6th Grade Mathematics

Ratios & Proportional Relationships

Unit 2 Pacing Calendar: November 9th – January 8th

ORANGE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

From the Common Core State Standards:

In **Grade 6**, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

1. Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates.

2. Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

3. Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

4. Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability.

November 2015
Unit 2: Ratio and Proportion

Chapter 4: From Fractions to Ratios: In this chapter, students 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.

Chapter 5: Unit Rates and the Unitary Method: In this chapter, students extend their knowledge of ratios to the concept of rates. They use the unitary method and bar models to find rates and unit rates, and solve real-world rate problems.

Chapter 6: Percent and Unitary Method: In this chapter, students 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," and the concept of base, that percent have a base of 100.

NOVEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5 NJEA Convention District Closed	6 NJEA Convention District Closed	7
8	9 Unit 2: Ratios & Proportion. . . *Chapter 4 Pre-test (MIF)*	10 Unit 2: Chapter 4 Transition Lesson	11	12	13	14
15	16	17	18	19	20 *Assessment: Chapter 4 Test (MIF)*	21
22	23	24 *Unit 2: Chapter 5 Pre-test (MIF)*	25 12:30 pm Dismissal	26 Thanksgiving District Closed	27 Thanksgiving District Closed	28
29	30 Unit 2: Chapter 5 Transition Lesson					

December 2015
Unit 2: Ratio and Proportion (Continued. . .)

Chapter 4: From Fractions to Ratios: In this chapter, students 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.

Chapter 5: Unit Rates and the Unitary Method: In this chapter, students extend their knowledge of ratios to the concept of rates. They use the unitary method and bar models to find rates and unit rates, and solve real-world rate problems.

Chapter 6: Percent and Unitary Method: In this chapter, students 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," and the concept of base, that percent have a base of 100.

DECEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3 ***Unit 2: Performance Task 1 due***	4 ***Assessment: Unit 2 Assessment 1***	5
6	7	8	9 ***Assessment: Chapter 5 Test (MIF)***	10 ***Assessment: Unit 2 Assessment 2***	11 ***Unit 2: Performance Task 2 due***	12
13	14 ***Unit 2: Chapter 6 Pre-test (MIF)***	15 **Unit 2: Chapter 6 Transition Lesson**	16	17	18	19
20	21	22	23 **12:30 pm Dismissal**	24 **Holiday Recess** **District Closed**	25 **Holiday Recess** **District Closed**	26
27	28 **Holiday Recess** **District Closed**	29 **Holiday Recess** **District Closed**	30 **Holiday Recess** **District Closed**	31 **Holiday Recess** **District Closed**		

January 2016
Unit 2: Ratio and Proportion (Continued. . .)

Chapter 4: From Fractions to Ratios: In this chapter, students 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.

Chapter 5: Unit Rates and the Unitary Method: In this chapter, students extend their knowledge of ratios to the concept of rates. They use the unitary method and bar models to find rates and unit rates, and solve real-world rate problems.

Chapter 6: Percent and Unitary Method: In this chapter, students 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," and the concept of base, that percent have a base of 100.

JANUARY

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 Holiday Recess District Closed	2
3	4 Unit 2: Transition Lesson	5	6	7 *Assessment: Chapter 6 Test (MIF)*	8 Solidify Unit 2 Concepts	9
10	11	12	13	14	15	16
17	18 MLK Birthday District Closed	19	20	21	22	23
24 31	25	26	27 12:30 pm Student Dismissal	28 12:30 pm Student Dismissal	29	30

Mangos for Sale (6.RP.A.2)

A store was selling 8 mangos for $10 at the farmers market.

Keisha said,

"That means we can write the ratio 10 : 8, or $1.25 per mango."

Luis said,

"I thought we had to write the ratio the other way, 8 : 10, or 0.8 mangos per dollar."

Can we write different ratios for this situation? Explain why or why not.

Solution:
Yes, this context can be modeled by both of these ratios and their associated unit rates. The context itself doesn't determine the order of the quantities in the ratio; we choose the order depending on what we want to know. For example, If we want to know how much it cost for one mango then we write the ratio as $10:8 mangoes. If we want to know how many mango we can buy for one dollar then we write the ratio as 8 mangoes:$10 or 8/10 of a mango per dollar.

Unit 2 Performance Task 1 PLD Rubric

SOLUTION

- **Student mentions that both of the ratios represents unit rate.**
- **Student mentions that we choose the order of the quantities in the ratio depending on what we want to know. Cost for one mango or mangoes for one dollar.**

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	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 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.

Gianna's Job (6.RP.A.3a)

Gianna is paid $90 for 5 hours of work.

a. At this rate, how much would Gianna make for 8 hours of work?

b. At this rate, how long would Gianna have to work to make $60?

Solution: Making a table

a. This method uses a ratio table:

Time Worked (hours)	Gianna's Earnings (dollars)
5	90
10	180
20	360
40	720
8	144

b. The first row is the given information and to get to the second row we multiply both entries of the first row by 2. To get from the second to the third row of the table we multiply by 2 again. From the third to the fourth for we multiply by 2 for a third time. Now 40 hours can be divided by 5 to give 8 hours so this is the last step. There are many other possible ways to arrive at the answer with a table. For example, since

$$8 = \left(\frac{8}{5}\right) \times 5$$

we could move from the first row to the last in one step, multiplying the first row by $\frac{8}{5}$.

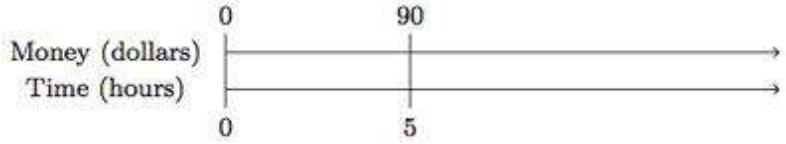
c. We again make a table and this time the goal is to get $60 in the earnings column and find out how many hours it takes for Gianna to earn this amount of money. We see that 60 is not a factor of 90 so we can't get to 60 directly by dividing by a whole number. But 60 is a factor of 180 which is 2 × 90 so we use this:

Time Worked (hours)	Gianna's Earnings (dollars)
5	90
10	180
$\frac{10}{3}$	60

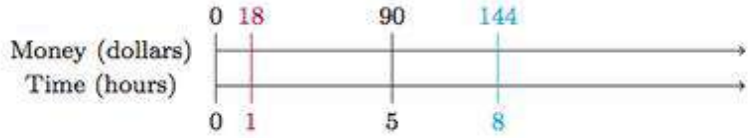
d. It takes Gianna $\frac{10}{3}$ hours or 3 hours and 20 minutes to make $60.

Solution: Making a double number line

a. We are given that Gianna makes \$90 in 5 hours. We can plot this information on a double number line, with money plotted on one line and time on the other:

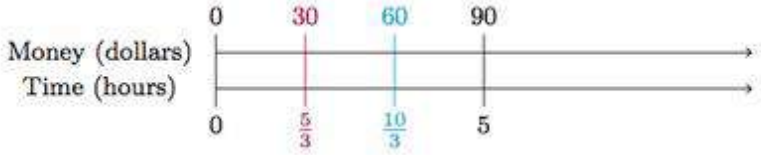


The goal is to use the information given to work out what dollar amount will go along with 8 hours. One way to do this would be to work out the hourly wage and then multiply by 8. This is shown below with the first step drawn in purple and the second step in blue:



To find the hourly wage we have to divide the number of given hours by 5 and so we also divide the wages by 5. Next, to find the wages for 8 hours we multiply the hourly wage by 8. There are many other alternatives. The quickest method would be to multiply the given values of money and time by $\frac{8}{5}$.

b. To find how long Gianna has to work to make \$60 notice that \$60 is $\frac{2}{3}$ of \$90. So we can first take one third of the given values (in purple below) and then double these new values (in blue):



It takes Gianna $\frac{10}{3}$ hours or 3 and a third hours to earn \$60.

Solution: Using a unit rate

a. In order to find out how much Gianna makes in 8 hours, we can first find her hourly rate and then multiply by 8. Since Gianna makes \$90 in 5 hours she will make \$90 ÷ 5 in 1 hour. This means that Gianna makes \$18 per hour. So in 8 hours she will make
8 × \$18 = \$144.

b. To find out how long it takes Gianna to make \$60 we can find out how long it take her to make \$1 and then multiply by 60. Since Gianna makes \$90 in 5 hours she will make \$1 in 5 ÷ 90 hours. This is $\frac{1}{18}$ of an hour. Since Gianna makes \$1 in $\frac{1}{18}$ of an hour she will make \$60 in $\frac{60}{18}$ hours. This is three and a third hours.

Although the solutions to (a) and (b) are conceptually similar, (a) feels more natural because we use the units of dollars per hour frequently when thinking of wages. For part (b), we use the units of hours per dollar which feel less familiar

Unit 2 Performance Task 2 PLD Rubric

SOLUTION

- The student indicates that Gianna would make $144 for 8 hours and shows how the situation was modeled (e.g. table or line diagram, or unit rate)
- The student indicates that it will take Giana 10/3 hours or 3hours and 20 minutes to earn $60.00 and shows how the answer was derived.
  (e.g. table or line diagram , or unit rate)

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, Line diagram table diagram or equations with unit rates, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusion	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, table diagram, line diagram, or equations with rates, 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 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, table diagram, line diagram, or equations with rates, 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 that are connected to a written method, line diagram or table diagram, 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.