

Unit 1: The Number System

Content Area: **Mathematics**
Course(s): **Accelerated Math 7**
Time Period: **1st Marking Period**
Length: **6 weeks**
Status: **Published**

Unit Overview

In this unit, students will use numbers and symbols to represent mathematical ideas. They will perform all operations (addition, subtraction, multiplication and division) on integers and rational numbers. Students will also write numbers in various ways (scientific notation, square and cube roots, etc.)

In early September, administer the Link IT! Gr 7 MathLinkIt! NJSLs BM Form A.

Transfer

Students will be able to independently use their learning to solve real-world problems involving...

- representing and using rational numbers in solve real-life situation problems.
- representing rational numbers with visuals (including distance models), language, and real-life contexts.
- using a number line model to represent the unique placement of any number in relation to other numbers.
- apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

- One representation may sometimes be more helpful than another; and, used together, multiple representations give a fuller understanding of a problem.
- A quantity can be represented numerically in various ways.
- Numeric fluency includes both the understanding of and the ability to appropriately use numbers.
- Computational fluency includes understanding not only the meaning, but also the appropriate use of numerical operations.
- In many cases, there are multiple algorithms for finding a mathematical solution, and those algorithms may be more or less efficient.

Essential Questions

Students will keep considering...

- Chapter 1: What happens when you add, subtract, multiply, and divide rational numbers?
- Chapter 2: Why is it useful to write numbers in different ways?
- Chapter 3: What are the differences between rational and irrational numbers and how do they relate to each other?

Application of Knowledge and Skill

Students will know...

Students will know...

- Negative integers can be used in everyday contact that involve values below zero.
- Every quotient (with non-zero divisor) is a rational number.
- Numbers that are not rational are called irrational.
- Every rational number can be expressed as a decimal, fraction, or percent.
- Numbers can be expressed in scientific notation.

Students will be skilled at...

Students will be skilled at...

- Combining Opposite Numbers
- Modeling the Addition of Integers
- Adding Integers & Other Rational Numbers
- Subtracting Integers & Other Rational Numbers
- Finding the Distance Between Two Numbers
- Multi-Step Addition & Subtraction Problems Involving Rational Numbers
- Multiplying Rational Numbers
- Dividing Rational Numbers
- Multi-Step Multiplication & Division Problems Involving Rational Numbers - In Progress
- Converting Between Fractions and Decimals
- Using Arithmetic Methods to Solve Multi-Step Problems
- Using Properties of Exponents in Multiplication Expressions
- Using Properties of Exponents in Division Expressions
- Understanding The Power of 0 and Negative Exponents
- Writing Equivalent Expressions using Properties of Exponents
- Writing Numbers in Scientific Notation
- Comparing Numbers in Scientific Notation & Choosing Reasonable Units
- Understanding Perfect Squares and Perfect Cubes
- Understanding Square Roots & Cube Roots
- Simplifying Square Roots & Cube Roots
- Understanding Irrational Numbers
- Approximating Irrational Numbers
- Representing Rational Numbers with Decimals
- Converting Repeating Decimals into Fractions

Academic Vocabulary

<ul style="list-style-type: none"> • absolute value • additive inverse • approximation • bar notation • common denominator • compare • convert • cube root • decimal • digit • equation • equivalent 	<ul style="list-style-type: none"> • expansion • exponent • expression • graph • integer • inverse operation • irrational number • least common denominator • like fractions • measurement • negative integer 	<ul style="list-style-type: none"> • nonterminating • number line • numerical • operation • opposites • perfect cube • perfect square • positive integer • power of 10 • property • quantity • radical • rational 	<ul style="list-style-type: none"> • reasoning • repeating decimal • scientific notation • size • value • solution • square root • symbol • terminating decimal • unknown
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<ul style="list-style-type: none"> • estimate • evaluate 	<ul style="list-style-type: none"> • nonrepeating 	<ul style="list-style-type: none"> • rational number 	<ul style="list-style-type: none"> • unlike fractions • variable • zero pair
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Learning Goal 1

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Target #1.1 -- DOK: 2 Skill/Concept

SWBAT: Combine opposite numbers to make 0.

MA.7.NS.A.1a	Describe situations in which opposite quantities combine to make 0.
MA.7.NS.A.1b	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. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
MA.7.NS.A.1c	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.

Target #1.2 -- DOK: 2 Skill/Concept

SWBAT: model adding opposites on a number line.

MA.7.NS.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers.
MA.7.NS.A.1a	Describe situations in which opposite quantities combine to make 0.
MA.7.NS.A.1b	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. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.

Target #1.3 -- DOK: 2 Skill/Concept

SWBAT: Add integers.

MA.6.NS.A.1	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.
MA.6.NS.B	Compute fluently with multi-digit numbers and find common factors and multiples.
MA.7.NS.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

Target #1.4 -- DOK: 2 Skill/Concept

SWBAT: subtract integers.

MA.7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
MA.7.EE.A.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
MA.7.NS.A.1c	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.

Target #1.5 -- DOK: 3 Strategic Thinking

SWBAT: Solve and interpret problems to show that the distance between two rational numbers is the absolute value of their difference.

MA.7.NS.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers.
MA.7.NS.A.1a	Describe situations in which opposite quantities combine to make 0.
MA.7.NS.A.1b	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. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
MA.7.NS.A.1c	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-$

q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.8	Look for and express regularity in repeated reasoning.

Target #1.6 -- DOK: 2 Skill/Concept

SWBAT: Add/Subtract multi-step problems involving rational numbers; use and identify commutative and associative properties as needed.

MA.7.NS.A.1	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.
MA.7.NS.A.1a	Describe situations in which opposite quantities combine to make 0.
MA.7.NS.A.1b	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. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
MA.7.NS.A.1c	Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
MA.7.NS.A.1d	Apply properties of operations as strategies to add and subtract rational numbers.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

For example, in the first round of a game, Maria scored 20 points. In the second round of

the same game, she lost 20 points. What is her score at the end of the second round?

Target#1.7 -- DOK: 2 Skill/Concept

SWBAT: Multiply rational numbers.

MA.7.NS.A.1	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.
MA.7.NS.A.2a	Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.8	Look for and express regularity in repeated reasoning.

Target #1.8 -- DOK: 2 Skill/Concept

SWBAT: Divide rational numbers.

MA.7.NS.A.1	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.
MA.7.NS.A.2a	Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
MA.7.NS.A.2b	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 $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.

Target #1.9 -- DOK: 2 Skill/Concept

SWBAT: Divide integers within multi-step problems.

MA.7.NS.A.2a	Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the
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distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

MA.7.NS.A.2b

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 $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.

MA.7.NS.A.2c

Apply properties of operations as strategies to multiply and divide rational numbers.

MA.K-12.1

Make sense of problems and persevere in solving them.

MA.K-12.2

Reason abstractly and quantitatively.

MA.K-12.3

Construct viable arguments and critique the reasoning of others.

MA.K-12.4

Model with mathematics.

Target #1.10 -- DOK: 2 Skill/Concept

SWBAT: Convert between fractions and decimals.

MA.7.NS.A.2

Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

MA.7.NS.A.2d

Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

MA.K-12.1

Make sense of problems and persevere in solving them.

MA.K-12.3

Construct viable arguments and critique the reasoning of others.

MA.K-12.4

Model with mathematics.

MA.K-12.7

Look for and make use of structure.

Target #1.11 -- DOK: 4 Extended Thinking

SWBAT: Solve and interpret multi-step mathematical and word problems involving rational numbers with all four operations.

MA.7.NS.A.3

Solve real-world and mathematical problems involving the four operations with rational numbers.

MA.K-12.1

Make sense of problems and persevere in solving them.

MA.K-12.2

Reason abstractly and quantitatively.

MA.K-12.3

Construct viable arguments and critique the reasoning of others.

MA.K-12.4

Model with mathematics.

MA.K-12.7

Look for and make use of structure.

Learning Goal 2

Work with radicals and integer exponents

MA.8.EE.A.1

Know and apply the properties of integer exponents to generate equivalent numerical expressions.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.

Target #2.1 -- DOK: 3 Strategic Thinking

SWBAT:

Apply the properties of integer exponents to simplify and write equivalent numerical expressions.

Simplify a real number expressions by multiplying and dividing monomials.

MA.8.EE.A	Work with radicals and integer exponents.
MA.8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.

Target #2.2 -- DOK: 1 Recall

SWBAT: Use scientific notation to write large and small numbers.

MA.8.EE.A.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.7	Look for and make use of structure.

Learning Goal 3

Know that there are numbers that are not rational, and approximate them by rational numbers.

Target #3.1 -- DOK 2 Skill/Concept

SWBAT: Find square roots and cube roots.

MA.8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
MA.8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.

Target #3.2 -- DOK: 2 Skill/Concept

SWBAT: Understand the difference between and order rational and irrational numbers

MA.8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
MA.8.NS.A.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 convert a decimal expansion which repeats eventually into a rational number.
MA.8.NS.A.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.

Target #3.3 -- DOK: 2 Skill/Concept

SWBAT: Write fractions as decimals and decimals as fractions.

MA.8.NS.A.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 convert a decimal expansion which repeats eventually into a rational number.
MA.8.NS.A.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

21st Century Life and Careers and Technology (IN PROGRESS)

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CAEP.9.2.8.B.4	Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.
TECH.8.1.8	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.
TECH.8.1.8.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.

Formative Assessment and Performance Opportunities

- Clickers
- Exit/Admit Ticket
- Journal
- Kahoot
- My Favorite No
- Status Check (Thumbs up/down...)
- Student-Teacher Conference
- Think-Pair-Share

Summative Assessment

- Portfolio
- Project
- Quiz
- Test

Accommodations & Modifications

- Adaptive Practice (ck-12 modality)
- calculators
- lesson extensions
- leveled centers
- manipulatives
- modifications as per IEP/504
- PLIX (ck-12 modality)
- small group instruction
- teacher conference
- Use number lines and counters to help students find the distance from 0 for both positive and negative integers to see the distance, represented by absolute value, is always positive
- word bank

Unit Resources

See also *Unit 1: Number Systems* Folder in Curriculum Portal

- ALEKS online learning
- ck-12.org
- NJCTL - New Jersey Center for Teaching & Learning
- NJSLS for Mathematics