7th Grade Mathematics

Proportional Relationships and Percentages
Unit 4 Pacing Calendar – Illustrative Mathematics

ORANGE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

From the New Jersey Student Learning Standards:

In **Grade 7**, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

1. Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

2. Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

3. Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

4. Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

Yearlong Pacing Guide
Grade 7

Grade	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
5	Unit 1 5.NBT	Unit 2 5.NBT		Unit 3 5.NF		Unit 4 5.NF		Unit 5 5.MD	Unit 6 5.OA & 5.G	
6	Unit 1 6.G	Unit 2 6.RP	Unit 3 6.RP	Unit 4 6.NS		Unit 5 6.NS	Unit 6 6.EE	Unit 7 6.NS	Unit 8 6.SP	
7	Unit 1 7.G	Unit 2 7.RP	Unit 3 7.G	Unit 4 7.RP		Unit 5 7.NS	Unit 6 7.EE	Unit 7 7.G	Unit 8 7.SP	
8	Unit 1 8.G	Unit 2 8.G	Unit 3 8.EE	Unit 4 8.EE		Unit 5 8.F	Unit 6 8.SP	Unit 7 8.EE	Unit 8 8.G	

Unit 1 — Geometry: Scale Drawings

Unit 2 — Ratios & Proportional Relationships: Introducing Proportional Relationships

Unit 3 — Geometry: Measuring Circles

Unit 4 — Ratios & Proportional Relationships: Proportional Relationships & Percentages

Unit 5 — Number System: Rational Number Arithmetic

Unit 6 — Expressions & Equations: Expressions, Equations &

Unit 7 — Geometry: Angles, Triangles, and Prisms

Unit 8 — Statistics & Probability: Probability and Sampling

2019-2020 Grade 7 (iM)							
Quarter 1		**Quarter 2**		**Quarter 3**		**Quarter 4**	
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
7.G.1(A)	7.RP.2a(M) 7.RP.2b(M) 7.RP.2c(M) 7.RP.2d(M)	7.G.4(A)	7.RP.1(M) 7.RP.3(M)	7.NS.1(M) 7.NS.2(M) 7.NS.3(M)	7.EE.3(M) 7.EE.4(M) 7.EE.2(M) 7.EE.1(M)	7.G.5(A) 7.G.2(A) 7.G.3(A) 7.G.6(A)	7.SP.6(S) 7.SP.5(S) 7.SP.7(S) 7.SP.8(S) 7.SP.1(S) 7.SP.2(S) 7.SP.3(S) 7.SP.4(S)
15 Days	17 Days	13 Days	19 Days	19 Days	25 Days	19 Days	22 Days
Oct. 1	Oct. 30	Nov. 22	Jan. 8	Feb. 7	Mar. 27	May 5	Jun. 9

Major Work   Supporting Content   Additional Content

Table of Contents

I. Unit Overview

In this unit, students deepen their understanding of ratios, scale factors, unit rates (also called constants of proportionality), and proportional relationships, using them to solve multi-step problems that are set in a wide variety of contexts that involve fractions and percentages.

In the first section of the unit, students extend their use of ratios and rates to problems that involve computing quotients of fractions, and interpreting these quotients in contexts such as scaling a picture or running at constant speed (MP2).

The section begins by revisiting scale factors and proportional relationships, each of which has been the focus of a previous unit. Both of these concepts can be used to solve problems that involve equivalent ratios. However, it is often more efficient to view equivalent ratios as pairs that are in the same proportional relationship rather than seeing one pair as obtained by multiplying both entries of the other by a scale factor. From the scaling perspective, to see that one ratio is equivalent to another or to generate a ratio equivalent to a given ratio, a scale factor is needed—which may be different for each pair of ratios in the proportional relationship. From the proportional relationship perspective, all that is needed is the constant of proportionality—which is the same for every ratio in the proportional relationship.

The second section of the unit is about percent increase and decrease. Students consider situations for which percentages can be used to describe a change relative to an initial amount, e.g., prices before and after a 25% increase. They begin by considering situations with unspecified amounts, e.g., matching tape diagrams with statements such as "Compared with last year's strawberry harvest, this year's strawberry harvest increased by 25%". They next consider situations with a specified amount and percent change, or with initial and final amounts, using double number line diagrams to find the unknown amount or percent change. Next, they use equations to represent such situations, using the distributive property to show that different expressions for the same amount are equivalent, e.g., $x−0.25x=0.75x$. So far, percent change in this section has focused on whole-number rates per 100, e.g., 75%. The last lesson asks students to compute fractional percentages of given amounts.

In the third section of the unit, students begin by using their abilities to find percentages and percent rates to solve problems that involve sales tax, tip, discount, markup, markdown, and commission (MP2). The remaining lessons of the section continue the focus on situations that can be described in terms of percentages, but the situations involve error rather than change—describing an incorrect value as a percentage of the correct value rather than describing an initial amount as a percentage of a final amount (or vice versa).

The last section of the unit consists of a lesson in which students analyze news items that involve percent increase or decrease. In small groups, students identify important quantities in a situation described in a news item, use diagrams to map the relationship of the quantities, and reason mathematically to draw conclusions (MP4). This is an opportunity to choose an appropriate type of diagram (MP5), to state the meanings of symbols used in the diagram, to specify units of measurement, and to label the diagram accurately (MP6). Each group creates a display to communicate its reasoning and critiques the reasoning shown in displays from other groups (MP3).

II. Pacing Guide

Activity	New Jersey State Learning Standards (NJSLS)	Estimated Time (Blocks)
Unit 4 Pre-Unit Assessment (IM) *Optional*	6.RP.A.3.a, 6.RP.A.3.b, 6.EE.A.3, 6.RP.A.3.c, 6.RP.A.3, 7.RP.A.3	½
Lesson 1: Lots of Flags	7.RP.A, 7.RP.A.1, 7.RP.A.2.a	1
Lesson 2: Ratios and Rates with Fractions	7.RP.A.1	1
Lesson 3: Revisiting Proportional Relationships	7.RP.A.1, 7.RP.A.2	1
Lesson 4: Half as Much Again	7.RP.A.2	1
Lesson 5: Say it with Decimals	7.RP.A.3	1
Lesson 6: Increasing and Decreasing	7.RP.A.3	1
Lesson 7: One Hundred Percent	7.RP.A.3	1
Lesson 8: Percent Increase and Decrease with Equations	7.RP.A.3	1
Lesson 9: More and Less than 1%	7.RP.A.3	1
Lesson 10: Tax and Tip	7.RP.A.3	1
Lesson 11: Percent Contexts	7.RP.A.3	1
Lesson 12: Finding the Percentage	7.RP.A.3	1
Lesson 13: Measurement Error	7.RP.A.3	1
Lesson 14: Percent Error	7.RP.A.3	1
Lesson 15: Error Intervals	7.RP.A.3	1
Lesson 16: Posing Percentage Problems	7.RP.A.3	1
Unit 4 Performance Task	7.RP.A.3	½
Unit 4 End of Unit Assessment (IM) *Optional*	7.RP.A.2, 7.RP.A.3, 7.G.A.1, 7.RP.A.1, 7.EE.B.3	**1**
Total Time		**18 Blocks**
Grade 7 Interim Assessment 2		**1**

==Major Work== ==Supporting Content== ==Additional Content==

III. Pacing Calendar

Please complete the pacing calendar based on the suggested pacing (*see Pacing Guide on page 2*).						

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				

Please complete the pacing calendar based on the suggested pacing (*see Pacing Guide on page 2)*.

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	

IV. PARCC Assessment Evidence Statements

Type I   Type II   Type III

NJSLS	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 1/2/1/4 miles per hour, equivalently 2 miles per hour	i) Tasks have a real-world context. ii) Tasks do not assess unit conversions.	MP. 2 MP. 4 MP. 6	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 are not limited to ratios of whole numbers. iii) Tasks use only coordinates in Quadrant 1 and use only a positive constant of proportionality.	MP. 2 MP. 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) Tasks may or may not have a context. ii) Tasks sample equally across the listed representations (graphs, equations, diagrams, and verbal descriptions). iii) Tasks use only coordinates in Quadrant 1 and use only a positive constant of proportionality.	MP. 2 MP. 5 MP. 8	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 the total cost and the number of items can be expressed as $t = pn$.	i) Tasks have a context. ii) Tasks use only coordinates in Quadrant 1 and use only a positive constant of proportionality.	MP. 2 MP. 8	No
7.RP.3-1	Use proportional relationships to solve multistep ratio problems.	i) Tasks will include proportional relationships that only involve positive numbers.	MP. 1 MP. 2 MP. 6	Yes

7.RP.3-2	Use proportional relationships to solve multistep percent problems. Examples: simple interest, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.	-	MP. 1 MP. 2 MP. 5 MP. 6	Yes
7.C.4	Base explanations/reasoning on a coordinate plane diagram (whether provided in the prompt or constructed by the student in her response). Content Scope: Knowledge and skills articulated in 7.RP.A	i) Tasks use only coordinates in Quadrant 1 and use only a positive constant of proportionality.	MP. 2 MP. 3 MP. 5 MP. 6	Yes
7.C.6.1	Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. Content Scope: Knowledge and skills articulated in 7.RP.2	i) Tasks use only coordinates in Quadrant 1 and use only a positive constant of proportionality.	MP. 2 MP. 3 MP. 6	Yes
7.C.7.1	Present solutions to multi-step problems in the form of valid chains of reasoning, using symbols such as equals signs appropriately (for example, rubrics award less than full credit for the presence of nonsense statements such as $1 + 4 = 5 + 7 = 12$, even if the final answer is correct), or identify or describe errors in solutions to multi-step problems and present corrected solutions. Content Scope: Knowledge and skills articulated in 7.RP.3	i) Tasks use only coordinates in Quadrant 1 and use only a positive constant of proportionality.	MP. 1 MP. 3 MP. 6 MP. 7 MP. 8	Yes
7.D.2	Solve multi-step contextual problems with degree of difficulty appropriate to grade 7, requiring application of knowledge and skills articulated in 6.RP.A, 6.EE.C, 6.G.	i) Tasks may have scaffolding, if necessary, in order to yield a degree of difficulty appropriate to grade 7.	MP.1 MP.2 MP.4 MP.5 MP.7	Yes

V. Differentiated Instruction

Supporting English Language Learners

The purpose of this document is to nudge the field forward by offering support to the next generation of mathematics learners and by challenging persistent assumptions about how to support and develop students' disciplinary language. The goal is to provide guidance to mathematics teachers for recognizing and supporting students' language development processes in the context of mathematical sense making. UL/SCALE provides a framework for organizing strategies and special considerations to support students in learning mathematics practices, content, and language. The framework is intended to help teachers address the specialized academic language demands in math when planning and delivering lessons, including the demands of reading, writing, speaking, listening, conversing, and representing in math (Aguirre & Bunch, 2012). Therefore, while the framework can and should be used to support all students learning mathematics, it is particularly well-suited to meet the needs of linguistically and culturally diverse students who are simultaneously learning mathematics while acquiring English.

For more information, click the link below:

Supporting ELL Learners

Supporting Students with Disabilities

The philosophical stance that guided the creation of these materials is the belief that with proper structures, accommodations, and supports, all children can learn mathematics. Lessons are designed to maximize access for all students and include additional suggested supports to meet the varying needs of individual students. While the suggested supports are designed for students with disabilities, they are also appropriate for many children who struggle to access rigorous, grade-level content. Teachers should use their professional judgment about which supports to use and when, based on their knowledge of the individual needs of students in their classroom.

For more information, click the link below:

Supporting Students with Disabilities

VI. Vocabulary

<u>Measurement Error:</u>	Measurement error is the positive difference between a measurement of a quantity and the actual quantity. It is often expressed as a percentage of the actual value. For example, if we get 6 cm when we measure a line that is actually 6.2 cm long, then the measurement error is 0.2 cm and the percent error is 3.2%, because 0.2÷6.2=0.032.
<u>Percent Error:</u>	The difference between the correct value and the incorrect value, expressed as a percentage of the correct value.
<u>Percentage Decrease:</u>	Given an initial amount and a final amount which is smaller than the initial amount, the percentage decrease is the difference (initial amount minus final amount) expressed as a percentage of the initial amount.
<u>Percentage Increase:</u>	Given an initial amount and a final amount which is larger than the initial amount, the percentage increase is the difference (final amount minus initial amount) expressed as a percentage of the initial amount.
<u>Repeating Decimal:</u>	A repeating decimal is an infinite decimal expansion that eventually repeats the same sequence of digits over and over again. The repeated sequence is indicated by a line above it.

VII. Assessment Framework

Unit 4 Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded?**
Pre-Unit Diagnostic Assessment (Beginning of Unit – Optional) *Illustrative Mathematics*	6.RP.A.3.a, 6.RP.A.3.b, 6.EE.A.3, 6.RP.A.3.c, 6.RP.A.3, 7.RP.A.3	½ Block	Individual	Yes (No Weight)
End-of-Unit Assessment (End of Unit – Optional) *Illustrative Mathematics*	7.RP.A.2, 7.RP.A.3, 7.G.A.1, 7.RP.A.1, 7.EE.B.3	1 Block	Individual	Yes

Unit 4 Performance Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded?**
Unit 4 Performance Task 1 (Early January) *Double Discounts*	7.RP.A.3	½ Block	Individual	Yes; Rubric
Unit 4 Performance Task Option 1 (Optional) *Finding a 10% Increase*	7.RP.A.3	Teacher Discretion	Teacher Discretion	Yes, if administered

Name _____   Block _____   Date _____

Double Discounts (7.RP.A.3)

Emily has a coupon for 20 percent off of her purchase at the store. She finds a backpack that she likes on the discount rack. Its original price is $60 but everything on the rack comes with a 30 percent discount. Emily says

Thirty percent and twenty percent make fifty percent so it will cost $30.

    a.   Is Emily Correct? Explain

    b. What price will Emily pay for the backpack?

7th Grade Double Discounts – Rubric   Name: _____   Date: _____

NJSLS: 7.RP.A.3   Type: _____   Teacher: _____

Task Description	• 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. • Clearly constructs and communicates a complete response by ➢using a logical approach based on a conjecture and/or stated assumptions ➢providing an efficient and logical progression of steps ➢using grade-level vocabulary, symbols, and labels ➢providing a justification of a conclusion with minor computational error ➢evaluating, interpreting and critiquing the validity and efficiency of others' responses				
Command Level Description	*Level 5:* ***Distinguished Command*** Perform the task items accurately or with minor computation errors.	*Level 4:* ***Strong Command*** Perform the task items with some non-conceptual errors	*Level 3:* ***Moderate Command*** Perform the task items with minor conceptual errors and some computation errors.	*Level 2:* ***Partial Command*** Perform the task items with some errors on both math concept and computation.	*Level 1:* Perform the task items with serious errors on both math concept and computation.
Score range	*6 pts*	*4-5 pts*	*3 pts*	*2 pts*	*0-1 pt*
Task Score & PLD Assigned					

7th Grade Double Discounts – Scoring Guide   **NAME: _____**

#	Answer	Scoring
Part A	It is true that 20% and 30% make 50%. However, in the context of sale prices it is essential to keep track of the wholes to which these percents apply. The 30% discount on the backpack applies to the original price of $60: $0.3 \times 60 = 18$ making the discount of the backpack $18.00. Therefore, after the using the coupon, the backpack price becomes $42. Emily's additional 20% coupon applies not to the original backpack price but to the discounted price of $42: $0.2 \times 42 = 8.40$ Emiliy would need to save an additional $12 off the price of $42 in order to buy the backpack for #30 so her calculations are not correct.	1 point: Correctly stating that Emily's statement is incorrect. 2 points: Writing a thorough and correct explanation. **3 TOTAL POINTS**
Part B	As displayed in part (A), Emily's coupon lowers the discount rack price by $8.40, therefore she will pay: $42 - 8.40 = 33.60$ $33.60	3 points: Student has correct answer, correct work, and units. 2 points: Student has correct discount amount and correct units but has a minor mistake. 1 point: student only has the correct discount amount. **3 TOTAL POINTS**

Name _____   Block _____   Date _____

Finding a 10% Increase (7.RP.A.3)

5,000 people visited a book fair in the first week. The number of visitors increased by 10% in the second week.

How many people visited the book fair in the second week?

IX. 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** .

References

"Illustrative Mathematics" *Open Up Resources.* 2018

        <https://auth.openupresources.org/register/complete>