

**Unit 1: Foundations of Algebra**  
**Algebra Prep**  
**15 Meetings**  
*Revised May 2023*

**Essential Questions**

- How can we use approximations to compare real numbers?
- How can simplification of a mathematical process make solving problems easier?

**Enduring Understandings with Unit Goals**

- EU 1:** A number can be classified as rational or irrational and all numbers have decimal approximations
- Utilize a number line to locate and order real numbers
  - Categorize real numbers as rational or irrational
- EU 2:** Simplifying mathematical expressions containing exponents makes solving problems easier
- Simplify expressions involving exponents by using the power and product properties of exponents
  - Utilize the quotient and negative properties of exponents to simplify exponential expressions
- EU 3:** Scientific Notation is commonly used to represent large and small quantities
- Translate numbers from standard form to Scientific Notation
  - Perform operations with numbers expressed in Scientific Notation

**Standards**

**Common Core State Standards:**

- **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.,  $\pi^2$ ). For example, by truncating the decimal expansion of  $\sqrt{2}$ , show that  $\sqrt{2}$  is between 1 and 2, then between 1.4 and 1.5, and explain how to continue to get better approximations.
- **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  $x^2 = p$  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.
- **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 in scientific notation and choose units of appropriate size for measurements of very large or very small quantities.

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**ISAAC Vision of the Graduate Competencies**

**Competency 1:** Write effectively for a variety of purposes.

**Competency 2:** Speak to diverse audiences in an accountable manner.

**Competency 3:** Develop the behaviors needed to interact and contribute with others on a team.

**Competency 4:** Analyze and solve problems independently and collaboratively.

**Competency 5:** Be responsible, creative, and empathetic members of the community.

**Unit Content Overview**

**1. Real Numbers and the Number Line**

- Converting numbers to fractions, decimal approximations, and percents
- Comparing the value of numbers
- Arranging numbers in increasing and decreasing order
- Classifying real numbers
- Vocabulary: rational number, irrational number, repeating decimal, terminating decimal, square root, pi, denominator, improper fraction, integer, mixed number, infinity, natural number, number line, numerator, perfect root, perfect square, place value, radicand, square root, whole number

**2. Exponential Expressions**

- Using the product and power rules to simplify algebraic expressions
- Rewriting algebraic expressions with negative and zero exponents
- Simplifying all types of expressions using several exponential situations
- Vocabulary: exponent, power, base, radical, square root, cube root, perfect square, perfect cube

**3. Scientific Notation**

- Rewriting numbers as a single digit times a power of ten
- Performing operations with numbers expressed in scientific notation
- Vocabulary: scientific notation, decimal notation, exponent, power, base

**Interdisciplinary Connection:**

- Language Arts - Word Problems
- Science – Word Problems

**Daily Learning Objectives with *TWPS* Activities**

**Students will be able to...**

- Convert rational and irrational numbers into decimal approximations\*\*
  - *TWPS – Which number is the largest?*
  - *TWPS – Which of the three statements is a lie?*
- Simplify and evaluate square and cube roots
  - *TWPS – Find the error in the student's work when estimating the square root*

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- Classify real numbers as rational or irrational
  - *TWPS – Which number does not belong with the rest?*
- Compare and order rational and irrational numbers using their decimal approximations
  - *TWPS – Which number is larger? Explain.*
- Apply the Product Property and Power Property when multiplying exponential expressions
  - *TWPS – Which of the three statements is a lie?*
- Utilize the Quotient Property when dividing exponential expressions
  - *TWPS – Explain why the student is incorrect*
- Apply the Zero and Negative Power Properties
  - *TWPS – Which of the exponential expressions does not belong with the rest?*
- Simplify exponential expressions using a variety of properties
  - *TWPS – What is the error in the student's simplification?*
- Convert numbers between standard notation and scientific notation
  - *TWPS – Which of the three statements is a lie?*
- Perform operations with numbers expressed in scientific notation
  - *TWPS – Which of the numbers is largest? Explain.*

**Instructional Strategies/Differentiated Instruction**

- Whole-group instruction
- Creating authentic connections for students
- Rephrasing and restatement of information and concepts
- Guided notes
- Student-led instruction
- Independent problem-solving
- Collaborative problem-solving
- Cross-curricular problem solving (independent and collaborative)
- Accountable Talk
- Manipulatives
- Cumulative Homework
- Visuals to support instruction
- Small group instruction
- Pre-teaching and reteaching
- Multiplication charts
- Number lines
- Explicit instruction
- Color-coding
- Small group check in
- Differentiated homework assignments
- Differentiated assessments

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**EL DIFFERENTIATED INSTRUCTION:**

- Word Walls with visuals
- TWPS (Think, Write, Pair, Share)
- Pre-reading strategies
- Culturally responsive teaching
- Explicit Modeling
- Key Vocabulary
- Graphic Organizers
- Strategic Grouping
- Non-verbal Assessments

**Assessments**

**FORMATIVE ASSESSMENTS:**

- Accountable Talk Discussions
- Daily Think-Write-Pair Share (TWPS)
- Daily Do Now
- Whiteboards
- Mid-class check-ins
- Exit Slips
- Cumulative Homework
- Performance Task – Mowing Lawns
  - Problem Solving Rubric

**SUMMATIVE ASSESSMENTS:**

- Edulastic Quiz – EU 1
- Edulastic Quiz - EU 2
- Unit 1 Test
- Performance Task – Mowing Lawns

**Unit Task**

**Unit Task Name: Mowing Lawns**

**Description:** In this task, students will apply their knowledge of approximating real numbers to create a brochure for their own business mowing lawns. Students will need to convert between fractions and decimals (EU 1) and simplify various expressions (EU2, EU 3) while determining corresponding fees for various lawn sizes. Students will need to show correct mathematical work while explaining to their customers why these numbers are equivalent to fractions.

**Evaluation:** Problem Solving Rubric

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Unit Resources
<ul style="list-style-type: none"><li>• Worksheets</li><li>• Calculator</li><li>• Laptops</li><li>• SBAC Prep Online</li><li>• Edulastic</li><li>• Kahn Academy</li><li>• Gimkit</li><li>• Quizizz</li><li>• Individual Whiteboards</li><li>• 2 Truths &amp; One Lie</li><li>• State Common Core Standards Transition Tasks</li><li>• Online resources</li></ul>