Orange Public Schools

Office of Curriculum & Instruction

2019-2020 Mathematics Curriculum Guide

6th Grade Mathematics

Illustrative Mathematics - Unit 7: Rational Numbers

April 20, 2020 – May 19, 2020

Board Approved: 1.14.2020

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From the New Jersey Student Learning 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.

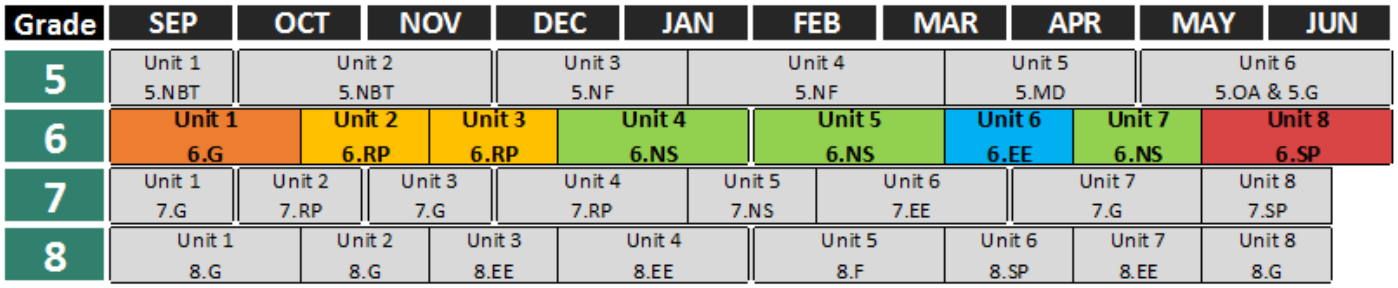
(1) Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving 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 New Jersey Student Learning Standards for Mathematics 40 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. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Yearlong Pacing Guide
Grade 6



Unit 1 — **Geometry:** Area and Surface Area

Unit 2 — **Ratios & Proportional Relationships:** Introducing Ratios

Unit 3 — **Ratios & Proportional Relationships:** Unit Rates & Percentages

Unit 4 — **Number System:** Dividing Fractions

Unit 5 — **Number System:** Arithmetic in Base Ten

Unit 6 — **Expressions & Equations:** Expressions & Equations

Unit 7 — **Number System:** Rational Numbers

Unit 8 — **Statistics & Probability:** Data Sets and Distributions

2019-2020 Grade 6 (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
6.G.1(S) 6.G.4(S)	6.RP.1(M) 6.RP.3a(M)	6.RP.2(M) 6.RP.3(M) 6.RP.3b(M) 6.RP.3c(M) 6.RP.3d(M)	6.NS.1(M) 6.G.2(S)	6.NS.3(A) 6.NS.2(A)	6.EE.6(M) 6.EE.5(M) 6.EE.7(M) 6.EE.4(M) 6.EE.2(M) 6.EE.3(M) 6.EE.1(M) 6.EE.9(M)	6.NS.5(M) 6.NS.6(M) 6.NS.7(M) 6.EE.8(M) 6.NS.8(M) 6.NS.4(A) 6.G.3(S)	6.SP.1(A) 6.SP.5(A) 6.SP.4(A) 6.SP.2(A) 6.SP.3(A)
22 Days	19 Days	19 Days	20 Days	18 Days	20 Days	20 Days	21 Days
Oct. 11	Nov. 15	Dec. 19	Jan. 31	Mar. 6	Apr. 9	May 19	Jun. 19

Major Work Supporting Content Additional Content

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References

"Illustrative Mathematics" *Open Up Resources.* 2018 <https://auth.openupresources.org/register/complete>

I. Unit Overview

In this unit, students are introduced to signed numbers and plot points in all four quadrants of the coordinate plane for the first time. They work with simple inequalities in one variable and learn to understand and use "common factor," "greatest common factor," "common multiple," and "least common multiple."

The first section of the unit introduces signed numbers. Students begin by considering examples of positive and negative temperatures, plotting each temperature on a vertical number line on which 0 is the only label. Next, they consider examples of positive and negative numbers used to denote height relative to sea level. In the second lesson, they plot positive and negative numbers on horizontal number lines, including "opposites"—pairs of numbers that are the same distance from zero. They use "less than," "greater than," and the corresponding symbols to describe the relationship of two signed numbers, noticing correspondences between the relative positions of two numbers on the number line and statements that use these symbols, e.g., $0.8>-1.3$ means that 0.8 is to the right of -1.3 on the number line. Students learn that the sign of a number indicates whether the number is positive or negative, and that zero has no sign. They learn that the absolute value of a number is its distance from zero, how to use absolute value notation, and that opposites have the same absolute value because they have the same distance from zero.

Previously, when students worked only with non-negative numbers, magnitude and order were indistinguishable: if one number was greater than another, then on the number line it was always to the right of the other number *and* always farther from zero. In comparing two signed numbers, students distinguish between magnitude (the absolute value of a number) and order (relative position on the number line), distinguishing between "greater than" and "greater absolute value," and "less than" and "smaller absolute value."

Students examine opposites of numbers, noticing that the opposite of a negative number is positive.

The second section of the unit concerns inequalities. Students graph simple inequalities in one variable on the number line, using a circle or disk to indicate when a given point is, respectively, excluded or included. In these materials, inequality symbols in grade 6 are limited to $<$ and $>$ rather than $\leq$ and $\geq$. However, in this unit students encounter situations when they need to represent statements such as $2<x$ or $2=x$.

Students represent situations that involve inequalities, symbolically and with the number line, understanding that there may be infinitely many solutions for an inequality. They interpret and graph solutions in contexts (MP2), understanding that some results do not make sense in some contexts, and thus the graph of a solution might be different from the graph of the related symbolic inequality. For example, the graph describing the situation "A fishing boat can hold fewer than 9 people" omits values other than the whole numbers from 0 to 8, but the graph of $x<8$ includes all numbers less than 8. Students encounter situations that require more than one inequality statement to describe, e.g., "It rained for more than 10 minutes but less than 30 minutes" ($t>10$ and $t<30$, where t is the amount of time that it rained in minutes) but which can be described by one number line graph.

The third section of the unit focuses on the coordinate plane. In grade 5, students learned to plot points in the coordinate plane, but they worked only with non-negative numbers, thus plotted points only in the first quadrant. In a previous unit, students again worked in the first quadrant of the coordinate plane, plotting points to represent ratio and other relationships between two quantities with positive values. In this unit, students work in all four quadrants of the coordinate plane, plotting pairs of signed number coordinates in the plane. They understand that for a given data set, there are more and less strategic choices for the scale and extent of a set of axes. They understand the correspondence between the signs of a pair of coordinates and the quadrant of the corresponding point. They interpret the meanings of plotted points in given contexts (MP2), and use coordinates to calculate horizontal and vertical distances between two points.

The last section of the unit returns to consideration of whole numbers. In the first lesson, students are introduced to "common factor" and "greatest common factor," and solve problems that illustrate how the greatest common factor of two numbers can be used in real-world situations, e.g., determining the largest rectangular tile with whole-number dimensions that can tile a given rectangle with whole-number dimensions. The second lesson introduces "common multiple" and "least common multiple," and students solve problems that involve listing common multiples or identifying common multiples of two or more numbers. In the third and last lesson, students solve problems that revisit situations similar to those in the first two lessons and identify which of the new concepts is involved in each problem. This lesson includes two optional classroom activities.

Essential Questions

- How are opposite and negative numbers used in real-world contexts?
- What is the difference between an integer and a rational number?
- What is the Cartesian plane and what does an ordered pair represent?
- How are inequalities different than equality equations?
- How will inequalities help model real world problems?

Enduring Understanding

- More than integers are necessary to solve real-world application. ie. negative, opposite, and rational numbers.
- The Cartesian plane and ordered pairs can be utilized to represent real world application problems.
- Inequalities are used in real world problems.
- Inequalities can be modeled using number lines and solved using different operations.
- Inequalities are manipulated similarly to equality equations.

II. Pacing Guide

Activity	New Jersey State Learning Standards (NJSLS)	Estimated Time (Blocks)
Unit 7 Pre-Unit Diagnostic Assessment *Optional*	5.NF.B.5; 5.NBT.A.3b; 4.NF.C.6; 3.NF.A.2; 4.NF.A.2; 5.NBT.B.7; 5.G.A.1; 5.G.A.2	**1/2**
Lesson 1: Positive and Negative Numbers	6.NS.C.5; 6.NS.C.6	1
Lesson 2: Points on the Number Line	6.NS.C.6a; 6.NS.C.6c; 6.NS.C.6	1
Lesson 3: Comparing Positive and Negative Numbers	6.NS.C.7a; 6.NS.C.7b	1
Lesson 4: Ordering Rational Numbers	6.NS.C.6; 6.NS.C.7	1
Lesson 5: Using Negative Numbers to Make Sense of Contexts	6.NS.C.5	1
Lesson 6: Absolute Value of Numbers	6.NS.C.7c; 6.NS.C.7d	1
Lesson 7: Comparing Numbers and Distance from Zero	6.NS.C.6a; 6.NS.C.7d; 6.NS.C.7	1
Lesson 8: Writing and Graphing Inequalities	6.EE.B.6; 6.EE.B.8; 6.NS.C.7b	1
Lesson 9: Solutions of Inequalities	6.EE.B.5; 6.EE.B.8; 6.NS.C.7a	1
Lesson 10: Interpreting Inequalities	6.EE.A.2; 6.EE.B.5; 6.EE.B.6; 6.EE.B.8	1
Lesson 11: Points on the Coordinate Plane	6.NS.C.6; 6.NS.C.8	1
Lesson 12: Constructing the Coordinate Plane	6.NS.C.6c	1
Lesson 13: Interpreting Points on a Coordinate Plane	6.NS.C.6; 6.NS.C.7, 6.NS.C.8	1
Lesson 14: Distances on a Coordinate Plane	6.NS.C.6; 6.NS.C.8	1
Lesson 15: Shapes on a Coordinate Plane	6.G.A.3; 6.NS.C.6; 6.NS.C.8	1
Lesson 16: Common Factors	6.NS.B.4	1
Lesson 17: Common Multiples	6.NS.B.4	1
Lesson 18: Using Common Multiples & Common Factors ***(Project Based Learning)***	6.NS.B.4	1
Unit 7 End-Unit Assessment *Optional*	6.NS.C.6c; 6.EE.B.8; 6.NS.B.4;6.NS.C.7; 6.NS.C.5; 6.G.A.3; 6.NS.C.8	**1**
Performance Task 7		**1 /2**
Total Time		**20 Blocks**

Major Work Supporting Content Additional Content

III. Pacing Calendar

Please complete the pacing calendar based on the suggested pacing (*see Pacing Guide on page 1)*.

APRIL

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		

Please complete the pacing calendar based on the suggested pacing (*see Pacing Guide on page 1)*.

MAY

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. NJSLA Assessment Evidence Statements

Type I Type II Type III

NJSLS	Evidence Statement	Clarification	Math Practices	Calculator ?
6.NS.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	i) Tasks do not require students to perform any computations. ii) Students may be asked to recognize the meaning of 0 in the situation, but will not be asked to explain.	MP.2 MP.5	No
6.NS.6a	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite	i) Tasks have “thin context” or no context.	MP.5 MP.8	No
6.NS.6b-1	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane.	i) Tasks have “thin context” or no context. ii) Students need not recognize or use traditional notation for quadrants (such as I, II, III, IV). iii) Coordinates are not limited to integers.	MP.5	No

6.NS.6b-2	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. b. Recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes	i) Tasks have "thin context" or no context. ii) Students need not recognize or use traditional notation for quadrants (such as I, II, III, IV). iii) Coordinates are not limited to integers. .	MP.5 MP.8	No
6.NS.6c-1	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram	i) Tasks have "thin context" or no context. ii) Coordinates are not limited to integers.	MP.5	No
6.NS.6c-2	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. c. Find and position pairs of integers and other rational numbers on a coordinate plane.	i) Tasks have "thin context" or no context. ii) Students need not recognize or use traditional notation for quadrants (such as I, II, III, IV). iii) Coordinates are not limited to integers.	MP.5	No
6.NS.7a	Understand ordering and absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.	i) Tasks do not have a context. ii) Tasks are not limited to integers.	MP.2 MP.5	No

6.NS.7b	Understand ordering and absolute value of rational numbers. b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write –3°C > –7°C to express the fact that –3°C is warmer than –7°C.	i) Tasks are not limited to integers. ii) For the explain aspect of 6.NS.7b, see 6.C.4	MP.2 MP.3 MP.5	No
6.NS.7c-1	Understand ordering and absolute value of rational numbers. c. Understand the absolute value of a rational number as its distance from 0 on the number line	i) Tasks do not have a context. ii) Tasks are not limited to integers.	MP.2 MP.5	No
6.NS.7c-2	Understand ordering and absolute value of rational numbers. c. Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.	i) Tasks have a context. ii) Tasks are not limited to integers.	MP.2	No
6.NS.7d	Understand ordering and absolute value of rational numbers. d. Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than –30 dollars represent a debt greater than 30 dollars.	i) Tasks may or may not contain context. ii) Tasks are not limited to integers. iii) Prompts do not present students with a number line diagram, but students may draw a number line diagram as a strategy.	MP.2 MP.5	No
6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	i) Tasks may or may not contain context. ii) Finding distances is limited to points with integer coordinates.	MP.1 MP.2 MP.5	No

6.EE.8	Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	i) Values of c are not limited to integers. ii) Tasks involve < and >, not ≤ and ≥.	MP.2 MP.6 MP.7	No
6.NS.4-1	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12.	i) Tasks do not have a context.	-	No
6.NS.4-2	Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express 36 + 8 as 4(9 + 2).	i) Tasks do not have a context. ii) Tasks require writing or finding the equivalent expression with the greatest common factor.	MP.7	No
6.C.4	Base explanations/reasoning on a number line diagram (whether provided in the prompt or constructed by the student in her response). Content Scope: Knowledge and skills articulated in 6.NS.6, 6.NS.7	-	MP.3 MP.5 MP.6	Yes
6.C.5	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 6.NS.6, 6.NS.8	-	MP.3 MP.4 MP.5 MP.6	Yes
6.D.1	Solve multi-step contextual word problems with degree of difficulty appropriate to Grade 6, requiring application of knowledge and skills articulated in Type I, Sub-Claim A Evidence Statements.	i) Tasks may have scaffolding, if necessary, in order yield a degree of difficulty appropriate to Grade 6.	MP.1 MP.2 MP.4 MP.5 MP.7	Yes

6.D.3	Reasoned estimates: Use reasonable estimates of known quantities in a chain of reasoning that yields an estimate of an unknown quantity. Content Scope: Knowledge and skills articulated in Type I, Sub-Claim A Evidence Statements.	i) Tasks may have scaffolding, if necessary, in order to yield a degree of difficulty appropriate to Grade 6.	MP.1 MP.2 MP.4 MP.5 MP.7	Yes

V. Differentiated Instruction

Supporting English Language Learners

There are four design principles for promoting mathematical language use and development in curriculum and instruction. The design principles and related routines work to make language development an integral part of planning and delivering instruction while guiding teachers to amplify the most important language that students are expected to bring to bear on the central mathematical ideas of each unit.

The design principles are:
- Design Principle 1: Support sense-making
- Design Principle 2: Optimize output
- Design Principle 3: Cultivate conversation
- Design Principle 4: Maximize linguistic and cognitive meta-awareness

These four principles are intended as guides for curriculum development and planning and execution of instruction, including the structure and organization of interactive opportunities for students, and the observation, analysis, and reflection on student language and learning. The design principles motivate the use of mathematical language routines (MLRs).

These eight routines are:
- MLR1: Stronger and Clearer Each Time
- MLR2: Collect and Display
- MLR3: Critique, Correct, and Clarify
- MLR4: Information Gap
- MLR5: Co-Craft Questions and Problems
- MLR6: Three Reads
- MLR7: Compare and Connect
- MLR8: Discussion Supports

Supporting Students with Disabilities

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.

The inclusion of additional supports for students with disabilities offers additional strategies for teachers to meet the individual needs of a diverse group of learners. Lesson and activity-level supports for students with disabilities are aligned to an area of cognitive functioning and are paired with a suggested strategy aimed to increase access and eliminate barriers. These lesson specific supports help students succeed with a specific activity without reducing the mathematical demand of the task. All of the supports can be used discreetly and are designed to be used as needed.

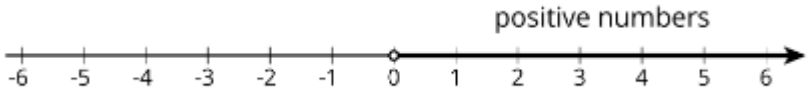
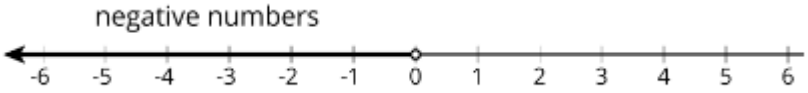
Suggestions for supports fall under the following categories:

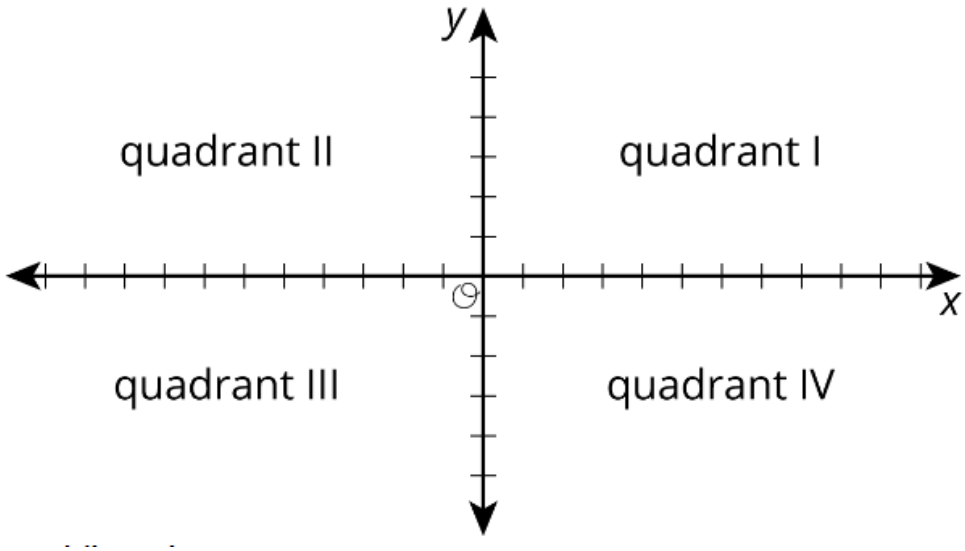
Eliminate Barriers
Processing Time
Peer Tutors
Assistive Technology
Visual Aids
Graphic Organizers
Brain Breaks

For a more descriptive account of these supports, reference the following:

https://im.openupresources.org/6/teachers/teacher_course_guide.html - supporting-students-with-disabilities

VI. VOCABULARY

Term	Definition
Positive Number	A positive number is any number that is greater than zero. On a number line, positive numbers are always on the same side of 0 as 1. If a number line is drawn horizontally, the positive numbers are usually to the right of zero.  If a number line is drawn vertically, then the positive numbers are usually above zero, like most thermometers or on the vertical axis in the coordinate plane.
Negative Number	A negative number is any number that is less than zero. On a number line, negative numbers are always on the opposite side of 0 as 1. If a number line is drawn horizontally, the negative numbers are usually to the left of zero.  If a number line is drawn vertically, then the negative numbers are usually below zero, like most thermometers or on the vertical axis in the coordinate plane.
Opposite (numbers)	Two numbers are opposites of each other if they are the same distance from 0 on the number line, but on opposite sides.
Rational Number	A rational number is a fraction or the opposite of a fraction. Remember that a fraction is a point on the number line that you get by dividing the unit interval into b equal parts and finding the point that is a of them from 0. We can always write a fraction in the form $\frac{a}{b}$ where *a* and *b* are whole numbers, with *b* not equal to 0, but there are other ways to write them. For example, 0.7 is a fraction because it is the point on the number line you get by dividing the unit interval into 10 equal parts and finding the point that is 7 of those parts away from 0. We can also write this number as $\frac{7}{10}$.

Sign	The sign of a nonzero number is either positive or negative.
Absolute Value	The absolute value of a number is its distance from 0 on the number line.
Solution to an inequality	A solution to an inequality is a value of the variable that makes the inequality true. For example, x=-3 is a solution to the inequality x<-1, but x=3 is not a solution.
Quadrant	When axes extend in both positive and negative directions, the coordinate plane is divided into 4 regions called quadrants. The quadrants are numbered with Roman numerals, with quadrant I in the upper right, quadrant II in the upper left, quadrant III in the lower left, and quadrant IV in the lower right. 
Common Factor	A common factor of two whole numbers is a factor that they have in common. For example, 5 is a common factor of 15 and 20.
Common Multiple	A common multiple for two whole numbers is a number that is a multiple of both numbers. For example, 20 is a multiple of 2 and a multiple of 5, so 20 is a common multiple of 2 and 5.

VII. Assessment Framework

Unit 7 Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded ?**
Pre-Unit Diagnostic Assessment (Beginning of Unit – Optional) *Illustrative Mathematics*	5.NF.B.5; 5.G.A.2; 4.NF.C.6; 3.NF.A.2; 4.NF.A.2; 5.NBT.B.7; 5.G.A.1; 5.NBT.A.3b	½ Block	Individual	Yes (No Weight)
End-of-Unit Assessment (End of Unit – Optional) *Illustrative Mathematics*	6.NS.C.6c; 6.EE.B.8; 6.NS.B.4;6.NS.C.7; 6.NS.C.5; 6.G.A.3; 6.NS.C.8	1 Block	Individual	Yes

Unit 7 Performance Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded ?**
Unit 7 Performance Task 1 (Mid-May) ***Extending the Number Line***	6.NS.C.6	½ Block	Individual w/ Interview Opportunity	Yes; Rubric
Unit 7 Performance Task Option 1 (Optional) ***It's Warmer in Miami***	6.NS.C.5	Teacher Discretion	Teacher Discretion	Yes, if administered
Extended Constructed Response (ECR)* (click here for access)	Dependent on unit of study & month of administration	Up to 30 minutes	Individual	Yes; Rubric

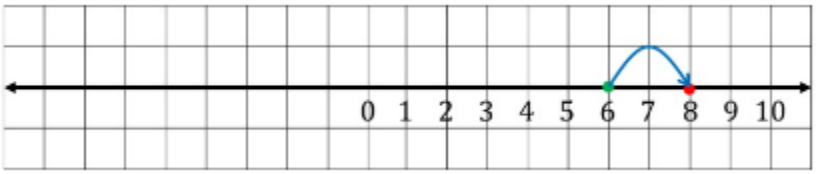
* Use the following links to access ECR protocol and district assessment scoring documents:

- *Assessment & Data in Mathematics Bulletin*
- *Extended Constructed Response Protocol*

Name _____ Block _____ Date _____

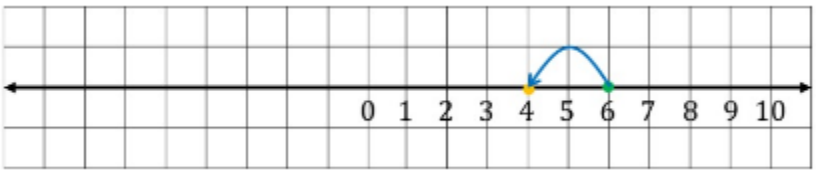
Extending the Number Line (6.NS.C.6)

a. Draw a line on graph paper. Make a tick mark in the middle of the line and label it 0. Mark and label 1, 2, 3, ... 10. Since 6+2 is 2 units to the right of 6 on the number line, we can represent 6+2 like this:



Describe the location of 3+4 on the number line in terms of 3 and 4. Draw a picture like the one above.

b. 6-2 is 2 units to the left of 6 on the number line, which we can represent like this:

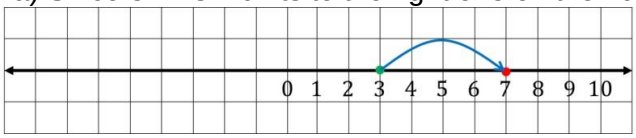


Describe the location of 3-4 on the number line in terms of 3 and 4. Draw a picture like the one above.

Unit 7 Performance Task 1 PLD Rubric

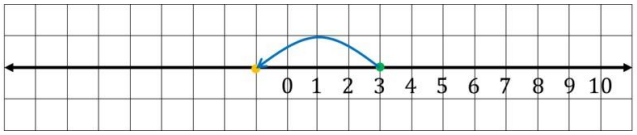
SOLUTION

- a) Since 3+4 is 4 units to the right of 3 on the number line, we can find and represent 3+4 like this:



We can see from the number line that 3+4=7.

- b) Since 3-4 is 4 units to the left of 3 on the number line, we can find and represent 3-4 like this:



The difference 3-4 has a well determined place on the number line as shown in the picture. This place, however, is not marked and is not a whole number. The difference 3-4 is one unit to the left of 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 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	No parts are correct. The student shows no work or justification.

Name _____ Block _____ Date _____

It's Warmer in Miami (6.NS.C.5)

Task

One morning the temperature is -28◦ in Anchorage, Alaska, and 65◦ in Miami, Florida. How many degrees warmer was it in Miami than in Anchorage on that morning?

IX. Modifications

Special Education/ 504:	English Language Learners:
-Adhere to all modifications and health concerns stated in each IEP. -Give students a MENU options, allowing students to pick assignments from different levels based on difficulty. -Accommodate Instructional Strategies: reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), handouts, definition list with visuals, extended time -Allow students to demonstrate understanding of a problem by drawing the picture of the answer and then explaining the reasoning orally and/or writing , such as Read-Draw-Write -Provide breaks between tasks, use positive reinforcement, use proximity -Assure students have experiences that are on the Concrete- Pictorial- Abstract spectrum by using manipulatives -Implement supports for students with disabilities (click here) - Make use of strategies imbedded within lessons -Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 17-18) - Strategies for students with 504 plans	- Use manipulatives to promote conceptual understanding and enhance vocabulary usage - Provide graphic representations, gestures, drawings, equations, realia, and pictures during all segments of instruction - During i-Ready lessons, click on “Español” to hear specific words in Spanish - Utilize graphic organizers which are concrete, pictorial ways of constructing knowledge and organizing information - Use sentence frames and questioning strategies so that students will explain their thinking/ process of how to solve word problems - Utilize program translations (if available) for L1/ L2 students - Reword questions in simpler language - Make use of the ELL Mathematical Language Routines (click here for additional information) -Scaffolding instruction for ELL Learners -Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 16-17)
Gifted and Talented:	**Students at Risk for Failure:**
- Elevated contextual complexity - Inquiry based or open ended assignments and projects - More time to study concepts with greater depth - Promote the synthesis of concepts and making real world connections - Provide students with enrichment practice that are imbedded in the curriculum such as: ● Application / Conceptual Development ● Are you ready for more? - Provide opportunities for math competitions - Alternative instruction pathways available - Common Core Approach to Differentiate Instruction: Students with Disabilities (pg. 20)	- Assure students have experiences that are on the Concrete- Pictorial- Abstract spectrum - Modify Instructional Strategies, reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), inclusion of more visuals and manipulatives, Peer Support - Constant parental/ guardian contact - Provide academic contracts to students & guardians - Create an interactive notebook with samples, key vocabulary words, student goals/ objectives. - Plan to address students at risk in your learning tasks, instructions, and directions. Anticipate where the needs will be, then address them prior to lessons. -Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 19)

21st Century Life and Career Skills:

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

https://www.state.nj.us/education/cccs/2014/career/9.pdf

- **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.

Students are given an opportunity to communicate with peers effectively, clearly, and with the use of technical language. They are encouraged to reason through experiences that promote critical thinking and emphasize the importance of perseverance. Students are exposed to various mediums of technology, such as digital learning, calculators, and educational websites.

Technology Standards:

All students will be prepared to meet the challenge of a dynamic global society in which they participate, contribute, achieve, and flourish through universal access to people, information, and ideas.
https://www.state.nj.us/education/cccs/2014/tech/

8.1 Educational Technology:

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. **Technology Operations and Concepts:** Students demonstrate a sound understanding of technology concepts, systems and operations.
B. **Creativity and Innovation:** Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
C. **Communication and Collaboration:** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
D. **Digital Citizenship:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
E. **Research and Information Fluency:** Students apply digital tools to gather, evaluate, and use of information.
F. **Critical thinking, problem solving, and decision making:** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:

All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

A. **The Nature of Technology: Creativity and Innovation-** Technology systems impact every aspect of the world in which we live.
B. **Technology and Society:** Knowledge and understanding of human, cultural, and societal values are fundamental when designing technological systems and products in the global society.
C. **Design:** The design process is a systematic approach to solving problems.
D. **Abilities in a Technological World:** The designed world in a product of a design process that provides the means to convert resources into products and systems.
E. **Computational Thinking: Programming-** Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Interdisciplinary Connections:	
English Language Arts:	
L.6.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
SL.6.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
W.6.1	Write arguments to support claims with clear reasons and relevant evidence.

X. Core Instruction & Supplemental Resources

Core Instruction

ILLUSTRATIVE MATHEMATICS V. 2019
(OPEN UP RESOURCES)

GRADE	TEACHER RESOURCES	STUDENT RESOURCES
6	• **Teacher Edition: Unit 1-9** • Online Course Guide	• Student Workbook Set: Unit 1-9 • Online Student Access (Digital Applets)
7	• **Teacher Edition: Unit 1-9** • Online Course Guide	• Student Workbook Set: Unit 1-9 • Online Student Access (Digital Applets)
8	• **Teacher Edition: Unit 1-9** • Online Course Guide	• Student Workbook Set: Unit 1-9 • Online Student Access (Digital Applets)

5 Practices for Orchestrating Productive Mathematics Discussions

Anticipate

Consider how students might mathematically interpret a problem, the array of strategies—both correct and incorrect—that they might use to tackle it, and how those strategies and interpretations might relate to the mathematical concepts, representations, procedures, and practices that you would like the students to learn.

- Solve the problem yourself first. If possible work with colleagues.
- Ask yourself the following questions:
  - What strategies have students used in the past?
  - What representations are students most likely to use?
  - What incorrect or unproductive strategies are students likely to try?
  - What things might get in the way of students being able to engage with the problem? How can you remove those barriers?
  - What questions will you ask those who struggle?

Monitor

Pay close attention to students' mathematical thinking and solution strategies as they work on the task.

- Create a list of strategies the students may produce.
- Circulate the room. Watch and listen to students as they work.
- If any students use strategies you anticipated, write their name or group number on your list.
- Ask questions that will help students make their thinking visible.
- Ask questions that will help students clarify their thinking.
- Press students to consider aspects of the task to which they need to attend.

Select

Select particular students to share their work with the rest of the class to get specific mathematics into the open for discussion. The selection of particular students and their solutions is guided by the previously anticipated strategies and your assessment of how each approach will contribute to that goal.

- Based on the previously anticipated strategies and the mathematical goal of the activity, decide which student strategies to highlight.
- Select students who will share their work with the class.

Sequence

Make purposeful choices about the order in which students' work is shared to maximize the chances of achieving the mathematical goals for the discussion.

- Based on the mathematical goal, decide on the purpose for the sequence of work. For example: least efficient to most efficient, concrete to abstract, misconceptions to conceptions, or building representations.
- Decide in which order students will present their work.

Connect

Help students draw connections between their solutions and other students' solutions as well as the key mathematical ideas in the lesson. Help students to make judgments about the consequences of different approaches for the range of problems that can be solved, one's likely accuracy and efficiency in solving them, and the kinds of mathematical patterns that can be most easily discerned. Know where you want the discussion to "land" and make choices that are likely to get you there. If necessary, you may have to demonstrate an approach that students didn't come up with themselves.

- As students share, ask questions to elicit and clarify student thinking.
- After each student shares, ask questions to connect it to previously shared work or ask a student to summarize what another student said in their own words.
- Ask students to compare and contrast strategies or representations during the discussion.
- If students did not come up with an approach that you need them to see in order for the discussion to "land," demonstrate this approach and connect it to the work that students did.

IDEAL MATH BLOCK

Whole Group Instruction	55min	INSTRUCTION (Grades 3 – 8) Daily Routine: Mathematical Content or Language Routine (7 – 10 min) Anchor Task: Anticipate, Monitor, Select, Sequence, Connect Tech Integration: Digital applets embedded within lessons designed to enhance student learning Collaborative Work* Guided Learning/Guided Practice Independent Work (Demonstration of Student Thinking) Additional Activities / Let's Practice		
Rotation Stations (Student Notebooks & Chromebooks Needed)	1-2X 30 min	STATION 1: Focus on current Grade Level Content STUDENT EXPLORATION* Independent or groups of 2-3 Emphasis on MP's 3, 6 (Reasoning and Precision) And MP's 1 & 4 (Problem Solving and Application) TOOLS/RESOURCES Practice Problems Extra Practice/Enrichment Are you ready for more? Put Your Thinking Cap On	STATION 2: Focus on Student Needs TECH STATION Independent TECH INTEGRATION iReady - *i-Ready* delivers online lessons driven by student data to provide tailored instruction that meets students where they are in their learning trajectory. Dreambox (ELL) – Adaptive online learning platform.	TEACHER STATION: Focus on Grade Level Content; heavily scaffolded to connect deficiencies TARGETED INSTRUCTION 4 – 5 Students TOOLS/ RESOURCES Homework Manipulatives Reteach Workbook Transition Guide *all students seen in 2 weeks
Closure	5 min	INSTRUCTION Exit Ticket (Demonstration of Student Thinking) TOOLS/RESOURCES Notebooks or Exit Ticket Slips		

* Promotes discourse and collaboration

Supplemental Resources

Achieve the Core

Tasks - https://achievethecore.org/category/416/mathematics-tasks

Coherence Map - https://achievethecore.org/page/1118/coherence-map

Embarc

https://embarc.online/

Engage NY

https://www.engageny.org/ccss-library/?f%5B0%5D=field_subject%253Aparents_all%3A13601

iReady Digital Platform

https://login.i-ready.com/

Illustrative Mathematics

Content Standard Tasks - https://tasks.illustrativemathematics.org/content-standards

Practice Standard Tasks - https://tasks.illustrativemathematics.org/practice-standards

Open Up Resources - https://access.openupresources.org/sign_in

iM Additional Resources - https://bit.ly/imshare

Khan Academy

https://www.khanacademy.org/math/illustrative-math

NJDOE Digital Item Library

https://nj.digitalitemlibrary.com/home?subject=Math

Ready Teacher Toolbox

https://teacher-toolbox.com/

References

"Illustrative Mathematics" *Open Up Resources.* 2018

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