7th Grade Mathematics (Accelerated)

Rational Numbers and Exponents

Unit 1 Pacing Calendar - Math in Focus

ORANGE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

OFFICE OF MATHEMATICS

From the Common Core State Standards:

Traditional Pathway Accelerated 7th Grade

In **Accelerated 7th Grade,** instructional time should focus on four critical areas: (1) Rational Numbers and Exponents; (2) Proportionality and Linear Relationships; (3) Introduction to Sampling Inference; (4) Creating, Comparing, and Analyzing Geometric Figures

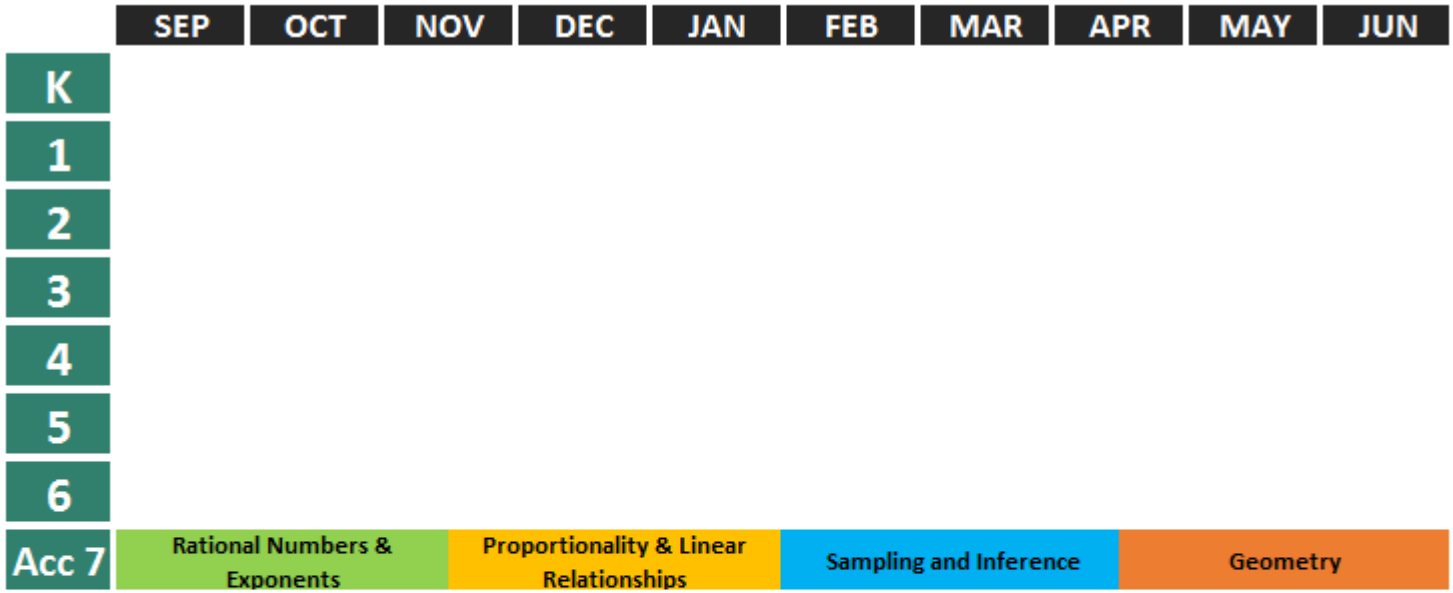
1. Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, 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. They extend their mastery of the properties of operations to develop an understanding of integer exponents, and to work with numbers written in scientific notation.

2. Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as special linear equations ($y= mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount $m \times A$. Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation.

3. 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

4. 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, 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. Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

A STORY OF UNITS



Rational Numbers and Exponents: Operations with rational numbers, learn of irrational numbers, expressions and equations work with radical and integer exponents

Proportionality and Linear Relationships: Analyze proportional relationships, generate equivalent expressions using properties of operations, and understand connections between proportional relationships and

Sampling and Inference: Use random sampling, draw inferences, investigate chance processes, develop, use, and evaluate probability models

Geometry: construct geometrical figures, understand congruence and similarity using physical models, and solve real-life problems involving angle measure, area, surface area and volume

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UNIT OVERVIEW

In this unit students will….

- Adding, subtracting, multiplying, and dividing integers
- Finding the distance between two integers on a number line
- Using the order of operations with integers
- Adding, subtracting, multiplying, and dividing rational numbers in fraction or decimal form
- Solving real-world problems using operations with integers, fractions, and decimals
- Students know that for most integers *n*, *n* is not a perfect square, and they understand the square root symbol. Students find the square root of small perfect squares.
- Students approximate the location of square roots on the number line.
- Students know that the positive square root and cube root exists for all positive numbers and is unique.
- Students solve simple equations that require them to find the square or cube root of a number.
- Students use factors of a number to simplify a square root.
- Students find the positive solutions for equations of the form $x^2 = p$ and $x^3 = p$.
- Students know that the long division algorithm is the basic skill to get division-with-remainder and the decimal expansion of a number in general.
- Students know why digits repeat in terms of the algorithm.
- Students know that every rational number has a decimal expansion that repeats eventually.
- Students apply knowledge of equivalent fractions, long division, and the distributive property to write the decimal expansion of fractions.
- Students know the intuitive reason why every repeating decimal is equal to a fraction. Students convert a decimal expansion that eventually repeats into a fraction.
- Students know that the decimal expansions of rational numbers repeat eventually.
- Students understand that irrational numbers are numbers that are not rational. Irrational numbers cannot be represented as a fraction and have infinite decimals that never repeat.

- Students use rational approximation to get the approximate decimal expansion of numbers like the square root of 3 and the square root of 28.
- Students distinguish between rational and irrational numbers based on decimal expansions.
- Students apply the method of rational approximation to determine the decimal expansion of a fraction.
- Students relate the method of rational approximation to the long division algorithm.
- Students place irrational numbers in their approximate locations on a number line.

Pacing Guide & Calendar

Activity	New Jersey State Learning Standards (NJSLS)	Estimated Time
Grade 7 MIF Chapter 1 Pretest	7.NS.A.1; 7.NS.A.2; 7.NS.A.3; 7.EE.A.2; 7.EE.A.4;	1 Block
Grade 7 Chapter 1 (MIF) Lesson 1-5	7. NS.A.1; 7. NS.A.2; 7. NS.A.3	5 Blocks
Grade 7 Chapter 2 (MIF) Lesson 4-6	7. NS.A.2; 7. NS.A.3	3 Blocks
Unit 1 Performance Task 1	7.NS.A.2,	½ Block
Grade 7 Module 2 (EngageNY) Lesson 13-16	7.NS.A.2.a; 7.NS.A.2.b; 7.NS.A.2.c; 7.NS.A.2.d;	4 Blocks
Unit 1 Assessment 1	7.NS.A.1, 7.NS.A.2,7.NS.A.3;	½ Block
Grade 8 Module 7 (EngageNY) Lesson 1-4	8.NS.A.1, 8.NS.A.2, 8.EE.A.2	5 Blocks
Unit 1 Performance Task 2	8.NS.A.2	½ Block
Grade 8 Module 7 (EngageNY) Lesson 6-11	8.NS.A.1, 8.NS.A.2, 8.EE.A.2	5 Blocks
Unit 1 Assessment 2	8.NS.A.1, 8.NS.A.2,8.EE.A2	½ Block
Grade 8 Module 1 (EngageNY) Lesson 2-10	8.EE.A.1 , 8.EE.3,8.EE.4	9 Blocks
Unit 1 Performance Task 3	8.NS.A.1, 8.NS.A.2, 8.EE.A.2,	½ Block
Unit 1 Assessment 3	8.EE.A.1, 8.EE.A.3,8.EE.A.4	½ Block
Total Time		**35 Blocks**

Major Work Supporting Content Additional Contents

Pacing Calendar: Please complete the pacing calendar based on the suggested pacing (*see Pacing Guide on page 5)*.

Math in Focus Chapter 1: Students extend their knowledge of numbers (whole numbers, integers, fractions, and decimals) to irrational numbers. They identify the numbers that make up the set of rational numbers and those that make up the set of real numbers. They locate numbers from both sets on the number line.

Math in Focus Chapter 2: Students learn to add and subtract integers with the same sign and with different signs. They learn how to add integers to their opposites and how to subtract integers by adding their opposites. Students also learn to find the distance between two integers on the number line.

EngageNY Grade 7 Module 2: Rational Numbers (Topic B only).

Students represent the division of two integers as a fraction, extending product and quotient rules to all rational numbers. Students recognize that the context of a situation often determines the most appropriate form of a rational number, and they use long division, place value, and equivalent fractions to fluently convert between these fraction and decimal forms.

EngageNY Grade 8 Mathematics Module 7: Introduction to Irrational Numbers (Topic A & Topic B)

Though the term "irrational" is not introduced until Topic B, students learn that irrational numbers exist and are different from rational numbers. Students develop a deeper understanding of long division, they show that the decimal expansion for rational numbers repeats eventually, and they convert the decimal form of a number into a fraction.

EngageNY Grade 8 Module 1: Integer Exponents and Scientific Notation

Students expand their knowledge of positive integer exponents and prove the Laws of Exponents for any integer exponent. They work with numbers in the form of an integer multiplied by a power of 10 to express how many times as much one is than the other. This leads to an explanation of scientific notation and work performing operations on numbers written in this form.

SEPTEMBER

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

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Math in Focus Chapter 2: Students learn to add and subtract integers with the same sign and with different signs. They learn how to add integers to their opposites and how to subtract integers by adding their opposites. Students also learn to find the distance between two integers on the number line.

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OCTOBER

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				

Pacing Calendar: Please complete the pacing calendar based on the suggested pacing (*see Pacing Guide on page 5)*.

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NOVEMBER

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

PARCC Assessments Evidence Statements

NJSLS	Evidence Statement	Clarification	Math Practices	Calculator?
7.NS.1a	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.		5	No
7.NS.1b	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative.	i) Tasks do not have a context. ii) Tasks are not limited to integers. iii) Tasks involve a number line. iv) Tasks do not require students to show in general that a number and its opposite have a sum of 0; for this aspect of 7.NS.1b-1, see 7.C.1.1 and 7.C.2	5,7	No
7.NS.1c	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. c. Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$. Apply this principle in real-world contexts.	i) Tasks may or may not have a context. ii) Tasks are not limited to integers. iii) Contextual tasks might, for example, require students to create or identify a situation described by a specific equation of the general form $p – q = p + (–q)$ such as $3 – 5 = 3 + (–5)$. iv) Non-contextual tasks are not computation tasks but rather require students to demonstrate conceptual understanding, for example, by identifying a difference that is equivalent to a given difference. For example, given the difference $–1/3 – (1/5 + 5/8)$, the student might be asked to recognize the equivalent expression $–1/3 + –(1/5 + 5/8)$.	2,5,7	No
7.NS.1d	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number	i) Tasks do not have a context. ii) Tasks are not limited to integers. iii) Tasks may involve sums and differences of 2 or 3 rational numbers. iv) Tasks require students to	5,7	No

	line diagram. d. Apply properties of operations as strategies to add and subtract rational numbers	demonstrate conceptual understanding, for example, by producing or recognizing an expression equivalent to a given sum or difference. For example, given the sum –8.1 + 7.4, the student might be asked to recognize or produce the equivalent expression –(8.1 – 7.4).		
7.NS.2b	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then -(p/q) = (–p)/q =p/(–q).	i) Tasks do not have a context. ii) Tasks require students to demonstrate conceptual understanding, for example, by providing students with a numerical expression and requiring students to produce or recognize an equivalent expression.	7	No
7.NS.2c	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. c. Apply properties of operations as strategies to multiply and divide rational number	i) Tasks do not have a context. ii) Tasks are not limited to integers. iii) Tasks may involve products and quotients of 2 or 3 rational numbers. iv) Tasks require students to compute a product or quotient, or demonstrate conceptual understanding, for example, by producing or recognizing an expression equivalent to a given expression. For example, given the expression (–8)(6)/(–3), the student might be asked to recognize or produce the equivalent expression –(8/3)(–6).	7	No
7.NS.3	Solve real-world and mathematical problems involving the four operations with rational numbers..	i) Tasks are one-step word problems. ii) Tasks sample equally between addition/subtraction and multiplication/division. iii) Tasks involve at least one negative number. iv) Tasks are not limited to integers.	1,4	No
8.NS.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and	i) Tasks do not have a context. ii) An equal number of tasks require students to write a fraction a/b as a repeating decimal, or write a repeating decimal as a fraction. iii) For tasks that involve writing a repeating decimal as a fraction, the given decimal should include no	7,8	No

	convert a decimal expansion, which repeats eventually into a rational number.$t = pn$.	more than two repeating decimals without non-repeating digits after the decimal point (i.e. 2.16666…, 0.23232323…).		
8.NS.2	Use rational approximations of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g. π 2). For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	i) Tasks do not have a context.	5,7,8	No
8.EE.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 1/3^3 = 1/27$	i) Tasks do not have a context. ii) Tasks focus on the properties and equivalence, not on simplification. iii) Half of the expressions involve one property; half of the expressions involves two or three properties. iv) Tasks should involve a single common base or a potential common base, such as, a task that includes 3, 9 and 27.	7	No
8.EE.2	Use square root and cube root symbols to represent solutions to equations of the form x2=p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational	i) Tasks may or may not have a context. ii) Students are not required to simplify expressions such as √8 to 2√2 . Students are required to express the square roots of 1, 4, 9, 16, 25, 36, 49, 64, 81 and 100; and the cube roots of 1, 8, 27, and 64.	7	No
8.EE.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9 , and determine that the world population is more than 20 times larger.		4	No
8.EE.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.	i) Tasks have “thin context” or no context. ii) Rules or conventions for significant figures are not assessed. iii) Some of the tasks involve both decimal and scientific notation.	6,7,8	No or Yes

Connections to the Mathematical Practices

1	Make sense of problems and persevere in solving them
	- Students use tools, conversions, and properties to solve problems
2	Reason abstractly and quantitatively
	- Students use concrete numbers to explore the properties of numbers in exponential form and then prove that the properties are true for all positive bases and all integer exponents using symbolic representations for bases and exponents. - Use symbols to represent integer exponents and make sense of those quantities in problem situations. - Students refer to symbolic notation in order to contextualize the requirements and limitations of given statements (e.g., letting m, n represent positive integers, letting a, b represent all integers, both with respect to the properties of exponents)
3	Construct viable arguments and critique the reasoning of others
	- Students reason through the acceptability of definitions and proofs (e.g., the definitions of x^0 and x^{-b} for all integers b and positive integers x). - New definitions, as well as proofs, require students to analyze situations and break them into cases. - Examine the implications of definitions and proofs on existing properties of integer exponents. Students keep the goal of a logical argument in mind while attending to details that develop during the reasoning process.
4	Model with mathematics
	- When converting between measurements in scientific notations, students understand the scale value of a number in scientific notation in one unit compared to another unit
5	Use appropriate tools strategically
	- Understand the development of exponent properties yet use the properties with fluency - Use unit conversions in solving real world problems
6	Attend to precision
	- In exponential notation, students are required to attend to the definitions provided throughout the lessons and the limitations of symbolic statements, making sure to express what they mean clearly. Students are provided a hypothesis, such as $x < y$, for positive integers x, y, and then asked to evaluate whether a statement, like $-2 < 5$, contradicts this hypothesis.
7	Look for and make use of structure
	- Students understand and make analogies to the distributive law as they develop properties of exponents. Students will know $x^m \cdot x^n = x^{m+n}$ as an analog of $m^x + n^x = (m + n)$ and $(x^m) = x^{m \times n}$ as an analog of $n \times (m \times x) = (n \times m) \times x$.
8	Look for and express regularity in repeated reasoning
	- While evaluating the cases developed for the proofs of laws of exponents, students identify when a statement must be proved or if it has already been proven. - Students see the use of the laws of exponents in application problems and notice the patterns that are developed in problems.

Vocabulary

Term	Definition
Additive Identity	The additive identity is the number 0.
Additive Inverse	An additive inverse of a number is a number such that the sum of the two numbers is 0.
Multiplicative Identity	The multiplicative identity is the number 1
Repeating Decimal Expansion	Decimal expansion is repeating if, after some digit to the right of the decimal point, there is a finite string of consecutive digits called a block after which the decimal expansion consists entirely of consecutive copies of that block repeated forever.
Terminating Decimal Expansion	A terminating decimal expansion is a repeating decimal expansion with period 1 and repeating digit 0.
Decimal System	The decimal system is a positional numeral system for representing real numbers by their decimal expansions. The decimal system extends the whole number place value system and the place value systems to decimal representations with an infinite number of digits.
Irrational Number	An irrational number is a real number that cannot be expressed as p/p for integers p and q with $q \neq 0$. An irrational number has a decimal expansion that is neither terminating nor repeating
Perfect Square	A perfect square is a number that is the square of an integer
Rational Approximation	*y* is *inversely proportional* to *x* if *y = k/x.*
A Square Root of a Number	A square root of b is a number aa such that $a^2 = b$. Negative numbers do not have any square roots, zero has exactly one square root, and positive numbers have two square roots.
The Square Root of a Number	Every positive real number a has a unique positive square root called the square root of the number b or principle square root of b; it is denoted √b. The square root of zero is zero
Scientific Notation	A representation of real numbers as the product of a number between 1 and 10 and a power of 10, used primarily for very large or very small numbers.
Model	A mathematical representation of a process, device, or concept by means of a number of variables.
Interpret	To establish or explain the meaning or significance of something.
Linear	A relationship or function that can be represented by a straight line.

Non-Linear	A relationship which does not create a straight line
Base	The number that is raised to a power in an exponential expression. In the expression 35, read “3 to the fifth power”, 3 is the base and 5 is the exponent.
Standard Form	The most common way we express quantities. For example, 27 is the standard form of 33.
Exponential Form	A quantity expressed as a number raised to a power. In exponential form, 32 can be written as 25. The exponential form of the prime factorization of 5,000 is 23×54.

Potential Student Misconceptions

- When subtracting numbers with positive and negative values, students often subtract the two numbers and use the sign of the larger number in their answer rather than realize they are actually moving up or down the number line depending on the signs of the numbers. They also become very confused when subtracting a negative and often add the numbers and make the answer negative or subtract the numbers and make the answer negative.
- Another common mistake occurs when students attempt to apply the rules for multiplying and dividing numbers to adding and subtracting. For example, if they are subtracting two negative numbers they subtract the numbers and make the answer positive. Similarly, when subtracting a negative and positive value, they subtract the two numbers make the answer negative.
- Students often make the mistake of assuming that signed numbers mean only integers. They should be exposed to exercises that include signed fractions and decimals to curb this mistake.
- Students often mistake the exponent as the number of zeros to put on the end of the coefficient instead of realizing it represents the number of times they should multiply by ten.
- Students often move the decimal in the wrong direction when dealing with positive and negative powers. Also, students forget to the move the decimal past the first non-zero digit (or count it) for very small numbers.
- Students may make the relationship that in scientific notation, when a number contains one nonzero digit and a positive exponent, that the number of zeros equals the exponent. This pattern may incorrectly be applied to scientific notation values with negative values or with more than one nonzero digit. Students may mix up the product of powers property and the power of a power property.
- When writing numbers in scientific notation, students may interpret the negative exponent as a negative number.
- When multiplying or dividing numbers that are given in scientific notation, in which the directions say to write the answer in scientific notation, sometimes students forget to double check that the answer is in correct scientific notation.
- When performing calculations on a calculator, in which the number transforms to scientific notation, students sometimes overlook the last part of the number showing scientific notation part and just notice the first part of the number, ignoring the number after E.
- Students will sometimes multiply the base and the exponent. For example, 2^6 is not equal to 12, it's 64.

Assessment Framework

Unit 1 Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded ?**
Grade 7 Chapter 1 Pretest (Beginning of Unit) *Math in Focus*	7.NS.A.1; 7.NS.A.2; 7.NS.A.3; 7.EE.A.2; 7.EE.A.4;	½ Block	Individual	Yes (No Weight)
Unit 1 Assessment 1 (After EngageNY Gr. 7 Module 2) *District Assessment*	7.NS.A.1, 7.NS.A.2	½ Block	Individual	Yes
Unit 1 Assessment 2 (After EngageNY Gr. 8 Module 7) *District Assessment*	8.NS.A.1,8.NS.A.2,8. EE.2	1 Block	Individual	Yes
Unit 1 Assessment 3 (Conclusion of Unit) *District Assessment*	8.EE.1, 8.EE.A.3, 8.EE.A.4	1 Block	Individual	Yes
Grade 7 Chapter 1 Test (Optional) *Math in Focus*	7.NS.A.1; 7.NS.A.2; 7.NS.A.3; 7.EE.A.2;7.EE.A.4;	Teacher Discretion	Teacher Discretion	Yes, if administered
Grade 7 Chapter 2 Test (Optional) *Math in Focus*	7. NS.A.1; 7. NS.A.2; 7. NS.A.3	Teacher Discretion	Teacher Discretion	Yes, if administered
Mid- Module Assessment Gr. 7 Module 2 (Optional) *EngageNY*	7.NS.A.1, 7.NS.A.2	Teacher Discretion	Teacher Discretion	Optional
Mid- Module Assessment Gr. 8 Module 7 (Optional) *EngageNY*	8.NS.A.1,8.NS.A.2	Teacher Discretion	Teacher Discretion	Optional
Mid- Module Assessment Gr. 8 Module 1 (Optional) *EngageNY*	8.EE.A.3, 8.EE.A.4	Teacher Discretion	Teacher Discretion	Optional
End of Module Assessment Gr. 7 Module 2 (Optional) *EngageNY*	7.NS.A.1, 7.NS.A.2	Teacher Discretion	Teacher Discretion	Optional
End of Module Assessment Gr. 8 Module 7 (Optional) *EngageNY*	8.NS.A.1,8.NS.A.2	Teacher Discretion	Teacher Discretion	Optional
End of Module Assessment Gr. 8 Module 1 (Optional) *EngageNY*	8.EE.A.3, 8.EE.A.4	Teacher Discretion	Teacher Discretion	Optional

Unit 1 Performance Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded ?**
Unit 1 Performance Task 1 (Late September) *Equivalent fractions approach to non-repeating decimals*	7.NS.2	½ Block	Individual w/ Interview Opportunity	Yes; Rubric
Unit 1 Performance Task 2 (Early October) *Identifying Rational Numbers*	8.NS.A.1	½ Block	Group (Possible Reflection)	Yes; Rubric
Unit 1 Performance Task 3 (Early November) *Giant burgers*	8.EE.A.3, 8.EE.A.4	½ Block	Individual w/ Interview Opportunity	Yes; Rubric
Unit 1 Performance Task Option 1 (optional)	7.NS.1	Teacher Discretion	Teacher Discretion	Yes, if administered
Unit 1 Performance Task Option 2 (optional)	7.NS.1	Teacher Discretion	Teacher Discretion	Yes, if administered

Equivalent fractions approach to non-repeating decimals (7.NS.2)

Malia found a "short cut" to find the decimal representation of the fraction $\frac{117}{250}$. Rather than use long division she noticed that because $250 \times 4 = 1000$,

$$\frac{117}{250} = \frac{117 \times 4}{250 \times 4} = \frac{468}{1000} = 0.468.$$

a. For which of the following fractions does Malia's strategy work to find the decimal representation?

$$\frac{1}{3}, \frac{3}{4}, -\frac{6}{25}, \frac{18}{7}, \frac{13}{8} \text{ and } -\frac{113}{40}.$$

For each one for which the strategy does work, use it to find the decimal representation.

b. For which denominators can Malia's strategy work?

Solution:

a.
- The strategy does not work for $\frac{1}{3}$ because there are no multiples of 3 which are powers of 10.
- Because $4 \times 25 = 100$, $\frac{3}{4} = \frac{3 \times 25}{4 \times 25} = \frac{75}{100} = 0.75$.
- $-\frac{6}{25} = -\frac{24}{100} = -0.24$.
- The strategy does not work for $\frac{18}{7}$ because there are no multiples of 7 which are powers of 10.
- $\frac{13}{8} = \frac{13 \times 125}{8 \times 125} = \frac{1625}{1000} = 1.625$.
- $-\frac{113}{40} = -2\frac{37}{40} = -2 + (-\frac{37 \times 25}{40 \times 25}) = -2 + (-\frac{825}{1000}) = -2.825$.

b. The strategy can work for any denominator which is a factor of a power of 10. In this case one can multiply the numerator and denominator by the complementary factor (that is, the quotient of that power of 10 by the denominator) to obtain a fraction with denominator equal to that power of 10. Such fractions are represented by terminating decimals.

Unit 1 Performance Task 1 PLD Rubric

SOLUTION

The strategy does not work for 13 because there are no multiples of 3 which are powers of 10. Because 4×25=100,

$\frac{3}{4} = \frac{3\times 25}{4\times 25} = \frac{75}{100} = 0.75.$ $-\frac{6}{25} = -\frac{24}{100} = -0.24.$

The strategy does not work for $\frac{18}{7}$ because there are no multiples of 7 which are powers of 10

$\frac{13}{8} = \frac{13\times 125}{8\times 125} = \frac{1625}{1000} = 1.625.$ $-\frac{113}{40} = -2\frac{37}{40} = -2+(\frac{37\times 25}{40\times 25}) = -2+(\frac{825}{1000}) = -2.825.$

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 • major calculation errors • partial justification of a conclusion	The student shows no work or justification.

Identifying Rational Numbers (8.NS.A.1)

Decide whether each of the following numbers is rational or irrational. If it is rational, explain how you know.

a. $0.33\overline{3}$

b. $\sqrt{4}$

c. $\sqrt{2} = 1.414213\ldots$

d. 1.414213

e. $\pi = 3.141592\ldots$

f. 11

g. $\frac{1}{7} = 0.\overline{142857}$

h. $12.3456565\overline{656}$

Solution:

a. Since

$$0.333\overline{3} = \frac{1}{3}$$

$0.333\overline{3}$ is a rational number.

b. Since

$$\sqrt{4} = 2 = \frac{2}{1}$$

$\sqrt{4}$ is a rational number.

c. $\sqrt{2} = 1.414213\ldots$ is not rational. In eighth grade most students know that the square root of a prime number is irrational as a "fact," but few 8th grade students will be able to prove it. There are arguments that 8th graders can understand if they are interested.

d. Since

$$1.414213 = \frac{1414213}{100000},$$

1.414213 is a rational number.

e. $\pi = 3.141592\ldots$ is not rational. In eighth grade most students know that π is irrational as a "fact." The proof of this is quite sophisticated.

f. Since

$$11 = \frac{11}{1}$$

11 it is rational.

g. $\frac{1}{7} = 0.\overline{142857}$ is already written in a way that makes it clear it is a rational number, although some students might say it is irrational, possibly because the repeating part of the decimal is longer than many familiar repeating decimals (like $\frac{1}{3}$).

h. We have

$$12.3456565\overline{656} = 12.34 + .00\overline{56} = \frac{1234}{100} + \frac{56}{9900} = \frac{1234 \cdot 99 + 56}{9900} = \frac{122222}{9900},$$

which is certainly rational.

Unit 1 Performance Task 2 PLD Rubric

SOLUTION:

A) Rational
B) Rational
C) Irrational
D) Rational
E) Irrational
F) Rational
G) Rational
H) Rational

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Giantburgers Task (8.EE.4)

This headline appeared in a newspaper.

Every day 7% of Americans eat at Giantburger restaurants

Decide whether this headline is true using the following information.

- There are about 8×10^3 Giantburger restaurants in America.
- Each restaurant serves on average 2.5×10^3 people every day.
- There are about 3×10^8 Americans.
- Explain your reasons and show clearly how you figured it out.

Solution:

If there are about 8×10^3 Giantburger restaurants in America and each restaurant serves about 2.5×10^3 people every day, then about

$$8 \times 10^3 \cdot 2.5 \times 10^3 = 20 \times 10^6 = 2 \times 10^7$$

people eat at a Giantburger restaurant every day.

Since there are about 3×10^8 Americans, the percent of Americans who eat at a Giantburger restaurant every day can be computed by dividing the number of restaurant patrons by the total number of people:

$$2 \times 10^7 \div 3 \times 10^8 = \frac{2}{3} \times 10^{-1}$$

Since

$$\frac{2}{3} \times 10^{-1} = \frac{2}{3} \times \frac{1}{10} = \frac{2}{30} = \frac{1}{15} = 0.06\overline{6},$$

our estimate is that $6\frac{2}{3}\%$ of Americans eat a Giantburger restaurant every day, which is reasonably close to the claim in the newspaper.

Unit 1 Performance Task 3 PLD Rubric

SOLUTION

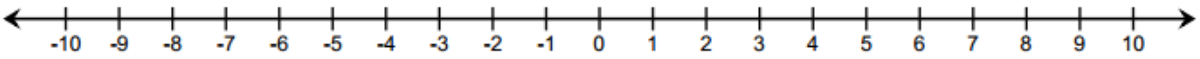
- **Our estimate is that $6\frac{2}{3}\%$ or 6.0666 of Americans eat a Giantburger restaurant every day, which is reasonably close to the claim in the newspaper.**

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 conclusionwith minor computational error	Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusionwith minor conceptual error	Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical, but incomplete, progression of steps • minor calculation errors • partial justification of a conclusion • 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.

Performance Task 1 Option 1 (7.NS. A.1)

1. Diamond used a number line to add. She started counting at 10, and then she counted until she was on the number -4 on the number line.

   a. If Diamond is modeling addition, what number did she add to 10? Use the number line below to model your answer.



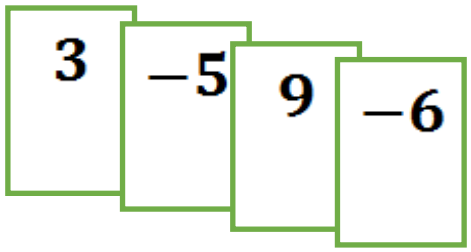
   b. Write a real-world story problem that would fit this situation.

   c. Use absolute value to express the distance between 10 and -4.

Performance Task 1 Option 2 (7.NS. A.1)

Jesse and Miya are playing the Integer Card Game. The cards in Jesse's hand are shown below:

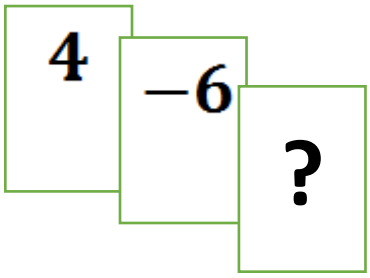
Jesse's Hand
3, −5, 9, −6



a. What is the total score of Jesse's hand? Support your answer by showing your work.

b. Jesse picks up two more cards, but they do not affect his overall point total. State the value of each of the two cards, and tell why they do not affect his overall point total.

c. Complete Jesse's new hand to make this total score equal zero. What must be the value of the card? Explain how you arrived at your answer.



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** .