

Unit 05 - Making Sense of Symbols

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **25 days**
Status: **Published**

General Overview, Course Description or Course Philosophy

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

In this unit student work includes simplifying, factoring, expanding, evaluating or solving expressions and equations. Students will develop the understanding of using symbolic expressions to represent and reason about relationships.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Essential Questions:

- How does one interpret the number of solutions to linear equations in one variable?
- How can one use volume to solve real-world and mathematical problems?
- What is the relationship, if any, between volume of cones, cylinders, and spheres?
- How can situations be modeled with symbolic statements?
- When do two or more symbolic statements represent the same context?
- How can the properties of real numbers, such as the Distributive Property, be used to write equivalent expressions?
- How can different symbolic expressions be mathematically equivalent?
- How can information that equivalent expressions represent in a given context be identified?
- How can you determine the equivalent expression or equation that is most helpful in answering a particular question about a relationship?
- How can algebraic equations be used to describe the relationship among the volumes of cylinders, cones and spheres that have the same height and radius?
- How are linear equations involving parentheses solved?
- How can the number of solutions in a linear equation be determined? When will the equation have a finite number of solutions, an infinite number of solutions, or no solution?
- How can equations be analyzed in order to determine the patterns of change in the tables and graphs that the equations represent?
- How are parts of a symbolic statement or expression related to the underlying properties of the relationship they represent and to the context of the problem?

Enduring Understandings:

- The solution to a linear equation is a point or set of points which will make the equation true.
- Properties of operations with numbers can be applied to variables.
- Volume is a unit of measurement that indicates the number of cubic units a three-dimensional shape can hold.
- Algebraic equations and expressions can be used to solve problems.
- Equivalence is useful when solving equations and problems.
- Equivalent expressions can be generated using properties of operations. Examining equivalent forms of an expression can reveal new information about the context of a problem.
- Equivalent expressions can be used to develop and relate formulas for geometric shapes including volumes of cones, spheres, and cylinders.
- Equations can have one solution, no solution, or an infinite number of solutions which can be identified by examining the equation or its graph.
- The underlying pattern of change in a relationship or function can be represented by a symbolic representation or equation. Different types of functions, such as linear, inverse, exponential, or quadratic, have specific characteristics in their symbolic representations.

CONTENT AREA STANDARDS

8.NS

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

8.EE

A. Work with radicals and integer exponents

B. Understand the connections between proportional relationships, lines, and linear equations

C. Analyze and solve linear equations and pairs of simultaneous linear equations

8.F

A. Define, evaluate and compare functions

B. Use functions to model relationships between quantities

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.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.8.EE.C.7	Solve linear equations in one variable.
MA.8.EE.C.7a	Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).
MA.8.EE.C.7b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
MA.8.F.A.2	Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MA.8.G.C	Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.
MA.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.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

9.1.8.PB.6: Construct a budget to save for short-term, long term, and charitable goals. There are strategies to decrease and manage expenses. 9.1.8.PB.7: Brainstorm techniques that will help decrease expenses including comparison shopping, negotiating, and day-to-day expense management.

LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.K-12.NJSLSA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
LA.K-12.NJSLSA.SL4	Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
CS.K-12.3	Recognizing and Defining Computational Problems
CS.K-12.5	Creating Computational Artifacts
CS.K-12.6	Testing and Refining Computational Artifacts
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand:

- the formulas for the volumes of cones, cylinders and spheres.

Procedural Knowledge

Students will be able to:

- Compare properties of two functions each represented in a different way.
- Give examples of functions that are not linear.
- Interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line.
- Use the formulas for the volume of cones, cylinders, and spheres to solve real-world and mathematical problems.
- Generate examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions.
- Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

EVIDENCE OF LEARNING

Benchmark Assessments

- BOY Diagnostic Snapshot Assessment
- MP1 Quarterly Assessment
- MP2 Quarterly Assessment
- MP3 Quarterly Assessment
- MP4 Quarterly Assessment
- EOY Diagnostic Snapshot Assessment

Alternate Assessments

- Portfolios

- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

Formative Assessments

Mathematical Reflections

Check Up 1

Check Up 2

Self Assessment Take-Home Questions

Delta Math Assignments

Summative Assessments

Partner Quiz

Teacher created assessments (both test generator and teacher generated questions)

OnCourse generated assessments

Delta Math teacher created assessments

Unit Project - Ice Cream Shop Project

RESOURCES (Instructional, Supplemental, Intervention Materials)

Instructional Materials

- CMP3 Unit - Say It With Symbols - Investigations 1, 2, 3(3.1 and 3.2)
- <https://www.savvasrealize.com/> (teacher and student recourses)
- [Delta Math](#)

Supplemental/Intervention Materials

- <https://www.khanacademy.org/>
 - [Variables and Expressions](#)
 - [Multi-step Equations](#)
- <https://illuminations.nctm.org/>
- <https://www.illustrativemathematics.org/>
 - [8.4 Linear Equations and Linear Systems - Lessons 2-9](#)
 - [8.5 Functions and Volume - Lessons 11-21](#)

INTERDISCIPLINARY CONNECTIONS

Art

Architecture

Engineering

Product Design

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.