii) 50% of tasks require students to correctly express the units of the result. The testing interface can provide students with a calculation aid of the specified kind for these tasks. iv) Expectations for ratios in this grade are limited to ratios of non-complex fractions. (See footnote, CCSS p 42.) The initial numerator and denominator should be whole numbers.	MP. 2 MP. 6 MP. 7 MP. 5 MP. 8	Yes
6.NS.1-2	Solve word problems involving division of fractions by fractions, For example, How much chocolate will each person get if 3 people share 1/2 lb. of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular	i) Only the answer is required; explanations and representations are not assessed here. ii) Note that the italicized examples correspond to three meanings/uses of division: (1) equal sharing; (2) measurement; (3) unknown factor. These meanings/uses	MP.4	No

	strip of land with length 3/4 mi and area 1/2 square mi?	of division should be sampled equally. iii) Tasks may involve fractions and mixed numbers but not decimals		
6.NS.2	Fluently divide multi-digit numbers using the standard algorithm.	i) Tasks access fluency implicitly; simply in virtue of the fact that there are two substantial computations on the EOY (see also 6.NS.3-1, 6.NS.3-2, 6.NS.3-3, 6.NS.3-4). Tasks need not be timed. ii) The given dividend and divisor are such as to require an efficient/standard algorithm (e.g., 40584 ÷ 76). Numbers in the task do not suggest any obvious ad hoc or mental strategy (as would be present for example in a case such as 40064 ÷ 16). iii) Tasks do not have a context. iv) Only the answer is required. v) Tasks have five-digit dividends and two-digit divisors, with or without remainders.	–	No

Differentiated Instruction

Chapter 4

Assessment and Intervention

	ASSESSMENT	RtI STRUGGLING LEARNERS
DIAGNOSTIC	• Quick Check in Recall Prior Knowledge in Student Book A, pp. 115–117 • Chapter 4 Pre-Test in *Assessments*	• Skills 11–16 in *Transition Guide, Course 1*
ON-GOING	• Guided Practice • Lesson Check • Ticket Out the Door	• Reteach worksheets • Extra Practice worksheets • *Activity Book*, Chapter 4
END-OF-CHAPTER	• Chapter Review/Test • Chapter 4 Test in *Assessments* • ExamView® Assessment Suite CD-ROM Course 1	• Reteach worksheets

ELL ENGLISH LANGUAGE LEARNERS

Review the terms *ratio* and *term*.

Model Draw a group of 4 circles. Next to it draw a group of 3 squares. Under the groups, write "4 : 3", "4 to 3", and "ratio".

Say A *ratio* compares two numbers or amounts. This ratio compares the number of circles to the number of squares. There are four circles for every three squares. (Point to *4 : 3*.) You say and read this ratio as "four to three".

Say (Circle the 4 and 3 in 4 : 3.) Each number in a ratio is called a *term*. The terms in the ratio 4 : 3 are 4 and 3.

Say If the ratio of A to B is 3 : 4, then A is $\frac{3}{4}$ of B.

For definitions, see Glossary, page 272, and Online Multilingual Glossary.

ADVANCED LEARNERS

- Adjusting a recipe to serve fewer or more people is an everyday activity that involves the application of equivalent ratios. Students can find recipes that serve 4 people and scale them down or up to yield a lesser or greater number of servings.
- As needed, provide direction for students. You may want to suggest that, as a warm up, students first take their recipe and scale it down to serve 1 or 2 people, then scale it up to serve 6 or 12. For a greater challenge, suggest they scale up the recipe so that it will serve 7 or 9 people.
- Finally, it may be fun for students to scale up the recipe so that it makes enough food to serve the entire class. In that case, ask students to do unit conversions to larger units where appropriate (i.e., from 28 teaspoons to $9\frac{1}{3}$ tablespoons).

To provide additional challenges use:

- *Enrichment*, Chapter 4
- Student Book A, Brain@Work problems

Differentiated Instruction

Chapter 5

Assessment and Intervention

	ASSESSMENT	RtI STRUGGLING LEARNERS
DIAGNOSTIC	• Quick Check in Recall Prior Knowledge in Student Book A, pp. 155–158 • Chapter 5 Pre-Test in *Assessments*	• Skills 10, 17–23 in *Transition Guide, Course 1*
ON-GOING	• Guided Practice • Lesson Check • Ticket Out the Door	• Reteach worksheets • Extra Practice worksheets • *Activity Book*, Chapter 5
END-OF-CHAPTER	• Chapter Review/Test • Chapter 5 Test in *Assessments* • ExamView® Assessment Suite CD-ROM Course 1	• Reteach worksheets

ELL ENGLISH LANGUAGE LEARNERS

Review the terms *rate* and *unit rate*.

Say A rate is a type of ratio. A *rate* describes one quantity in terms of another. For example, in 9 games, a basketball player scores a total of 45 points. (Write $\frac{45 \text{ points}}{9 \text{ games}}$.) The rate relates the number of points scored to the number of games they were scored in.

Say A *unit rate* is a rate with the denominator 1. To find the basketball player's unit rate, we divide both the numerator (top number) and denominator (bottom number) of the fraction by the same number.

Model Write "÷ 9" next to both the numerator and the denominator. Then write an equal sign and the equivalent fraction, $\frac{5 \text{ points}}{1 \text{ game}}$.

Say $\frac{5 \text{ points}}{1 \text{ game}}$ is a unit rate. You can think of it as meaning 5 points *per* game, or 5 points *divided by* 1 game, or as a fraction whose denominator is 1.

For definitions, see Glossary, page 272, and Online Multilingual Glossary.

ADVANCED LEARNERS

- Have students find and explain the error made by Luke in the following dialogue. Ask them to write a response from Rob that explains and corrects the error. Sample response: No. You're making the mistake of adding my rate to my aunt's house to my rate from my aunt's house, and finding the average of those rates. Instead you find the total distance and divide by the total time. 60 + 60 = 120 miles. Divide 120 miles by 3 hours to get an average speed of 40 miles per hour.

  Rob: It took me an hour to drive 60 miles from my house to my aunt's house on Friday. But when I drove the 60 miles back home, it was snowing so hard it took me 2 hours.

  Luke: So your average speed for the round trip was 45 miles per hour.

To provide additional challenges use:

- *Enrichment*, Chapter 5
- Student Book A, Brain@Work problem

Differentiated Instruction

Chapter 6

Assessment and Intervention

	ASSESSMENT	RtI STRUGGLING LEARNERS
DIAGNOSTIC	• Quick Check in Recall Prior Knowledge in Student Book A, pp. 183–184 • Chapter 6 Pre-Test in *Assessments*	• Skills 24–27 in *Transition Guide, Course 1*
ON-GOING	• Guided Practice • Lesson Check • Ticket Out the Door	• Reteach worksheets • Extra Practice worksheets • *Activity Book*, Chapter 6
END-OF-CHAPTER	• Chapter Review/Test • Chapter 6 Test in *Assessments* • ExamView® Assessment Suite CD-ROM Course 1	• Reteach worksheets

ELL ENGLISH LANGUAGE LEARNERS

Review the term *percent*.

Model Show a 10-by-10 grid with 25 squares shaded. Label it "25%, or $\frac{25}{100}$." Point to the percent, the fraction, and then the shaded grid.

Say A *percent* is a ratio of a number to 100. *Percent* means "per hundred." For example, 25% means "25 per hundred," or "25 out of 100."

Model Show a 10-by-10 grid with 100 squares shaded. Label it "100%, or $\frac{100}{100}$." Point to the percent, the fraction, and then the shaded grid.

Say 100% means "100 per hundred," or "100 out of 100." To have 100% of something means to have "all of it," or "the whole amount."

For definitions, see Glossary, page 272, and Online Multilingual Glossary.

ADVANCED LEARNERS

- Students can ask a survey question and display the results as a circle graph. Have them survey at least 12 friends, classmates, or family members. Suggest students write a question with a limited number of answers. For example: What is your favorite type of movie? How many children are in your family? How many pets do you have?
- Have students find the percent of the group surveyed that gave each response, and then make a circle graph to display the percent data.
- As needed, provide direction for students. Show them how to use a compass and protractor. Explain that to find the number of degrees of the circle that represents each percent, they must convert the percents, which are base-100, to base-360. To do that they must multiply each percent by 3.6.

To provide additional challenges use:

- *Enrichment*, Chapter 6
- Student Book A, Brain@Work problems

Connections to the Mathematical Practices

1	Make sense of problems and persevere in solving them
	- Make sense of real-world rate and proportion problem situations by representing the context in tactile and/or virtual manipulatives, visual, or algebraic models - Understand the problem context in order to translate them into ratios/rates
2	Reason abstractly and quantitatively
	- Understand the relationship between two quantities in order to express them mathematically - Use ratio and rate notation as well as visual models and contexts to demonstrate reasoning
3	Construct viable arguments and critique the reasoning of others
	- Construct and critique arguments regarding the proportion of a whole as represented in the context of real-world situations - Construct and critique arguments regarding appropriateness of representations given ratio and rate contexts, EX: does a tape diagram adequately represent a given ratio scenario
4	Model with mathematics
	– Model a problem situation symbolically (tables, expressions, or equations), visually (graphs or diagrams) and contextually to form real-world connections
5	Use appropriate tools strategically
	– Choose appropriate models for a given situation, including tables, expressions or equations, tape diagrams, number line models, etc.
6	Attend to precision
	- Use and interpret mathematical language to make sense of ratios and rates - Attend to the language of problems to determine appropriate representations and operations for solving real-world problems. - Attend to the precision of correct decimal placement used in real-world problems
7	Look for and make use of structure
	- Use knowledge of problem solving structures to make sense of real world problems - Recognize patterns that exist in ratio tables, including both the additive and multiplicative properties - Use knowledge of the structures of word problems to make sense of real-world problems

8	Look for and express regularity in repeated reasoning - Utilize repeated reasoning by applying their knowledge of ratio, rate and problem solving structures to new contexts - Generalize the relationship between representations, understanding that all formats represent the same ratio or rate - Demonstrate repeated reasoning when dividing fractions by fractions and connect the inverse relationship to multiplication – Use repeated reasoning when solving real-world problems using rational numbers

Vocabulary

Term	Definition
Chapter 4 Vocabulary	
Equivalent Ratios	Ratios that are of different forms but have the same value when simplified.
Ratio	A comparison of two or more numbers or quantities. It describes the relative sizes of the number or quantities.
Simplest Form (of a ratio)	A ratio whose term is a whole number and have no common factor other than 1.
Term (of a ratio)	The numbers or quantities that are being compared in a ratio.
Chapter 5 Vocabulary	
Average Speed	The average distance traveled per unit time.
Rate	A ratio that compares two quantities with different units.
Speed	A special rate that expresses distance per unit time.
Unit Rate	A ratio that compares a quantity to one unit of a different quantity.
Chapter 6 Vocabulary	
Base (of a percent)	The whole quantity of which a percent is found.
Commission	A percent of the total sales earned by a salesperson.
Discount	The amount by which an original price of something is reduced.
Interest	The amount charged for borrowing money, or the amount of money earned from savings or investments.

Potential Student Misconceptions

- Often there is a misunderstanding that a percent is always a natural number less than or equal to 100. Provide examples of percent amounts that are greater than 100%, and percent amounts that are less than 1%.

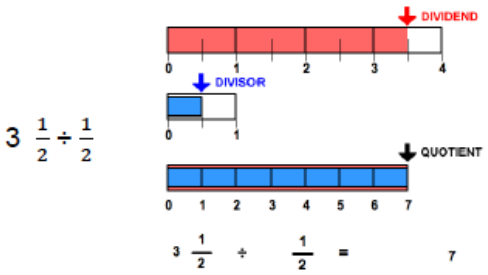
- Students may not distinguish between proportional situations and additive situations. Students may not realize that although they may have added to find equivalent ratios, they did not add the same amount on both sides.

- Students may still not understand the need to keep the same rate when thinking proportionally.

Teaching Multiple Representations

CONCRETE REPRESENTATIONS

- Number Lines



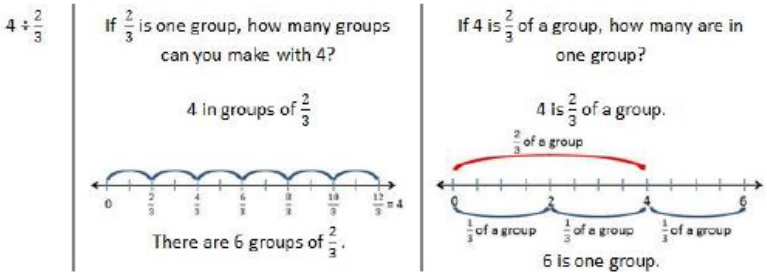
- 2-color coin counters to represent negatives and positives

- Number Lines

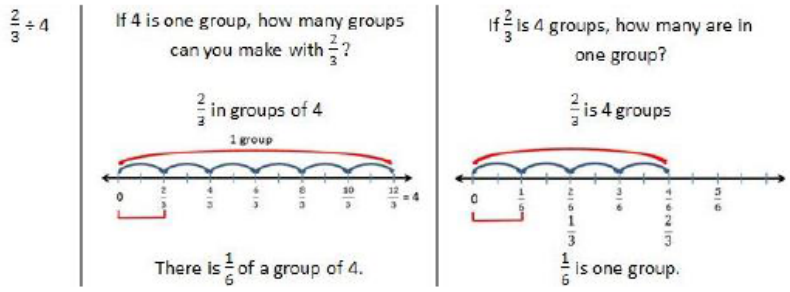
- Thermometers and other equally partitioned tools

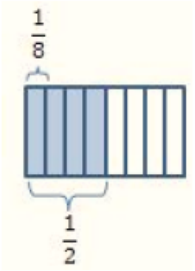
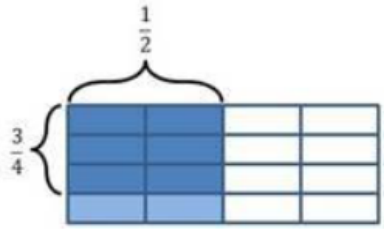
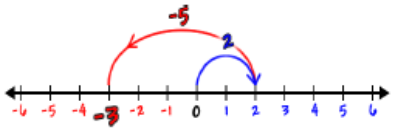
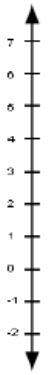
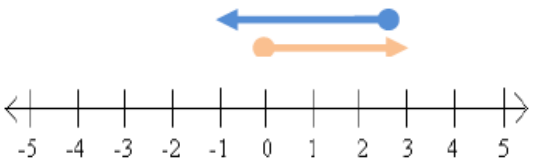
PICTORIAL REPRESENTATIONS

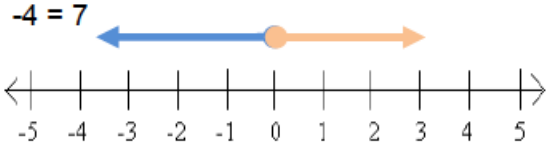
- Number Lines (Division Shown)



- Rectangular Area Models (Division & Multiplication Shown)



	$\frac{1}{2} \div \frac{1}{8}$  $\frac{3}{4} \times \frac{1}{2}$ 
• Number Lines (Horizontal) • Number Lines (Vertical)	 Figure 3 - Vertical Number Line 
• Distance / Vector Model	*Adding Integers* Addition is modeled as putting a second vector's tail at the first vector's head and finding where the second vector's head extends to. 3 + -4 = -1 

	Subtracting Integers Subtraction can be thought of as comparing the two vectors p, and q, by putting both tails together (starting each from zero) and asking the question: "How would one extend a vector from the head of p to the head of q?" The length and direction of that vector would be the result of the subtraction. 3 - -4 = 7 
ABSTRACT REPRESENTATIONS	
• Applying the Operations • Applying Properties of Numbers • Applying the standard algorithms for addition, subtraction, multiplication, and division	
• Applying Properties of Numbers	p – q = p + (-q) p - -q = p + q

Assessment Framework

Unit 2 Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded ?**
Chapter 4 Pretest (Beginning of Unit) *Math in Focus*	6.NS.1, 6.NS.2, 6.RP.1, 6.RP.3d	½ Block	Individual	Yes (No Weight)
Chapter 5 Pretest (After Chapter 4) *Math in Focus*	6.NS.1, 6.NS.2, 6.RP.1, 6.RP.3d	½ Block	Individual	Yes (No Weight)
Unit 2 Assessment 1 (After Chapter 5) *District Assessment*	6.RP.1, 6.RP.2,	1 Block	Individual	Yes
Chapter 6 Pretest (After Unit 2 Assessment 1) *Math in Focus*	6.RP.3, 6.RP.3c	½ Block	Individual	Yes (No Weight)
Unit 2 Assessment 2 (Conclusion of Unit) *District Assessment*	6.RP.A.3	1 Block	Individual	Yes
Chapter 4 Test (Optional) *Math in Focus*	6.NS.1, 6.NS.2, 6.RP.1, 6.RP.2, 6.RP.3, 6.RP.3b, 6.RP.3d	½ Block	Individual or Group	Yes, if administered
Chapter 5 Test (Optional) *Math in Focus*	6.NS.1, 6.NS.2, 6.RP.1, 6.RP.2, 6.RP.3, 6.RP.3b, 6.RP.3d	½ Block	Individual or Group	Yes, if administered
Chapter 6 Test (Optional) *Math in Focus*	6.RP.3, 6.RP.3c, 7.RP.3	½ Block	Individual or Group	Yes, if administered

Assessment Framework

Unit 2 Performance Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded ?**
Unit 2 Performance Task 1 (Late November) *Games at Recess*	6.RP.A.1	1 Block	Individual	Yes; Rubric
Unit 2 Performance Task 2 (Mid-December) *Which detergent is a better buy?*	6.RP.A.3	1 Block	Individual	Yes; Rubric
Unit 2 Performance Task 3 (Mid-January) *Riding at a Constant Speed*	6.RP.A.2, 6.RP.A.3	1 Block	Individual	Yes; Rubric
Unit 2 Performance Task Option 1 (Optional) *Mixing Concrete*	6.RP.A.3	Teacher Discretion	Teacher Discretion	Yes, if administered
Unit 2 Performance Task Option 2 (Optional) *Ticket Booth*	6.RP.A.2, 6.RP.A.3a	Teacher Discretion	Teacher Discretion	Yes, if administered

Performance Tasks

Unit 2 Performance Task 1

Games at Recess (6.RP.A.1)

The students in Mr. Hill's class played games at recess.

6 boys played soccer
4 girls played soccer
2 boys jumped rope
8 girls jumped rope

Afterward, Mr. Hill asked the students to compare the boys and girls playing different games.

Mika said,
"Four more girls jumped rope than played soccer."

Chaska said,
"For every girl that played soccer, two girls jumped rope."

Mr. Hill said, "Mika compared the girls by looking at the difference and Chaska compared the girls using a ratio."

A. Compare the number of boys who played soccer and jumped rope using the difference. Write your answer as a sentence as Mika did.

B. Compare the number of boys who played soccer and jumped rope using a ratio. Write your answer as a sentence as Chaska did.

C. Compare the number of girls who played soccer to the number of boys who played soccer using a ratio. Write your answer as a sentence as Chaska did.

Solution

a. Four more boys played soccer than jumped rope.

b. For every three boys that played soccer, one boy jumped rope. Therefore the ratio of the number of boys that played soccer to the number of boys that jumped rope is 3:1 (or "three to one").

c. For every two girls that played soccer, three boys played soccer. Therefore the ratio of the number of girls that played soccer to the number of boys that played soccer is 2:3 (or "two to three").

Unit 2 Performance Task 1 PLD Rubric

SOLUTION

- A) Student indicates four more boys played soccer than jumped rope
- B) Student indicates for every three boys that played soccer, one boy jumped rope. Therefore the ratio of the number of boys that played soccer to the number of boys that jumped rope is 3:1 (or "three to one").
- C) Student indicates for every two girls that played soccer, three boys played soccer. Therefore the ratio of the number of girls that played soccer to the number of boys that played soccer is 2:3 (or "two to three"). .

Level 5: Distinguished Command	**Level 4: Strong Command**	**Level 3: Moderate Command**	**Level 2: Partial Command**	**Level 1: No Command**
Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusion with minor computational error	Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusionwith minor conceptual error	Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical, but incomplete, progression of steps • minor calculation errors • partial justification of a conclusion	Constructs and communicates an incomplete response based on concrete referents provided in the prompt such as: diagrams, number line diagrams or coordinate plane diagrams, which may include: • a faulty approach based on a conjecture and/or stated assumptions • An illogical and incomplete progression of steps • major calculation errors • partial justification of a conclusion	The student shows no work or justification.

Unit 2 Performance Task 2

Which detergent is a better buy? (6.RP.A.3)

A store has two different brands of laundry detergent. Brand A can do 80 loads of laundry and costs $12.75. Brand B does 36 loads of laundry and costs $6.75. Which laundry detergent costs less per load? Show your work/ Explain your answer.

Solution

Solution: 1 Making a table

A table can be used to solve this problem in many different ways. For example we can use a table to find the cost to do 36 loads with Detergent A:

Washing with Detergent A

Loads of Wash	Cost
80	$12.75
40	$6.375
36	$5.6375

So detergent A is cheaper since it costs less than $6 to do 36 loads while detergent B costs $6.75 for 36 loads. This first approach with a table has the downside of running into complicated decimals that do not carry any meaning within the context of money, which is always rounded off to the nearest cent. A second method with a table that avoids this would be to look for a common multiple of 80 and 36. The least common multiple of these is 720. Then we can make two tables to find the cost with each detergent brand for 720 loads of wash:

Washing with Detergent A

Loads of Wash	Cost
80	$12.75
240	$38.25
720	$114.75

Washing with Detergent B

Loads of Wash	Cost
36	$6.75
72	$13.50
720	$135

We see again that detergent A costs less money per load than detergent B. In these tables, we could skip the middle line and go directly to the cost for 720 loads. An extra step was included because, particularly with the second table, each step (multiplying by 2 and then multiplying by 10) can be done mentally. For the first table, multiplying by 3 twice is probably easier to do mentally than multiplying by 9.

If the ratio

$$\text{loads of wash} : \text{cost of detergent}$$

is viewed as a fraction $\frac{\text{loads of wash}}{\text{cost of detergent}}$, the two methods outlined above correspond to comparing fractions by finding a common numerator and finding a common demoninator respectively.

Solution: 2 Finding a unit rate

We can calculate the approximate cost per load of wash with each detergent and then compare these numbers directly. With detergent A, we can wash 80 loads and the cost is $12.75. This means that the cost per load of wash with detergent A is

$$\$12.75 \div 80 \approx \$0.16.$$

The exact value is slightly less than $0.16 but closer to $0.16 than to $0.15. With detergent B we can wash 36 loads and the cost is $6.75. So the coast per load with detergent B is

$$\$6.75 \div 36 = \$0.1875$$

We can see that detergent A costs less per load of wash than detergent B, by almost 3 cents per load.

Solution: 3 Mental math

We can compare costs of the two detergents mentally. With detergent B we pay $6.75 for 36 loads. With two detergent B's we will pay $2 \times \$6.75 = \$13.50$ for $2 \times 36 = 72$ loads. This is more money for fewer loads of wash compared to detergent A: $0.75 cents more for 4 fewer loads of wash. Since detergent A does *more* loads of wash for *less* money it costs less per load of wash than detergent B.

Unit 2 Performance Task 2 PLD Rubric

SOLUTION

- A) Student indicates detergent A is the better buy. Student shows work to explain their answer.

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Unit 2 Performance Task 3

Riding at a Constant Speed (6.RP.A.2, 6.RP.A.3)

Lin rode a bike 20 miles in 150 minutes. If she rode at a constant speed,

A. How far did she ride in 15 minutes?

B. How long did it take her to ride 6 miles?

C. How fast did she ride in miles per hour? d. What was her pace in minutes per mile?

Solution

Solution 1

	A	B	C	D	E	F
Number of Minutes	150	15	7.5	30	45	60
Number of Miles	20	2	1	4	6	8

The values in column B were found by dividing both values in column A by 10. The values in column C were found by dividing both values in column B by 2. The other columns contain multiples of the values in column B.

a. If we look in column B, we can see that she could ride 2 miles in 15 minutes.
b. If we look in column E, we can see that it would take her 45 minutes to ride 6 miles.
c. If we look in column F, we can see that she is riding 8 miles every 60 minutes (which is 1 hour), so she is riding her bike at a rate of 8 miles per hour.
d. If we look in column C, we can see that her pace is 7.5 minutes per mile.

Solution 2

a. She could ride 1 mile in 7.5 minutes and 2 miles (1 + 1) in 15 minutes (7.5 + 7.5).
b. She rides 150/20 minutes per mile, which is 7.5 minutes per mile. So it would take her 45 minutes to ride 6 miles because $6 \times 7.5 = 45$.
c. If she rides 2 miles in 15 minutes, then she can ride 4 miles in 30 minutes and 8 miles per hour.
d. She rides 7.5 minutes per mile.

Unit 2 Performance Task 3 PLD Rubric

SOLUTION

- A) Student indicates she could ride 2 miles in 15 minutes.
- B) Student indicates it would take her 45 minutes to ride 6 miles.
- C) Student indicates she is riding her bike at a rate of 8 miles per hour.
- D) Student indicates that her pace is 7.5 minutes per mile.

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Unit 2 Performance Task Option 1

Mixing Concrete (6.RP.A.3)

A mixture of concrete is made up of sand and cement in a ratio of 5 : 3. How many cubic feet of each are needed to make 160 cubic feet of concrete mix?

Unit 2 Performance Task Option 2

Ticket Booth (6.RP.A.2, 6.RP.A.3a)

A school carnival ticket booth posts the following sign:

a. Which amount of tickets offers the best deal? Explain.

b. How would you suggest the students running the ticket booth modify the list of prices?

21st Century Career Ready Practices

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

For additional details see **21st Century Career Ready Practices** .

Extensions and Sources

Online Resources

http://www.illustrativemathematics.org/standards/k8
- Performance tasks, scoring guides

http://www.ixl.com/math/grade-6
- Interactive, visually appealing fluency practice site that is objective descriptive

https://www.khanacademy.org/math/arithmetic/fractions
- Interactive, tracks student points, objective descriptive videos, allows for hints

https://www.khanacademy.org/math/arithmetic/rates-and-ratios
- Interactive, tracks student points, objective descriptive videos, allows for hints

http://www.doe.k12.de.us/assessment/files/Math_Grade_6.pdf
- Common Core aligned assessment questions, including Next Generation Assessment Prototypes

https://www.georgiastandards.org/Common-Core/Pages/Math-6-8.aspx
- Common core assessments and tasks designed for students with special needs

http://www.parcconline.org/resources/educator-resources/model-content-frameworks/mathematics-model-content-framework/grade-6
- PARCC Model Content Frameworks Grade 6