Unit 1 - Exponents, Expressions, and Equations

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 1**
Length: **9-10 weeks**
Status: **Published**

Brief Summary of Unit

Students will distinguish between rational and irrational numbers, both in decimal and fractional forms, and estimate their placements on the number line. Exponent properties and rules will be introduced and applied to simplify and write equivalent expressions. Scientific notation will be used to estimate large and small numbers, as well as perform operations with numbers in scientific notation. Students will begin exploring proportional relationships to introduce concepts of unit rate and slope. The concept of slope will later be used to help develop the equation of a line. Students will understand the connections between proportional relationships, lines, and linear equations.

Revision Date: 5/30/24

Standards

Diversity and Inclusion: Students will focus on equity, inclusion, and tolerance when analyzing the comparison of various quantities regarding characteristics of people. Equality will also be highlighted which can be associated with both numerical representations and the connection between people. This can be associated with treating people fairly and equally.

8.NS.A	Know that there are numbers that are not rational and approximate them by rational numbers
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.
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., □²).
P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
8.NS.A.3	Understand that the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
8.EE.A	Work with radicals and integer exponents
P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical

	expressions.
8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form □² = □ and □³ = □, where □ is a positive rational number.
L.KL.8.2.B	Gather vocabulary knowledge when selecting a word or phrase important to comprehension or expression.
8.EE.A.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.
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.
8.EE.C	Analyze and solve linear equations and pairs of simultaneous linear equations
8.EE.C.7	Solve linear equations in one variable.

Essential Questions

- How can we solve different types of equations, and what strategies can we use to isolate variables?
- How can we solve equations with variables on both sides, and what methods are most effective in ensuring the equations are balanced?
- How can we use scientific notation to express very large or very small numbers, and what are the benefits of using this notation in scientific and real-world contexts?
- How do exponents represent repeated multiplication, and how do the properties of exponents simplify calculations?
- How do zero and negative exponents affect the value of expressions, and how can we interpret and apply these rules?
- In what ways can rewriting equations and formulas help us solve for specific variables in various contexts?
- What are the rules for multiplying and dividing powers, and how do they help in simplifying expressions with exponents?
- What methods can we use to perform operations with numbers in scientific notation, and how do these methods facilitate complex calculations?
- What role do the properties of operations play in solving multi-step equations?

Enduring Understandings

- Equations with variables on both sides can be solved by strategically moving terms to isolate the variable on one side.
- Estimating quantities using powers of 10 and scientific notation is a practical skill that aids in making sense of extremely large or small values in scientific and everyday contexts.
- Exponents represent repeated multiplication and have specific rules, such as the product of powers and quotient of powers, that simplify calculations.
- Multi-step equations require the application of combining like terms and the distributive property to simplify and solve them.

- Performing operations with numbers in scientific notation, including addition, subtraction, multiplication, and division, requires understanding how to manipulate the exponents and coefficients.
- Rewriting equations and formulas to isolate a specific variable can simplify problem-solving in various mathematical and real-world contexts.
- Scientific notation is a standardized way to express very large or very small numbers, making them easier to read, compare, and compute.
- Solving equations involves finding the value of the variable that makes the equation true.
- The properties of operations, such as addition, subtraction, multiplication, and division, are fundamental tools for isolating variables and solving equations.
- Zero exponents always result in a value of one, while negative exponents represent the reciprocal of the base raised to the positive exponent.

Students Will Know

- How to convert between standard form and scientific notation.
- How to estimate quantities using powers of 10 and scientific notation.
- How to identify and combine like terms in an equation.
- Methods for rewriting equations and formulas to solve for a specific variable.
- Strategies for solving multi-step equations that involve both like terms and the distributive property.
- Techniques for solving equations that have variables on both sides, including how to move terms to isolate the variable.
- The concept of scientific notation and its purpose in representing very large or very small numbers.
- The definition and notation of exponents, including how they represent repeated multiplication.
- The distributive property and its application in solving equations.
- The procedures for performing addition, subtraction, multiplication, and division with numbers in scientific notation.
- The product of powers property and the quotient of powers property.
- The rules for zero and negative exponents, and how these rules affect the value of expressions.
- The steps to solve one and two-step equations using addition, subtraction, multiplication, and division.

Students Will Be Skilled At

- Applying the distributive property to solve multi-step equations.
- Applying the rules for negative exponents to simplify expressions by finding the reciprocal of the base raised to the positive exponent.
- Applying the rules of exponents, including the product of powers and quotient of powers properties, to simplify expressions.
- Combining like terms to simplify equations.
- Converting numbers between standard form and scientific notation accurately.
- Correctly using zero exponents to simplify expressions to a value of one.
- Estimating large and small quantities using powers of 10 and scientific notation for practical problem-solving.

- Performing addition, subtraction, multiplication, and division with numbers expressed in scientific notation.
- Rewriting equations and formulas to solve for a specific variable in various contexts.
- Solving equations with variables on both sides by strategically moving terms to isolate the variable.
- Solving multi-step equations that involve both like terms and the distributive property.
- Solving one-step equations using addition, subtraction, multiplication, and division.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, iReady MyPath, Big Ideas Math online platform problems, and NJSLA test bank problems
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Big Ideas Math unit assessments
- Benchmark: iReady diagnostic assessments and district placement assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and adaptive learning tasks in iReady, Khan Academy, and Big Ideas Math

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Entrance/exit slips
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

8th Grade Math Curriculum Learning Plan: Equations and Exponents and Scientific Notation

Based on New Jersey Student Learning Standards (NJSLS) for Mathematics

Unit 1: Equations

Solving Simple Equations (2 days)

- Day 1: Understanding and Solving One-Step Equations
    - Objective: Students will understand and solve one-step equations using addition and subtraction.
    - Activities:
        - Introduction to equations and balance concept.
        - Practice problems in pairs.
        - Real-world application problems.
- Day 2: Solving One-Step Equations Using Multiplication and Division
    - Objective: Students will solve one-step equations using multiplication and division.
    - Activities:
        - Review of previous day's concepts.
        - Guided practice with multiplication and division.
        - Independent practice with a worksheet.

Solving Multi-Step Equations (2 days)

- Day 1: Combining Like Terms and Using the Distributive Property
    - Objective: Students will combine like terms and use the distributive property to simplify and solve equations.
    - Activities:
        - Introduction to combining like terms.
        - Guided practice with the distributive property.
        - Group activity solving multi-step equations.
- Day 2: Solving Multi-Step Equations
    - Objective: Students will solve multi-step equations involving combining like terms and the distributive property.
    - Activities:

        - Review of combining like terms and distributive property.
        - Independent practice with multi-step equations.
        - Real-world application problems.

Solving Equations with Variables on Both Sides (3 days)

- Day 1: Introduction to Equations with Variables on Both Sides
    - Objective: Students will solve equations with variables on both sides.
    - Activities:
        - Explanation and examples of variables on both sides.
        - Guided practice problems.
        - Class discussion on strategies.
- Day 2: Solving Equations with Variables on Both Sides - Practice
    - Objective: Students will practice solving equations with variables on both sides.
    - Activities:
        - Review and practice problems.
        - Partner work on more complex equations.
        - Peer review and feedback session.
- Day 3: Application and Problem Solving
    - Objective: Students will apply their skills to solve real-world problems involving equations with variables on both sides.
    - Activities:
        - Application problems.
        - Group presentations on solutions.
        - Reflection on strategies used.

Rewriting Equations and Formulas (2 days)

- Day 1: Rewriting Equations
    - Objective: Students will learn to rewrite equations to highlight a particular variable.
    - Activities:

        - Introduction to rewriting equations.
        - Guided practice with examples.
        - Individual practice problems.
- Day 2: Rewriting Formulas
    - Objective: Students will rewrite formulas to solve for a specific variable.
    - Activities:
        - Explanation and examples of rewriting formulas.
        - Practice problems.
        - Real-world application problems.

Unit 2: Exponents and Scientific Notation

Introduction to Exponents (2 days)

- Day 1: Understanding Exponents
    - Objective: Students will understand and define exponents.
    - Activities:
        - Introduction to exponent notation and terminology.
        - Guided practice with basic exponent problems.
        - Interactive group activity.
- Day 2: Powers of 10
    - Objective: Students will explore powers of 10 and their properties.
    - Activities:
        - Review of exponents.
        - Practice with powers of 10.
        - Application problems.

Product of Powers Property (2 days)

- Day 1: Introduction to Product of Powers Property
    - Objective: Students will learn and apply the product of powers property.

    - Activities:
        - Explanation and examples of the property.
        - Guided practice problems.
        - Group work on application problems.
- Day 2: Practice with Product of Powers
    - Objective: Students will practice using the product of powers property.
    - Activities:
        - Review of property.
        - Independent practice problems.
        - Real-world application problems.

Quotients of Powers Property (2 days)

- Day 1: Introduction to Quotients of Powers Property
    - Objective: Students will learn and apply the quotients of powers property.
    - Activities:
        - Explanation and examples of the property.
        - Guided practice problems.
        - Partner work on application problems.
- Day 2: Practice with Quotients of Powers
    - Objective: Students will practice using the quotients of powers property.
    - Activities:
        - Review of property.
        - Independent practice problems.
        - Real-world application problems.

Zero and Negative Exponents (2 days)

- Day 1: Understanding Zero Exponents
    - Objective: Students will understand and apply the zero exponent rule.
    - Activities:

        - Explanation and examples of zero exponents.
        - Guided practice problems.
        - Group activity.
- Day 2: Understanding Negative Exponents
    - Objective: Students will understand and apply the rules for negative exponents.
    - Activities:
        - Explanation and examples of negative exponents.
        - Guided practice problems.
        - Real-world application problems.

Estimating Quantities (2 days)

- Day 1: Introduction to Estimating Quantities Using Powers of 10
    - Objective: Students will estimate large and small quantities using powers of 10.
    - Activities:
        - Explanation and examples.
        - Guided practice with estimation problems.
        - Group work on application problems.
- Day 2: Practice with Estimation
    - Objective: Students will practice estimating quantities in various contexts.
    - Activities:
        - Review of estimation techniques.
        - Independent practice problems.
        - Real-world application problems.

Scientific Notation (2 days)

- Day 1: Introduction to Scientific Notation
    - Objective: Students will learn the concept and notation of scientific notation.
    - Activities:
        - Explanation and examples.

        - Guided practice with converting numbers to and from scientific notation.
        - Group activity.
- Day 2: Practice with Scientific Notation
    - Objective: Students will practice using scientific notation in various contexts.
    - Activities:
        - Review of scientific notation.
        - Independent practice problems.
        - Real-world application problems.

Operations in Scientific Notation (2 days)

- Day 1: Adding and Subtracting in Scientific Notation
    - Objective: Students will learn to add and subtract numbers in scientific notation.
    - Activities:
        - Explanation and examples.
        - Guided practice problems.
        - Partner work on application problems.
- Day 2: Multiplying and Dividing in Scientific Notation
    - Objective: Students will learn to multiply and divide numbers in scientific notation.
    - Activities:
        - Explanation and examples.
        - Guided practice problems.
        - Real-world application problems

Materials

Core instructional materials: Core Book List including Big Ideas Math textbook and online platform for all levels of grade 6, 7, 8, and Algebra 1

Supplemental materials: Khan Academy, Edia, and DeltaMath

- Calculators/Math Tools
- District approved textbook
- Manipulatives
- Teacher created activiites
- Teacher created notes
- Websites, such as Khan Academy

Suggested Strategies for Modifications

Possible accommodations/modification for Grade 8