7th Grade Mathematics

Ratios & Proportional Relationships

Unit 2 Curriculum Map: October 19th – December 11th

ORANGE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

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Unit Overview

In this unit, students will ….

- Understand what it means for figures to be similar
- Identify similar figures by comparing corresponding sides and angles
- Use scale factors and ratios to describe relationships among the side lengths, perimeters, and areas of similar figures
- Generalize properties of similar figures
- Recognize the role multiplication plays in similarity relationships
- Recognize the relationship between scale factor and ratio in similar figures
- Use informal methods, scale factors, and geometric tools to construct similar figures (scale drawings)
- Compare similar figures with nonsimilar figures
- Distinguish algebraic rules that produce similar figures from those that produce nonsimilar figures
- algebraic rules to produce similar figures
- Recognize when a rule shrinks or enlarges a figure
- Explore the effect on the image of a figure if a number is added to the *x*- or *y*-coordinates of the figure's vertices
- Develop strategies for using similar figures to solve problems
- Use the properties of similarity to find distances and heights that cannot be measured directly
- Predict the ways that stretching or shrinking a figure will affect side lengths, angle measures, perimeters, and areas
- Use scale factors or ratios to find missing side lengths in a pair of similar figures
- Use similarity to solve real-world problems
- Understand ratios, rates, and percents

- Use ratios, rates, fractions, differences, and percents to write statements comparing two quantities in a given situation
- Distinguish between and use both part-to-part and part-to-whole ratios in comparisons
- Use percents to express ratios and proportions
- Recognize that a rate is a special ratio that compares two measurements with different units
- Analyze comparison statements made about quantitative data for correctness and quality
- Make judgments about which kind of comparison statements are most informative or best reflect a particular point of view in a specific situation
- Understand proportionality in tables, graphs, and equations
- Recognize that constant growth in a table, graph, or equation is related to proportional situations
- Write an equation to represent the pattern in a table or graph of proportionally related variables
- Relate the unit rate and constant of proportionality to an equation, graph, or table describing a proportional situation
- Develop and use strategies for solving problems that require proportional reasoning
- Recognize situations in which proportional reasoning is appropriate to solve the problem
- Scale a ratio, rate, percent, or fraction to make a comparison or find an equivalent representation
- Use various strategies to solve for an unknown in a proportion, including scaling, rate tables, percent bars, unit rates, and equivalent ratios
- Set up and solve proportions that arise from real-world applications, such as finding discounts and markups and converting measurement units

Unit 2 Pacing Guide

Activity	Common Core Standards	Estimated Time
Unit 2 Diagnostic Assessment	6.RP.1, 6.RP3, 6.RP.2. 6.NS.B2, 6.NS.B3	1 Block
Stretching & Shrinking (CMP3) Investigation 1	7.RP.2, 7.G.1	2 Blocks
Assessment: Unit 2 Check Up 1 (CMP3)	7.RP.2, 7.G.1	½ Block
Stretching & Shrinking (CMP3) Investigation 2	7.RP.2, 7.G.1	2 Blocks
Assessment: Unit 2 Partner Quiz 1 (CMP3)	7.RP.2, 7.G.1	½ Block
Stretching & Shrinking (CMP3) Investigation 3	7.RP.2, 7.RP.3, 7.G.1	2 ½ Blocks
Assessment: Unit 2 Check Up 2 (CMP3)	7.RP.2, 7.RP.3, 7.G.1	½ Block
Stretching & Shrinking (CMP3) Investigation 4	7.RP.2, 7.G.1	2 ½ Blocks
Unit 2 Performance Task 1	7.RP.A.1	½ Block
Unit 2 Assessment 1	7.RP.1, 7.RP.2, 7.RP.3,	1 Block
Comparing & Scaling (CMP3) Investigation 1	7.RP.2, 7.RP.3	3 Blocks
Assessment: Unit 2 Check Up 3 (CMP3)	7.RP.2, 7.RP.3	½ Block
Comparing & Scaling (CMP3) Investigation 2	7.RP.1, 7.RP.2, 7.RP.3	3 Blocks
Assessment: Unit 2 Partner Quiz 2 (CMP3)	7.RP.1, 7.RP.2, 7.RP.3	½ Block
Identifying proportional relationship in table (EngageNY) Lesson 3	7.RP.2a	1½ Blocks
Identifying Proportional Relationship in Graphs (EngageNY) Lesson 5	7.RP.2a	1½ Blocks
Unit 2 Performance Task 2	7.RP.A.2a	½ Block
Comparing & Scaling (CMP3) Investigation 3	7.RP.1, 7.RP.2, 7.RP.3	2 Blocks
Unit 2 Assessment 2	7.RP.1, 7.RP.2, 7.RP.3, 7.G.1	1 Block
Unit 2 Performance Task 3	7.RP.A.3	½ Block
Total Time		**27 Blocks**

Major Work Supporting Content Additional Content

CMP Pacing Calendar

OCTOBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	**2**	**3**
4	**5** ***Assessment: Unit 1 Assessment 2***	**6**	**7**	**8**	**9** ***Assessment: Unit 1 Assessment 3***	**10**
11	**12** **Columbus Day** **No School**	**13** ***Performance Task 2 Due***	**14** **Solidify Unit 1 Concepts**	**15** **Solidify Unit 1 Concepts**	**16** **Unit 1 Complete**	**17**
18	**19** **Unit 2: Ratios & Proportion. . .** ***Unit 2 Diagnostic***	**20**	**21**	**22** **12:30 pm Student Dismissal**	**23** ***Assessment: Check up 1***	**24**
25	**26**	**27**	**28** ***Assessment: Partner Quiz 1***	**29** **PD Day 12:30 pm Student Dismissal**	**30**	**31**

NOVEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3 *Assessment: Check Up 2*	4	5 NJEA Convention District Closed	6 NJEA Convention District Closed	7
8	9	10	11 *Performance Task 1 Due*	12 *Assessment: Unit 2 Assessment 1*	13	14
15	16	17 *Assessment: Check Up 3*	18	19	20	21
22	23 *Assessment: Partner Quiz 2*	24	25 12:30 pm Dismissal	26 Thanksgiving District Closed	27 Thanksgiving District Closed	28
29	30					

DECEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	1	2 *Performance Task 2 is due*	3	4	5
6	7 *Assessment: Unit 2 Assessment 2*	8 Performance Task 3 is due	9 Solidify Unit 2 Concepts	10 Solidify Unit 2 Concepts	11 Unit 2 Complete	12
13	14	15	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		

Unit 2 Math Background

Students begin this Unit by informally exploring what it means for two geometric figures to be *similar*. The activities at the beginning of *Stretching and Shrinking* build on students' notions about similarity as they explore figures with the same shape. They draw similar figures using rubber bands and coordinate plane rules. Enlarging or shrinking pictures with a photocopier provides another familiar context for exploring similar figures. Through the activities in *Stretching and Shrinking*, students will grow to understand that the everyday use of the word *similar* and its mathematical use may be different. For students to determine definitively whether two figures are similar, similarity must have a precise mathematical definition.

The subtitle of *Comparing and Scaling* is *Ratios, Rates, Percents, and Proportions*. This subtitle makes clear that the heart of the second part of this Unit is to recognize when it is appropriate to make multiplicative comparisons. Throughout the Unit, students develop strategies for working with ratios, rates, percents, and proportions. They need to be able to use these strategies with understanding and efficiency.

PARCC Assessments Evidence Statements

CCSS	Evidence Statement	Clarification	Math Practices	Calculator?
7.RP.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction miles per hour, equivalently 2 miles per hour.	i) Tasks have a context	2, 6, 4	Yes
7.RP.2a	Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.	i) Tasks have "thin context" or no context. ii) Tasks may offer opportunities for students to investigate a relationship by constructing graphs or tables; however, students can opt not to use these tools. iii) Tasks are not limited to ratios of whole numbers	2,5	Yes
7.RP.2b	Recognize and represent proportional relationships between quantities. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.	i) Pool should contain tasks with and without context. ii) Tasks sample equally across the listed representations (graphs, equations, diagrams, and verbal descriptions).	2, 8, 5	No
7.RP.2c	Recognize and represent proportional relationships between quantities. c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between total the total cost and the number of items can be expressed as* $t = pn$.	i) Tasks have a context	2, 8	No
7.RP.2d	Recognize and represent proportional relationships between quantities. d. Explain what a point (x, y)	i) Tasks require students to interpret a point $(x\ y,\quad)$ on the graph of a proportional relationship in terms of the situation, with	2, 4	No

	on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r*) where *r* is the unit rate.	special attention to the points (0, 0) and (1, *r*) where *r* is the unit rate.		
7.RP.3a	Use proportional relationships to solve multi-step ratio problems.	none	1, 2, 6	Yes
7.RP.3b	Use proportional relationships to solve multi-step percent problems. *Examples*: *simple interest*, *markups and markdowns*, *gratuities and commissions*, *fees*, *percent increase and decrease*, *percent error*.	none	1, 2, 5, 6	Yes
7.G.1a	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	i) Pool should contain tasks with and without contexts.	2, 5	Yes

Connections to the Mathematical Practices

1	**Make sense of problems and persevere in solving them** - Students make sense of ratio and unit rates in real-world contexts. They persevere by selecting and using appropriate representations for the given contexts.
2	**Reason abstractly and quantitatively** - Students will reason about the value of the rational number in relation the models that are created to represent them. - Students reason abstractly and quantitatively in Problem 4.1(*Stretching and Shrinking*) when they determine that the ratios of length to width in two similar rectangles are always equal. They find that this is also true for similar parallelograms and triangles. They also conclude that if the ratios of length to width are not equal, the figures are not similar - In Problems 1.2 and 1.3(Comparing and Scaling), students determine which mixture tastes most “orangey” and explain their reasoning by using and comparing the ratios of juice concentrate to total mixture. Students use strategies such as scaling ratios to defend their responses. In addition to employing part-to-whole ratios, students examine and compare mixtures using part-to-part ratios.
3	**Construct viable arguments and critique the reasoning of others** - Students use arguments to justify their reasoning when creating and solving proportions used in real-world contexts. - In Problem 2.1 (*Stretching and Shrinking*), students determine which characters are members of the Wump family and which are impostors. They justify their conclusions to their group members by applying what they know about side lengths, areas, and angle measures of similar figures. - In Problem 2.1(Comparing and Scaling), students reason using unit rates and scaled ratios to determine who gets more pizza when pizzas are equally shared at different-sized tables. They also analyze Selena and Tony’s reasoning in determining which size table receives more pizza. Students argue, using rate tables and unit rates, which is the better deal in Problem 2.2(Comparing and Scaling) with pizza costs and Problem 3.1(Comparing and Scaling) with car commissions.
4	**Model with mathematics** - Students create models using tape diagrams, double number lines, manipulatives, tables and graphs to represent real-world and mathematical situations involving ratios and proportions. For example, students will examine the relationships between slopes of lines and ratio tables in the context of given situations - In Problem 3.4 (Stretching and Shrinking), students use surveying techniques to find a distance that cannot be measured directly. They use a sketch to model the situation, and they use the properties of similar triangles to find the distance across a river. - In Investigation 2(Comparing and Scaling), students work with the constant of proportionality, or rate of change, and analyze it using rate tables, graphs, proportions, and equations.

5	Use appropriate tools strategically - Students use visual representations such as the coordinate plane to show the constant of proportionality. - In Problem 1.1 (Stretching and Shrinking), students use rubber bands to make a scale drawing of a figure. They measure and compare side lengths using a ruler or the edge of a piece of paper. They also use an angle ruler or a protractor to compare angle measures. - Students use calculators to facilitate calculations in Problem 3.1(Comparing and Scaling). - Additional tools include conversion tables in Problem 3.2(Comparing and Scaling) for measurement units and grid paper for graphing proportional situations in Problem 2.2(Comparing and Scaling), and Problem 2.3(Comparing and Scaling) -In Problem 3.3(Comparing and Scaling), students examine a graph to determine how it relates to a situation and an equation that models the situation.
6	Attend to precision - Students attend to the ratio and rate language studied in grade 6 to represent and solve problems involving rates and ratios. - Students take their own measurements of shadows to solve Problem 4.4(Stretching and Shrinking). Imprecise measurements can affect the accuracy of their answers, so students may take several measurements and average them to ensure precision in their calculations. - When setting up proportions in Comparing and Scaling), students think about what each ratio means and how it fits in the overall proportion to produce an accurate solution.
7	Look for and make use of structure - Students look for patterns that exist in ratio tables in order to make connections between the constant of proportionality in a table with the slope of a graph. - Students make use of structure in Problem 2.3(Stretching and Shrinking) when they generalize the relationship between scale factor and areas of similar figures. They also make use of structure when they use rep-tiles to draw similar figures in Problem 3.2(Stretching and Shrinking). - In Problem 3.3(Comparing and Scaling), students see how different representations yield important structural characteristics, such as the role of the unit rate/constant of proportionality. - Students analyze conversion tables in Problem 3.2(Comparing and Scaling) to note patterns when converting between units of measurement.
8	Look for and express regularity in repeated reasoning - Students formally begin to make connections between covariance, rates, and representations showing the relationships between quantities. - In the first three Investigations of Stretching and Shrinking, students analyze the ratios of side lengths of many pairs of similar triangles. They are then able use ratios to determine which triangles are similar and which are not similar in Problem 4.2 (Stretching and Shrinking). - In Investigation 3(Comparing and Scaling), students might notice that markup and buying price can be related in a proportion. Other students might combine markup and buying price to yield the selling price. When examining graphs, students might discover that points on the graph will always match the unit rate of the problem at hand.

Vocabulary

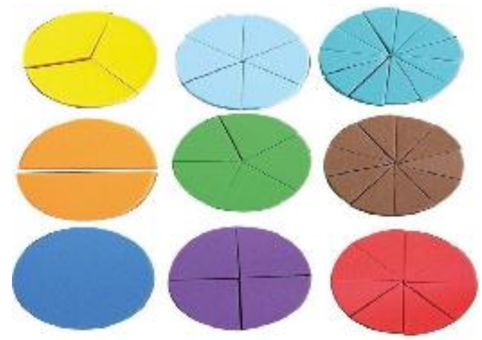
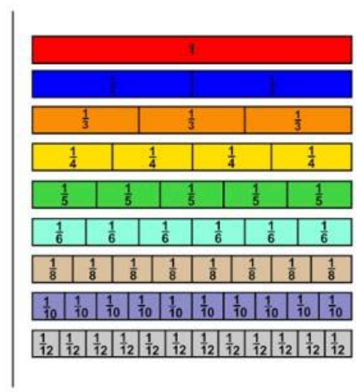
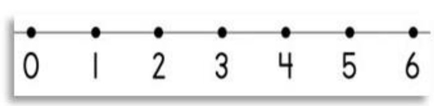
Term	**Definition**
Adjacent Sides	Two sides that meet at a vertex.
Constant of Proportionality	Constant value of the ratio of proportional quantities x and y. Written as y = kx, k is the constant of proportionality when the graph passes through the origin. Constant of proportionality can never be zero.
Corresponding Angles	Corresponding angles have the same relative position in similar figures.
Corresponding Sides	Corresponding sides have the same relative position in similar figures.
Directly Proportional	If $y = kx$, then y is said to be directly proportional to x
Equivalent Fractions	Two fractions that have the same value but have different numerators and denominators; equivalent fractions simplify to the same fraction.
Fraction	A number expressed in the form a/b where a is a whole number and b is a positive whole number
Image	The figure that results from some transformation of a figure.
Inversely Proportional	y is *inversely proportional* to x if $y = k/x$.
Multiplicative Inverse	Two numbers whose product is 1r. Example (3/4) and (4/3) are multiplicative inverses of one another because (3/4) x (4/3) = (4/3) x (3/4) = 1
Origin	The point of intersection of the vertical and horizontal axes of a Cartesian Grid
Percent rate of change	A rate of change expressed as a percent. Example: if a population grows from 50 to 55 in a year, it grows by (5/50) = 10% per year
Proportion	An equation stating that two ratios are equivalent
Proportional Relationship	Two quantities are said to have a proportional relationship if they vary in such a way that one of the quantities is a constant multiple of the other, or equivalently if they have a constant ratio.

Term	**Definition**
Ratio	A comparison of two numbers using division. The ratio of a to b (where $b \neq 0$) can be written as a to b, as (a/b), or as a:b.
Scale Factor	A ratio between two sets of measurements
Similar Figures	Figures that have the same shape but the sizes are proportional
Unit Rate	Ratio in which the second team, or denominator, is 1

Potential Student Misconceptions

- Often there is a misunderstanding that a percent is always a natural number less than or equal to 100. It would be helpful to provide examples of percent amounts that are greater than 100%, and percent amounts that are less 1%.
- Student may fail to interpret interval marks appropriately.
- Students may not understand that percents are a number out of one hundred; percents refer to hundredths.
- Students can confuse tenths with hundredths.
- Students may not realize that one whole equals 100%.
- Students can treat percents as though they are just quantities that may be added like ordinary discount amounts.
- The everyday use of the word *similar* and its mathematical use may be different for many students.

Teaching Multiple Representations

<table>
<tr><th colspan="2">CONCRETE REPRESENTATIONS</th></tr>
<tr><td>Partitioning with manipulatives</td><td></td></tr>
<tr><td>Bar model</td><td></td></tr>
<tr><td>Paper strips</td><td></td></tr>
<tr><td>Number line</td><td></td></tr>
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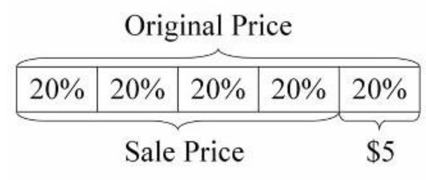
PICTORIAL REPRESENTATIONS

Fraction Strips
(Tape Diagrams)



Double Line Diagrams

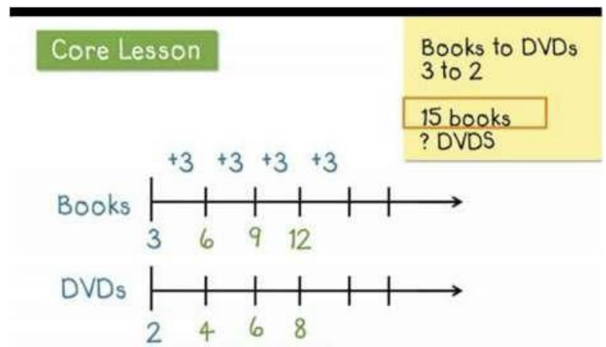
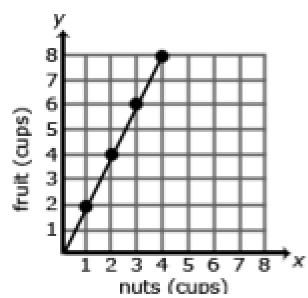


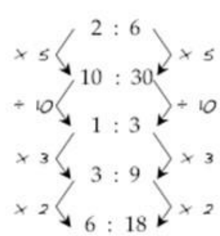
Table representation

Number of Books	Price
1	3
3	9
4	12
7	18

Graphical representation



Equivalent ratios



ABSTRACT REPRESENTATIONS	
Scale Factor (within and between) Iteration Algorithm Part/Whole Relationships Part/Part Relationships Finding the Unit Rate/Constant of Proportionality Simplifying Rates	• Setting up a Proportion • Creating an Equation • Finding the constant of proportionality • Algorithm for Scale Factor: Image/Actual figure Actual Figure/Image a/b = c/d

Assessment Framework

Unit 2 Assessment Framework				
Assessment	**CCSS**	**Estimated Time**	**Format**	**Graded ?**
Unit 2 Diagnostic Assessment (Beginning of Unit)	7.RP.1, 7.RP.2, 7.RP.3, 7.G.1	1 Block	Individual	Yes (Score has 0 weight in Genesis)
Unit 2 Check Up 1 (After Investigation 1) *Stretching & Shrinking CMP3*	7.RP.2, 7.G.1	½ Block	Individual	Yes
Unit 2 Partner Quiz 1 (After Investigation 2) *Stretching & Shrinking CMP3*	7.RP.2, 7.G.1	½ Block	Group	Yes
Unit 2 Check Up 2 (After Investigation 3) *Stretching & Shrinking CMP3*	7.RP.2, 7.RP.3, 7.G.1	½ Block	Individual or Group	Yes
Unit 2 Assessment 1 (After Investigation 4) *Model Curriculum*	7.RP.1, 7.RP.2,	1 Block	Individual	Yes
Unit 2 Check Up 3 (After Investigation 1) *Comparing & Scaling CMP3*	7.RP.2, 7.RP.3	½ Block	Individual	Yes
Unit 2 Partner Quiz 2 (After Investigation 2) *Comparing & Scaling CMP3*	7.RP.1, 7.RP.2, 7.RP.3	½ Block	Group	Yes
Unit 2 Assessment 2 (Conclusion of Unit) *Model Curriculum*	7.RP.1, 7.RP.2, 7.RP.3	1 Block	Individual	Yes

Assessment Framework (continued)

Unit 2 Performance Assessment Framework				
Assessment	**CCSS**	**Estimated Time**	**Format**	**Graded ?**
Unit 2 Performance Task 1 (1st Week of November) *Track Practice*	7.RP.A.1	½ Block	Individual w/ Interview Opportunity	Yes: rubric
Unit 2 Performance Task 2 (3rd Week of November) *Art Class*	7.RP.A.2a	½ Block	Group	Yes; Rubric
Unit 2 Performance Task 3 (1st Week of December) *Buying Protein Bars & Magazines*	7.RP.A.3	½ Block	Individual (Possible Reflection)	Yes: rubric
Unit 2 Performance Task Option 1 (optional)	7.RP.A.1	Teacher Discretion	Teacher Discretion	Yes, if administered
Unit 2 Performance Task Option 2 (optional)	7.RP.A.2a	Teacher Discretion	Teacher Discretion	Yes, if administered
Unit 2 Performance Task Option 3 (optional)	7.RP.A.3	Teacher Discretion	Teacher Discretion	Yes, if administered

Performance Tasks

Unit 2 Performance Task 1

Track Practice (7.RP.A.1)

Angel and Jayden were at track practice. The track is 2/5 kilometers around.

- Angel ran 1 lap in 2 minutes.
- Jayden ran 3 laps in 5 minutes.

1. How many minutes does it take Angel to run one kilometer? What about Jayden?
2. How far does Angel run in one minute? What about Jayden?
3. Who is running faster? Explain your reasoning

Solution:

We can create a table that shows how far each person runs and how long it takes for a certain number of lap

Angel

Number of laps	Number of km	Number of minutes
.5	1/5	1
1	2/5	2
1.5	3/5	3
2	4/5	4
2.5	5/5	5
3	6/5	6

Jayden

Number of laps	Number of km	Number of minutes
.5	1/5	2.5/3
1	2/5	5/3
1.5	3/5	7.5/3
2	4/5	10/3
2.5	1	12.5/3 =4.17
3	6/5	5 min

<u>Part A. Using the table:</u>

It takes Angel 5 minutes to run 1 Km.

It takes Jayden 4.17 minutes to run 1 km

Using unit conversion:

$$\frac{1\ lap}{\frac{2}{5}km} \times 1km \times \frac{2\ min}{1\ lap} = \frac{5}{2} \times 2\,\mathbf{m}\text{in} = 5\ minutes$$

<u>Part B: Using the table and unit conversion:</u>

$$\frac{\frac{2}{5}\ km}{2\ min} \times 1\,\mathbf{m}\text{in} = \frac{2}{5} \times \frac{1}{2}\ km = \frac{1}{5}$$

Angel runs 1/5 km in 1 minutes

$$\frac{\frac{6}{5}\ km}{5\ min} \times 1\,\mathbf{m}\text{in} = \frac{6}{5} \times \frac{1}{5}\ km = \frac{6}{25}\ km$$

Jayden runs $\frac{6}{25}\ km$ in 1 minutes

Part C:

It takes Jayden less time to cover the same distance (1 km) than Angel. Therefore, Jayden runs faster than Angel.

Unit 2 Performance Task 1 PLD Rubric

SOLUTION

- Student indicates It takes Angel 5 minutes to run 1 Km. It takes Jayden 4.17 minutes to run 1 km
- Student indicates Angel runs 1/5 km in 1 minute. Jayden runs $\frac{6}{25}\ km$ in 1 minutes
- Student indicates it takes Jayden less time to cover the same distance (1 km) than Angel. Therefore, Jayden runs faster than Angel.

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	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 • a logical, but incomplete, progression of steps	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

Art Class (7.RP.A.2a)

The students in Ms. Baca's art class were mixing yellow and blue paint. She told them that two mixtures will be the same shade of green if the blue and yellow paint are in the same ratio.

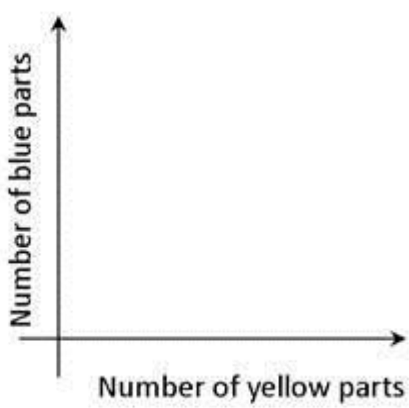
The table below shows the different mixtures of paint that the students made.

	A	B	C	D	E
Yellow	1 part	2 parts	3 parts	4 parts	6 parts
Blue	2 part	3 parts	6 parts	6 parts	9 parts

a. How many different shades of paint did the students make?

b. Some of the shades of paint were bluer than others. Which mixture(s) were the bluest? Show work or explain how you know.

c. Carefully plot a point for each mixture on a coordinate plane like the one that is shown in the figure. (Graph paper might help.)



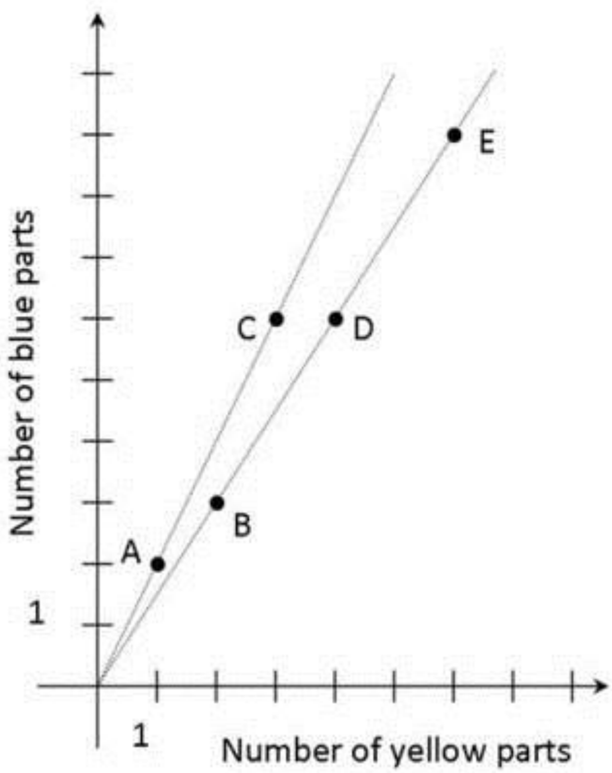
d. Draw a line connecting each point to (0, 0). What do the mixtures that are the same shade of green have in common?

Solution: Making a table

- The students made two different shades: mixtures A and C $(\frac{1}{2}, \frac{3}{6})$ are the same, because they are equivalence factions. Mixtures B, D, and E are $(\frac{2}{3}, \frac{4}{6}, \frac{9}{6})$ the same, because they are equivalence fractions.

- To make A and C, you add 2 parts blue to 1 part yellow. To make mixtures B, D, and E, you add 3/2 parts blue to 1 part yellow. Mixtures A and C are the bluest because you add more blue paint to the same amount of yellow paint.

  See the figure.



- If two mixtures are the same shade, they lie on the same line through the points (0,0).

Unit 2 Performance Task 2 PLD Rubric

SOLUTION

- **Student indicates two different shades: mixtures A and C and Mixtures B, D, and E and gives justifications.**
- **Student indicates Mixtures A and C are the bluest and gives justifications**
- **Student draws the line and indicates if two mixtures are the same shade, they lie on the same line through the points (0,0).**

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 asdiagrams 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 asdiagrams 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 • a logical, but incomplete, progression of steps	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 • majr calculation errors • partial justification of a conclusion	The student shows no work or justification.

Unit 2 Performance Task 3

Buying Protein Bars and Magazines (7.RP.A.3)

Tom wants to buy some protein bars and magazines for a trip. He has decided to buy three times as many protein bars as magazines. Each protein bar costs $0.70 and each magazine costs $2.50. The sales tax rate on both types of items is 6½%. How many of each item can he buy if he has $20.00 to spend?

Solution: Making a table

The table below shows the cost for the protein bars and magazines in a 3:1 ratio.

Number of magazines	1	2	3	4
Number of protein bars	3	6	9	12
Value of the magazines	$2.50	$5.00	$7.50	$10.00
Value of the protein bars	$2.10	$4.20	$6.30	$8.40
Value of both magazines and candy bars	$4.60	$9.20	$13.80	$17.40
Cost with tax	$4.90	$9.80	$14.70	$19.60

Looking at the last column of the table, we can see that Tom can buy 4 magazines and 12 protein bars for $20 and that he cannot afford 5 magazines and 15 protein bars.

Unit 2 Performance Task 3 PLD Rubric

SOLUTION

- **Student indicates that Tom can buy 4 magazines and 12 protein bars for $20 and that he cannot afford 5 magazines and 15 protein bars and justifies the solution with reasoning.**

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 conclusion with 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 • a logical, but incomplete, progression of steps	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 • majr calculation errors • partial justification of a conclusion	The student shows no work or justification.

Unit 2 Performance Task Option 1

Cooking with the Whole Cup (7.RP.A.1)

Travis was attempting to make muffins to take to a neighbor that had just moved in down the street. The recipe that he was working with required 34 cup of sugar and 18 cup of butter.

a. Travis accidentally put a whole cup of butter in the mix.
   i. What is the ratio of sugar to butter in the original recipe? What amount of sugar does Travis need to put into the mix to have the same ratio of sugar to butter that the original recipe calls for?
   ii. If Travis wants to keep the ratios the same as they are in the original recipe, how will the amounts of all the other ingredients for this new mixture compare to the amounts for a single batch of muffins?
   iii. The original recipe called for 38 cup of blueberries. What is the ratio of blueberries to butter in the recipe? How many cups of blueberries are needed in the new enlarged mixture?

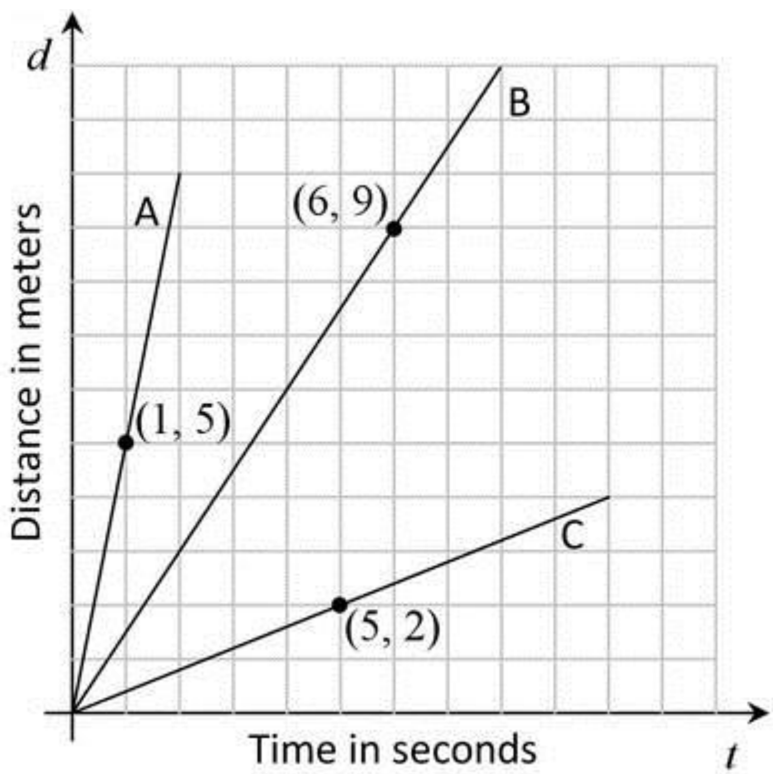
b. This got Travis wondering how he could remedy similar mistakes if he were to dump in a single cup of some of the other ingredients. Assume he wants to keep the ratios the same.
   i. How many cups of sugar are needed if a single cup of blueberries is used in the mix?
   ii. How many cups of butter are needed if a single cup of sugar is used in the mix?
   iii. How many cups of blueberries are needed for each cup of sugar?

Unit 2 Performance Task Option 2

Robot Races (7.RP.A.2)

Carli's class built some solar-powered robots. They raced the robots in the parking lot of the school. The graphs below are all line segments that show the distance d, in meters, that each of three robots traveled after t seconds.

a. Each graph has a point labeled. What does the point tell you about how far that robot has traveled?
b. Carli said that the ratio between the number of seconds each robot travels and the number of meters it has traveled is constant. Is she correct? Explain.
c. How fast is each robot traveling? How did you compute this from the graph?



Unit 2 Performance Task Option 3

How fast is Usain Bolt? (7.RP.A.3)

Jamaican sprinter Usain Bolt won the 100 meter sprint gold medal in the 2012 Summer Olympics. He ran the 100 meter race in 9.63 seconds. There are about 3.28 feet in a meter and 5280 feet in a mile. What was Usain Bolt's average speed for the 100 meter race in miles per hour?

Extensions

Online Resources

http://dashweb.pearsoncmg.com

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

http://www.ixl.com/math/grade-7
- Interactive, visually appealing fluency practice site that is objective descriptive

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

http://www.doe.k12.de.us/assessment/files/Math_Grade_7.pdf
- Common Core aligned assessment questions, including Next Generation Assessment Prototypes

http://www.learnzillion.com
- Videos organized by Common Core Standard presented with visual representations and student friendly language