Pre-College Algebra & Trigonometry - Unit 1 - Rebuilding the Foundations

Unit Focus

Many students who take this course have used memorization in previous courses. This method of learning math is not sustainable and has led to frustration and only partial understanding. In this course, students will be encouraged to reach for complete conceptual understanding of every topic, and discouraged from memorizing all but a very few small things like definitions. Learning math this way is more rewarding, enjoyable experience, and students will feel empowered to continue on in mathematics.

The goal of this mini-unit is to rewire student thinking about concepts that are fundamental to Algebra. We will look at the familiar concepts of order of operations, fractions, mathematical properties, operations on polynomials, and graphing from a new perspective that will enable students to transfer their knowledge to more abstract applications in the future. Example: fractions will be taught by prime factorization so that students can transfer their knowledge to the simplification of rational expressions.

Stage 1: Desired Results - Key Understandings

Standard(s)

Common Core
Mathematics: 9-12

- Interpret parts of an expression, such as terms, factors, and coefficients. (CCSS.MATH.CONTENT.HSA.SSE.A.1.A)
- Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P. (CCSS.MATH.CONTENT.HSA.SSE.A.1.B)
- Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. (CCSS.MATH.CONTENT.HSA.SSE.A.2)
- Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (CCSS.MATH.CONTENT.HSA.SSE.B.3)
- Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. (CCSS.MATH.CONTENT.HSA.APR.A.1)
- Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (CCSS.MATH.CONTENT.HSA.CED.A.2)
- Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). (CCSS.MATH.CONTENT.HSA.REI.D.10)

Transfer

Students will be able to independently use their learning to...
T1 Use properties and laws to manipulate numbers, expressions, and graphs to create order.
T2 demonstrate fluency with math facts, computation and concepts.
T3 Apply a new concept to rework a familiar situation/problem

Meaning

Understanding(s)	Essential Question(s)
Students will understand that... **U1** the rules of mathematics are not arbitrary but are designed to be logical and consistent. **U2** symbols, numbers, words, and visual representations have precise mathematical meaning. **U3** Mathematicians understand meanings of operations and how they relate to one another.	*Students will keep considering...* **Q1** How do I use what I know to approach this problem? **Q2** How do I create a representation (graph) that describes the problem situation (equation)?

Acquisition of Knowledge and Skill

Knowledge	Skill(s)
Students will know... **K1** order of operations (GEMA - grouping, exponents, multiplication, addition)	*Students will be skilled at...* **S1** using prime factorization to simplify expressions involving fractions.

Stage 1: Desired Results - Key Understandings

• Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (CCSS.MATH.CONTENT.HSF.IF.A.2) • Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (CCSS.MATH.CONTENT.HSF.IF.C.7) • Look for and make use of structure. (CCSS.MATH.MP.7) • Look for and express regularity in repeated reasoning. (CCSS.MATH.MP.8) **Madison Public Schools Profile of a Graduate** • Inquiry: Posing, pursuing, and refining significant questions to deepen understanding about a topic or issue. (POG.1.1) • Self-Awareness: Examining current performance critically to identify steps/ strategies to persist. (POG.4.1)	**K2** division IS multiplying by the reciprocal, subtraction IS adding the opposite **K3** graphs are a visual representation of the solution set of an equation. **K4** how to apply order of operations to simplify polynomial expressions **K5** Vocabulary: factor, term, commutative property, reciprocal	**S2** simplifying complicated expressions **S3** evaluating expressions **S4** graphing equations **S5** correctly apply commutative, inverse, and distributive properties