COMMON CORE Algebra 1 : 6 units

ALGEBRA 1 Scope and Sequence

UNIT 1 (September-October)

1) *Linear Model*

Simplifying Expressions and evaluating linear function

- Translating situations into a linear model and determining if a given situation fits into linear model
- Solving Linear Equations /Inequalities using the Properties of Algebra(Distributive, Inverse & Commutative) algebraically
- Solving Fractional linear equations & Inequalities
- Determine whether a given table is Linear function or Non-linear
- Transforming linear equations/inequalities from standard form into Slope-Intercept Form
- Modeling Linear Equations/Inequalities
- Graphing linear equations/inequalities
- Distance- Time Graph /Travel Graph

October

- Calculate Slope/rate of change/speed
- Analysis of linearity/non-linearity by rate of change using table
- Graphing Inequalities / Equations in two variables
- Solving System of Equations/ Inequalities algebraically by the Elimination and Substitution methods
- Graphing Absolute value equations & Square Root equations
- Modeling system of linear equation/inequality
- Literal Equations & Change of Formulas
- Piece-wise functions and their related graphs

UNIT 2 (November- December)

2) *Quadratic Model & Polynomials*

Evaluating Quadratic Functions graphically and algebraically

Factoring Quadratic Expressions

(i) Factoring by the Greatest Common Factor

(ii) Factoring Binomial Expressions

(iii) Factoring Trinomial Expressions

Zeros of quadratic Functions

- Graphing Quadratics and finding the zeros/ x-intercepts/roots as apply to equations
- Interpreting the Discriminant formula (b^2- 4ac)
- Factoring Method using the Zero product property
- Completing the square method and the Vertex form of quadratics)
- Completing the square to solve quadratic equation (the process of adding $(b/2)^2$ to x^2 + bx to form a perfect square trinomial
- Minimum/Maximum and the vertex form of quadratics
- Range and Domain on quadratic graphs
- Quadratic formula and solving quadratic equation by taking square roots
- Vertex Form of Quadratic and Transformations & Quadratics (shift ---Right, Left , Up, Down) or Vertical and Horizontal shifts
- Axis of symmetry And Vertex/ Turning Point
- Using the equation of the Axis of symmetry: x= -b/ 2a to find the maximum or minimum y- values and subsequently forming the Vertex graphically and algebraically
- Analyze Quadratic function over a given interval (finding the rate of change with the limits of a given interval)
- Graphing a Linear- Quadratic system (Graphing Calculator)
- Solving a linear- quadratic system algebraically by the substitution method
- Modeling Quadratic Function (translating a given situation into a quadratic equation)
- Graphing Square Root Function and determining the domain
- Polynomials/ Cubic Function
- Writing polynomials in standard form
- Adding and Subtracting polynomials in standard form
- Determining the x- intercepts /zeros of a cubic function algebraically and graphically
- Relationship between Zeros and Factors of polynomials
- Using the zeros to write quadratic equations in standard form and the equation of Axis of symmetry

<u>UNIT 3 (January - February)</u>

3) ***Exponential model***

- Graphing Exponential Functions,
- Exponential Decay (decreasing) Function ,Rate Factor less than 1
- Exponential Growth (increasing) Function, Rate Factor more than 1
- Identifying and Evaluating Exponential Function
- Simplifying Exponential Expressions including Exponential laws or rules
- Translating situations into Exponential Functions using keywords(doubling ,tripling, quadrupling as well as percentage rate of change)
- Interpreting the terms in Exponential Equation $y= ab^x$, where b= 1+r or b =1-r
- Attributes of Exponential Function (Initial value, Constant Ratio/ Rate Factor, Duration)
- Linear model and Exponential model(Tables and Rate of Change) as well as situations involving linear or Exponential models
- Finding the y-intercept/ initial value of an exponential function, the rate factor of the exponential function
- Modeling Exponential Functions(translating word problems into exponential equation)
- Compound Interest & Rate Factor(1+r) & (1-r),Compound Interest equation : $y= a(b+r)^x$

or $y= a(b-r)^x$

Solving Exponential Equations with the same Base

Key words: Compounded, appreciate, growth, gain/increase, decay, depreciate and lose/lost, doubling, tripling, etc.

UNIT 4 (March)

4) ***Function*** (Types: Linear, Quadratic, Absolute Value, Exponential piece-wise function)

Representation of Functions :(Coordinate Form/ set, Table Form & Graphs)

(1). Function Notation f(x), g(x) / Evaluating functions (2) Domain & Range

Evaluating a function with a given domain graphically and algebraically .Examples, f (0) etc.

- Rate of change (slope) with given intervals
- SLOPE = y2_ y1/ X2_X1 or Rise/ Run
- Writing a function that describes a relationship between two quantities
- Nature of function

- Graphs of functions and the Vertical line test as a visual tool to determine whether a graph is a function or not
- Creating function in table or coordinate forms (one to one mapping or correspondence)
- Relation and Function
- The Square Root and Cube Root Functions.
- Analyzing Functions Graphically
- Translations of Functions
- Interpreting Graph of Functions
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UNIT 5 (April)

5) *Sequence and the Number System*

(Number Pattern & Structure)

Identify Arithmetic and Geometric sequence by examining the pattern and write an equation to describe the pattern

Write an Explicit and Recursive Formulas with Arithmetic & Geometric Sequences

NOTE: In an Explicit, the output for any term depends on the term number but in a Recursive the output is used as the next input .Recursive in general means to repeat a process over and over again.

TWO MAIN TYPES OF SEQUENCES (Arithmetic and Geometric Sequences)

Terms of Arithmetic Sequence and their Common Difference

Terms of Geometric Sequence and their Common Ratio

- Arithmetic (Common Difference) and their terms(Explicit)
- Geometric (Common Ratio) and their terms (Explicit)
- Recursive and their terms for both Geometric and Arithmetic sequences
- Identifying Geometric and Arithmetic Sequences
- Writing the terms and rule for a given sequence (Arithmetic or Geometric)
- Write a Recursive Formula for a sequence with visuals
- Formulas associated with Arithmetic, Geometric sequences in Explicit and Recursive forms
- Evaluate the Explicit Arithmetic Sequence Formula: $a_n=a_1 + (n-1)d$ and the Explicit Geometric sequence Formula :$a_n = a_1(r)^{n-1}$ with a given n-value
- Real Numbers And Non- Real Numbers
- Real Number System (Rational & Irrational numbers)
- Operations with Rational and Irrational (Radicals) numbers

UNIT 6 (May- June)

6) *Statistics*

- Box-and-whisker Plot, Five-number summary including the Quartiles ,Histogram , Bar Graphs as well as a Dot plot
- Interpreting a given Statistical Graph
- Analyzing Univariate data by the Graphing calculator and interpreting the statistical symbols (mean, standard deviation, quartiles, etc.)
- Interpreting the Box and Whisker plot
- Measures of Central Tendency (Mean, Median, Mode)
- Measures of Variability/Spread/dispersion (range, Interquartile range. standard deviation),
- Interquartile range & outliers(extreme values)
- Analyzing data using the standard deviations and the interquartile range(IQR)
- Scatterplot and regression analysis, Interpreting scatter Plot (draw Trend Line, Interpolate and Extrapolate to predict an unknown variable)
- Quantitatively measure the strength of linear relationship by computing and interpreting the correlation coefficient.
- Represent Bivariate data on a Scatter Plot and describing the types of correlation
- Analyzing Lines of Fit (Finding a Line of Best Fit Using Technology)
- Correlation / Relationship /Association/Trend line/ Line of best fit
- Analyzing Bivariate Data: Using the Graphing Calculator to determine the equation and the correlation coefficient (r). Regression Equation ($y= mx + b$) & Correlation Coefficient (positive, negative and No correlation and their graphs)
- Interpreting the statistical symbols, r^2 as the coefficient of determination, the letter r as correlation coefficient and the Number Line showing the various degrees of correlation levels(strong ,moderate and weak) to draw a valid conclusion for a data set
- Causal & Non-Causal Situations
- Distinguish between correlation and causation