Unit 01: Variables, Expressions, and Integers

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 1**
Length: **3 Weeks**
Status: **Published**

Unit Overview

This unit will focus on the basics of Algebra through the forming of algebraic expressions and equations. Students will evaluate expressions and perform operations on real numbers using order of operations. They will use a problem-solving plan and equations to solve real-world problems involving order and real numbers. Students will become proficient at comparing and ordering real numbers and will learn how to plot points and use the coordinate grid.

Standards

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.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.7.NS.A.2	Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
MA.6.EE.A.1	Write and evaluate numerical expressions involving whole-number exponents.
MA.6.EE.A.2	Write, read, and evaluate expressions in which letters stand for numbers.
MA.6.EE.A.2a	Write expressions that record operations with numbers and with letters standing for numbers.
MA.6.EE.A.2b	Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.
MA.6.EE.A.2c	Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
MA.6.EE.A.3	Apply the properties of operations to generate equivalent expressions.
MA.6.EE.A.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

Essential Questions

- What makes a strategy for computing effective and efficient?
- What is meant by equality?
- How is thinking algebraically different from thinking arithmetically?

- How does explaining my process help me to understand a problem's solution better?

Application of Knowledge and Skills...

Students will know that...

- A coordinate plane is formed by the intersection of a horizontal number line called the x-axis and a vertical number line called the y-axis. The axes divide the plane into four quadrants.
- A numerical expressions consists of numbers and operations.
- A power can be written in a form that has has two parts: a number called a base and a number called the exponent.
- A power is a result of repeated multiplication of the same factor.
- A variable expression consists of numbers, variables, and operations.
- Absolute value of a number is its distance from zero on a number line.
- An Extended Constructed Response involves explaining one's mathematical thinking and justifying one's process through written language.
- Each point in a coordinate plane is represented by an ordered pair.
- Integers are positive and negative whole numbers that continue without end in both directions.
- Positive integers are greater than zero, and negative integers are less than zero.
- The mean, median, mode, and range are useful ways to evaluate a data set.
- The order of operations must be used to evaluate expressions involving more than one operation.
- There are four steps to solving a word problem: Read and Understand, Make a Plan, Solve the Problem, and Look Back.
- Two numbers are opposite if they have the same absolute value.

Students will be able to:

- Add and subtract two or more integers.
- Determine the absolute value of a number.
- Determine the mean/median/mode/range of a data set involving integers.
- Determine the product and the quotient of two or more integers.
- Evaluate an Extended Constructed Response.
- Evaluate variable expressions and equations.
- Identify and utilize key mathematical vocabulary associated with mathematical operations and algebraic expressions.
- Identify important parts and quadrants on a coordinate plane.

- Locate points on a coordinate plane.
- Order integers from least to greatest.
- Plot an ordered pair.
- Solve equations using the order of operations and grouping symbols.
- State the opposite of a number.
- Translate variable expressions and equations.
- Use and identify problem-solving strategies to solve word problems.
- Utilize a rubric to write an open-ended response.
- Write exponents as a product of multiplication.

Assessments

Digits Readiness Assessments:

The readiness assessment screens students on their understanding of the prerequisite content of a unit. Students are then assigned invidualized intervention lessons to address specific needs.

- Daily Formative Assessment Formative: Other written assessments Formative assessments, such as: Do Now Assignments, Homework Assignments, Tickets to Leave, and Communicators, will provide daily data for teachers.
- Human Number Line Formative: Other visual assessments Provide each student with a rational number. The students will order themselves from least to greatest. They will provide a real-world example that relates to their number. They will also determine any sets of numbers that provide an example of opposites or absolute values.
- Integer Message Formative: Personal Project Students will create a message utlizing the integer alphabet. They will determine the sum of their message.
- Open Ended -Individual Assignment Summative: Other written assessments Each student will be provided their own open-ended task based on ability. This will be graded using the NJASK scoring rubric.
- Open-Ended Partner Activity Formative: Self Assessment Students will critque their own work with a partner. Together they will evaluate their Extended Constructed Reponses using a rubric. The open-ended response may be linked to any topic in Unit 1.
- Pre-Test Diagnostic: Benchmark Assessment Students will complete a Pre-Test to determine their knoweldge of the material contained in Unit 1.
- Unit 1 Quiz Formative: Written Test This quiz will assess the students' ability to compare and order integers and to evaluate the follow: algebraic expressions, exponents, numeric expressions involving the order of operations, and absolute value.
- Unit 1 Test Summative: Written Test A teacher-constructed test assessing the students' understanding of variables, expressions, and integers.

Activities

- **Order of Operations:** "I Have, Who Has": Students will play a game which involves oral comprehension of the order of operations. To differentiate, write the problems on the board as the students say them aloud.
- **Coordinate Plane** Battle Ship: Each student is given two sets of coordinate planes. On one plane, they will plot their ships. On the other, they will mark their opponents hits/misses.
- **Order of Operations:** Students will develop their own pneumonic device for solving problems

involving order of operations.

- **Integers:** Create a foldable as a visual study guide to help students understand how to add, subtract, multiply, and divide integers.
- **Integer Message:**

  Students will create a message utilizing the integer alphabet. They will determine the sum of their message.

  - **Launch Activities: Digits grade 7 cd**

  Scuba Diving r4: In this activity students will look at examples about scuba diving to add and subtract fractions, find absolute values, and compare and order integers.

  Running a Bakery r5: In this activity students will solve problems related to running a bakery to multiply and divide fractions.

Activities to Differentiate Instruction

Coordinate Plane and Maps: Each student will be provided with a map of the Rutgers Campus or any real-world map. Each map must have a coordinate plane drawn on top. The students must locate buildings/objects on their map utilizing coordinates. (Have lower level students start by locating coordinate points and quadrants.) To challenge students, have them work backwards. Given a location, find the coordinate point and also provide critical thinking questions. Link is attached.

Open-Ended : After reviewing the NJASK Rubric, provide students with examples of Extended Constructed Responses. In small groups have them determine the numeric rating the response would earn using the NJ scoring rubric. Provide students with signs to hold up (0-3). Once the students have rated the response, they must support their rating. To complete the assignment, provide each student with their own open ended. This will be graded using the NJASK rubric. Level the open ended questions based on students' ability.

Operations Vocabulary: Use a graphic organizer to have students identify key vocabulary words associated with mathematical operations. Chart should be on Smart Board. Have words on the side of chart and have students slide them into correct place. Have students creatively think of some on their own. To challenge students, leave the words out and have students complete the chart individually, then as a whole class.

Addition/Subtraction of Integer: use two different visuals to help students identify the rules for adding and subtracting integers. The first way is to utilize red and yellow algebra tiles. The other way is to use a number line. Both can be set up on the Smart Board and students can move spaces on the number line or add/subtract algebra tiles. For advanced students, have them add/subtract three or more integers at a time or combine problems with addition and subtraction.

Order of Operations: Have advanced students insert grouping symbols into equations to make them true.

Problem-Solving Activity: Place students in groups by ability and have them solve a word problem on large poster board. Provide more than one option per group, allowing the students to select their problem. The problem in each group will be chosen based on the students' ability group. The students must identify the problem-solving strategy they chose, and show all the work necessary to solve the problem. Each group will

present its results to the class.

Coordinate Plane Graphic Organizer: Provide students with a horizontal number line. Have them place a vertical number line through the horizontal number line to create a coordinate plane. Have students label the coordinate plane with key vocabulary terms.

Differentiated Homework:

Digits Supported Materials:

- Math XL Printables
- Leveled Homework G and K
- Help Me Solve This: This function scaffolds math problems by asking prompting question at each individual step.
- View An Example: This function provides a fully worked out step-by-step solution of a similar problem.
- Readiness Assessment: After a student completes the readiness assessment intervention lessons are individually assigned to address prerequisite skills .
- Tools: On line manipulatives

Integrated/Cross-Disciplinary Instruction

Science (Volcanoes): Discuss the concept of sea level correlating to zero. Below sea level correlates with negative numbers, while above sea level correlates with positive integers. Provide students with statistics on numerous volcanoes throughout the world. How can an underwater volcano be growing? Would the top of the volcano be approaching or getting farther away from the surface? The students will order the volcanoes from least to greatest and determine which has the greatest absolute value.

Resources

- Kuta software

  Digits teacher materials and support: www.pearsonrealize.com

  Digits student access and support: www.MyMathUniverse.com

  SMART Exchange

  Smart Board

- NJ Extended Construction Response Rubric

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.