Algebra IA
(Available in English and Spanish)

SCOPE OF COURSE

This course is divided into two semesters of study (A & B) comprised of five units each. The first-semester (A) is a study of algebraic concepts including measurement and mathematical reasoning; algebraic expressions; factoring; and equations.

SEQUENCE OF SKILLS

UNIT 1 – Foundations

Real Numbers
- learn to recognize and differentiate between natural numbers, whole numbers, integers, rational numbers, irrational numbers, and real numbers
- relate the number line to the collection of real numbers

Sets
- recognize a well-defined set
- learn set notation and terminology
- study some subsets of real numbers-prime and composite numbers

Variables and Axioms
- learn why, when, or how to use a variable
- learn the definition of an axiom
- learn some specific axioms

Real Number Properties
- learn the characteristics and uses of the following properties of numbers: the commutative property, the associative property, the distributive property

Properties of Real Numbers
- to learn the meaning and some uses of identity elements, inverses, and the multiplicative property of zero
- to understand why division by zero is not allowed
- to introduce the uniqueness and existence properties

Density Property of Real Numbers
- study the density property of real numbers
- learn which subsets of real numbers are dense

Addition of Signed (+/-) Numbers (Integers): understand the concept and process of adding signed numbers
- by using additive inverses
- with the help of an algorithm (or rule) and the distance from zero (absolute value)
- by studying shortcuts to adding strings of integers
- in application problems

Subtraction of Signed (+/-) Numbers (Integers): learn to subtract signed numbers
- using an algorithm which changes the problem to an addition problem
- in applied problems

Multiplication and Division of Signed Numbers
- learn to multiply integers using pattern finding, repeated addition, and an algorithm
- learn to divide integers using the relationship between multiplication and division and an algorithm
- learn to multiply and divide integers in applications

Fractions and Number Sense
- become comfortable with fractions by understanding their make-up and comparing their sizes

Operations with Fractions: prepare for operations with algebraic fractions
- by understanding the concepts behind the algorithms
- by determining if solutions are reasonable

Decimals: become comfortable with decimals and decimal operations
- by understanding the relative size of decimals
- by understanding why the algorithms or rules dealing with decimals work
- by testing answers for reasonableness

Scientific Notation and Percent
- to review scientific notation-value and form
- to review percent and some of its applications

Properties of Real Numbers—Order and the Number Line: study the order of real numbers
- in relation to each other (the Trichotomy Property)
- as related to the number line; variables, order, and the number line

SEQUENCE OF SKILLS

UNIT 2 – Measurement and Mathematical Reasoning

Exponents
- to recognize an exponential expression and its parts
- to use exponents to express repeated multiplication
- to evaluate arithmetic expressions with exponents (with and without a calculator)

Operations with Exponents
- to evaluate exponential expressions with a negative base
- to multiply and divide expressions involving exponents
- to evaluate expressions involving scientific notation

Radicals
- learn the meaning or concept of radicals
- learn how to perform operations involving radicals
- learn applications and problem solving involving radicals

Like Radicals
- learn to identify like radicals
- learn to simplify radical expressions with and without like radicals
- learn to solve application problems

Absolute Value
- learn absolute value notation
- perform operations involving absolute value

Order of Operations
- learn the importance of order of operations
- learn the correct order of operations
- learn to use the calculator correctly by experimenting

Measurement-Conversions: learn to make conversions
- between units in the same system using the factor/label method
- between the British and the metric system of measurement

Nonstandard Measurement and Measurement as Problem Solving
- learn to use nonstandard measuring devices
- learn to solve problems involving measurement

Measurement—Estimation and Accuracy
- learn to estimate quantities between and within the British and metric systems
- learn to estimate quantities using your senses
- learn to select appropriate instruments and techniques to measure quantities
- learn accuracy of measurement
- learn the difference between actual and relative errors

Mathematical Reasoning
- learn about statements and their negative
- learn to use Venn Diagrams for problem solving
- learn to use counter-examples to justify arguments

Mathematical Reasoning "And" and "Or"
- learn to use "and" and "or" mathematically correctly
- learn to use Venn Diagrams in problem solving with "and" and "or"

Mathematical Reasoning—Conditional and Biconditional Statements
- learn to recognize the hypothesis and conclusion of a conditional statement
- determine the truth of a conditional statement
- solve problems with conditional statements
- write and evaluate the truth of the converse of a conditional statement
- if a statement and its converse are both true, write a biconditional statement to replace them

Mathematical Reasoning—Deduction
- learn the difference between valid arguments and valid conclusions
- learn to use three types of valid arguments: direct reasoning, indirect reasoning, and the chain rule

Mathematical Reasoning—Induction

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UNIT 3 – Algebraic Expressions

Writing Algebraic Expressions
- recognize constants and variables
- translate word expressions into algebraic expressions using variables and vice versa

Evaluating Algebraic Expressions with One Variable
- learn to evaluate algebraic expressions with one variable
- connect order of operations in algebraic and arithmetic expressions
- begin problem solving with algebra through applications

Evaluating Algebraic Expressions with More than One Variable
- learn to evaluate algebraic expressions with more than one variable
- use algebra to solve problems through applications

Polynomials
- recognize monomials, binomials, trinomials, polynomials, and coefficients
- find the degree of a monomial and a polynomial
- write polynomials in descending order

Combining Like Terms
- learn to recognize like terms
- add and subtract like terms

Adding and Subtracting Polynomials
- learn to add and subtract polynomials
- use the distributive property to simplify polynomial expressions

Simplifying Algebraic Expressions with Exponents
- learn to simplify algebraic expressions containing exponents of the form $a^m a^n$
- simplify algebraic expressions containing exponents of the form $\dfrac{a^m}{a^n}$

More on Algebraic Expressions with Exponents
- learn to simplify algebraic expressions of the form $\left(a^n\right)^m$
- simplify algebraic expression of the form $\left(ab\right)^n$

Multiplying Polynomials
- learn to multiply a monomial times a monomial
- learn to multiply a monomial times a polynomial

Multiplying a Binomial times a Binomial
- learn to multiply a binomial by a binomial using the distributive property
- learn to multiply a binomial by a binomial using FOIL

Special Binomial Products
- find the square of a binomial
- find the product of the sum and the difference of the same two terms

Multiplication with Polynomials
- learn to multiply a binomial times a polynomial with more than two terms
- learn to multiply two polynomials each with more than two terms

Dividing a Polynomial by a Monomial
- learn to divide a polynomial of any length by a monomial

Dividing a Polynomial by a Binomial
- learn how to divide a polynomial by a binomial

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SEQUENCE OF SKILLS

UNIT 4 – Factoring
Factoring—Common Factors
- learn to factor monomials
- learn to recognize common factors and use them to write expressions in factored form

The Difference of Two Squares
- learn to recognize the difference of two squares
- learn to factor the difference of two squares

Factoring Trinomials
- learn to factor trinomials with a leading coefficient of 1

Factoring Trinomials—Advanced
- learn to factor trinomials of the form $ax^2 + bx + c$ where $a \neq 1$ and a and c are prime
- learn to factor trinomials of the form $ax^2 + bx + c$ where $a \neq 1$ and a and c are not both prime

Factoring by Grouping
- learn to recognize when factoring by grouping is appropriate
- learn to factor by grouping

Factoring the Sum and Difference of Two Cubes
- learn to recognize the sums and differences of two cubes
- learn to factor the sum and the difference of two cubes

Factoring Completely
- learn to factor expressions completely

Reducing Algebraic Fractions Using Factoring
- learn how to use factoring to reduce algebraic fractions

Addition and Subtraction of Algebraic Fractions with Common Denominators
- learn to add algebraic fractions with a common denominator
- learn to subtract fractions with a common denominator

Addition and Subtraction of Algebraic Fractions without Common Denominators
- find the lowest common denominator of algebraic fractions
- add and subtract fractions after finding a common denominator

Multiplying and Dividing Algebraic Fractions
- learn to multiply algebraic fractions
- learn to divide algebraic fractions

Complex Algebraic Fractions
- learn to recognize complex fractions
- learn to simplify complex fractions by changing to the equivalent multiplication problem
- learn to simplify complex fractions using the least common multiple
- learn to use complex fractions in applications

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UNIT 5 – Equations

Equations
- learn to recognize equations
- learn to recognize solutions or roots of equations
- learn to identify conditional equations, identities, and impossible equations and find solution sets for each type

One Step Equations—Addition and Subtraction
- learn to solve equations that require one step: addition and subtraction
- learn to solve equations by writing equivalent equations

One Step Equations—Multiplication and Division
- learn to solve equations that require one step: multiplication and division
- learn to use a reciprocal to solve one step problems involving multiplication or division

Two Step Equations: learn to solve two step equations of the form
- $ax + bx = c$
- $ax + b = c$
- $ax + b = cx + d$

Multiple Step Equations
- learn to solve multiple-step problems involving the distributive property and clearing fractions

Writing Equations
- learn to write, solve, and check equations

Word Problems with One Variable (Number Relations, Consecutive Integer, and Average Problems)
- learn to write, solve, and check word problems that fall into the following three categories: number relations, consecutive integers, and average

Word Problems with One Variable (Coin Problems and Interest Problems)
- learn to solve coin or money problems and interest problems
- learn to use tables to organize data

Word Problems with One Variable (Perimeter and Area)
- learn to solve perimeter problems, area problems, and use drawings to help organize data

Rational Algebraic Expressions
- learn to solve rational algebraic equations using the lowest common denominator
- learn to use the cross product rule correctly
- learn to check solutions to rational algebraic equations for extraneous roots

Distance-Rate-Time Problems
- learn to combine sketches and tables to help solve problems
- learn to solve word problems involving distance, rate, and time
- learn to solve distance-rate-time problems with wind or current involved

Work Problems and Percent Problems
- learn to solve problems involving percent
- learn to solve work problems

Mixture Problems
- learn to solve mixture problems by mixing ingredients of different strengths or values to get a desired result
- learn to solve mixture problems by replacing part of the substance with a substance of another strength to obtain a desired result
- learn to use proportions to adjust for different amounts of a substance

Literal Equations
- learn to solve a literal equation for any of the variables it contains