

# Unit 1: Foundations of Algebra

## Algebra Prep

14 Class Meetings

*Created July 2020*

### Essential Questions

- How can we use variable expressions to represent mathematical relationships?
- Why is the order of operations important to accurately simplify expressions?

### Enduring Understandings with Unit Goals

**EU 1:** A number line is used to display the value of any real number and helps arrange them in order.

- Utilize a number line to locate and order real numbers.

**EU 2:** There are specific rules for adding, subtracting, multiplying, and dividing real numbers when simplifying algebraic expressions.

- Simplify expressions involving rational numbers.

**EU 3:** The order in which operations are performed can affect the value of an expression.

- Evaluate an expression using the order of operations

### Standards

#### Common Core State Standards:

- **8.EE.C.7:** Solve linear equations in one variable.
- **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 on to get better approximations.
- **8.EE.C.7:** Solve linear equations in one variable.
- **8.EE.A.1:** Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example,  $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$ .
- Formulas
- **8.G.C.9:** Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
- **ELA-Literacy.RST.9-10.7:** Translate quantitative or technical information expressed in words in a text into visual form and translate information expressed visually or mathematically into words.

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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. Mathematical Relationships

- Algebraic expression vs. variable expression
- Translating verbal expressions into numerical expressions
- Translating numerical expressions into verbal expressions

#### 2. Real Numbers and the Number Line

- Placing numbers on a number line
- Comparing the value of numbers
- Arranging numbers in increasing and decreasing order
- Classifying real numbers

#### 3. Properties of Real Numbers

- Commutative Properties of Addition and Multiplication
- Associative Properties of Addition and Multiplication
- Identity Properties of Addition and Multiplication
- Zero Property of Multiplication
- Multiplication Property of (-1)

#### 4. Operations with Real Numbers

- Adding real numbers with the same and different signs
- Inverse property of addition
- Subtracting real numbers with the same and different signs
- Multiplying and dividing real numbers
- Inverse property of multiplication
- Operations with fractions and decimals

#### 5. Order of Operations (PEMDAS)

- Evaluating expressions with exponents and radicals
- Simplifying expressions using the order of operations

#### 6. Formulas

- Area, perimeter, and volume of geometric figures
- Applying formulas to real-world problems

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### Interdisciplinary Connection:

- Language Arts - Word Problems
- Science – Word Problems

### Daily Learning Objectives with *Do Now Activities*

#### Students will be able to...

- Classify, graph, and compare real numbers
  - *What are some different types of real numbers and what is specific about each type?*
- Identify and use properties of real numbers
  - *Name a mathematical property and describe its purpose. Give an example of when it works and doesn't work.*
- Apply the properties of real numbers to add, subtract, multiply and divide
  - *Do you remember how to divide by a fraction? What is the special rule and why does it make sense?*
- Evaluate expressions (including ones with fractions and decimals) using order of operations
- Compare and contrast algebraic and numeric expressions
  - *Are there multiple ways to write an algebraic translation? How do you know?*
- Identify and explain the key parts of a formula.
  - *What is the formula for finding the area and perimeter of rectangles?*
- Solve for area, perimeter, and volume of geometric figures using substitution.
  - *How do the rectangle formulas change if we are looking at a square?*
- Apply geometric formulas to real-world situations.

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### Instructional Strategies/Differentiated Instruction

- Whole-group instruction
- Graphic organizers
- Creating authentic connections for students
- Rephrasing and restatement of information and concepts
- Guided notes
- Student-led instruction
- Small group instruction
- Independent problem-solving
- Collaborative problem-solving
- Cross-curricular problem solving (independent and collaborative)
- Accountable Talk
- Manipulatives
- Word walls with visuals
- Homework

### Assessments

#### **FORMATIVE ASSESSMENTS:**

- Warm-ups (SBAC)
- ABCD Cards
- Whiteboards
- Mid-class check-ins
- Exit Slips
- Accountable Talk Discussions
- Do Now
- Student-led instruction
- Homework
- Performance Task - **Crime Scene – The Real Number System**
  - Future Rubric Assessment in 2021-2022

#### **SUMMATIVE ASSESSMENTS:**

- Quiz 1 - EU 1, 2, 3
- Unit 1 Test – IAB – The Number System
- Performance Task - **Crime Scene – The Real Number System**

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### Unit Task

- **Unit Task Name: Crime Scene – The Real Number System**

**Description:** In this task, students will investigate the culprit of six fictional thefts. The criminal has left six messages, layered with algebra. Students will use their knowledge of algebraic concepts to build a case and present their findings to the court. The algebraic concepts in this task include the real number system, approximating numbers (EU 1), properties of real and irrational numbers (EU 2), and order of operations (E3).

**Evaluation:** Summative Assessment and Future Rubric in 2021-2022 school year

### Unit Resources

- Flipped Google Classroom Videos
- Worksheets
- Calculator
- Laptops
- SBAC Prep Online
- Kahn Academy
- Match Fishtank
- Map.Mathshell.org
- Online resources