**Secondary 1 Unit Outline – AFHS Math Department**

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| **Unit 1 – Properties of Numbers** |
| **Concepts*** Adding and Subtracting – Positive and Negative #’s
* Multiplying and Dividing – Positive and Negative #’s
* Number Families – Real, Integers etc (basic)
* Order of Operations
* Inverse operations – Addition/Subtraction, Multiplication/Division, Squaring/Square Root
 | **Core*** **A.SSE.1.a** I know the vocabulary (expression, terms, factors, and coefficients) and can identify them in linear and exponential expressions.
 | **Resources** Book Sections0-2 Real Numbers0-3 Operations with integers1-2 Order of Operations1-4 Distributive Property1-3 Properties of Numbers7-1 Multiplication Properties of Exponents7-2 Division Properties of Exponents TasksWorksheetsAdditional Resources |
| **Unit 2 – Geometrical Vocabulary** |
| **Concepts*** Fractions
* Measuring
* Units
* Definitions of an angle, circle, and line segments
 | **Core*** **G.CO.1** I can precisely define an angle, circle, perpendicular line, parallel line, and line segment based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
* **N.Q.2** I can identify appropriate units for modeling different contextual situations.
* **For example:** It’s normally not appropriate to measure the height of a person in mm.
* **N.Q.1.a** I can use unit analysis to help set up and solve contextual situations involving different units.
* **A.SSE.1.b** I can determine the real world context of the variables in an expression.
* **For example:** For  I understand what *P* andrepresent and how each affects the total amount.
 | **Resources**Book Sections0-4/0-5 Fractions10-1 Points, Lines and Planes10-2 Linear Measure10-4 Angle MeasureTasksWorksheetsAdditional Resources |
| **Unit 3 – Number Patterns** |
| **Concepts*** Building Tables, Graphs, pictorial representations and basic algebraic expressions for simple linear number patterns and simple exponential patterns
* Finding a common difference /ratio in tables, graphs, pictorial representations and representing them
* Establishing the concept of a variable and unknowns from contexts – discrete vs. continuous
 | **Core*** **F.LE.1.b** I can recognize contextual situations with a common difference between terms.
* **F.LE.1.c** I can recognize contextual situations with a common ratio between terms.
 | **Resources**Book Sections1-1 Variables and Expressions1-6 RelationsTasksWorksheetsAdditional Resources |
| **Unit 4 – Functions**  |
| **Concepts*** Function notation
* Function vocabulary – expression, terms, factors and coefficients
* Expressions vs. Equations
* Building functions from tables, graphs, and pictorial representations
* Domain/Range and Input/output – determining reasonability of domain and range from a context
* Is it a function? Graphs, tables, algebraic expressions and pictorial representations
* Evaluating functions
* Discrete vs Continuous
 | **Core*** **A.SSE.1.a** I know the vocabulary (expression, terms, factors, and coefficients) and can identify them in linear and exponential expressions.
* **F.IF.1.d** I can explain what it means to be a function.
* **F.IF.1.c** I can identify whether a relation is a function by looking at a table of values or by looking at the graph.
* **F.IF.1.a** I can explain the relationship between *x* and , that  notation means “the *y*-value of the function *f* at *x*”.
* **F.IF.1.b** I can identify the domain (input, ­x­-value) and range (output, *y*-value, ) of a function from an equation, table, or graph.
* **F.IF.5** I can determine an appropriate domain for the given context of a function.
* **F.IF.2.a** I can evaluate functions in  notation for values in the domain.
* **F.IF.2.b** I can interpret statements that use function notation in terms of a context. For example, given the amount of money in a savings account is , I can explain what  represents.
* **A.REI.10.c** I can explain why a continuous curve (including lines) contains an infinite number of solutions.
 | **Resources**Book Sections1-7 Functions1-8 Interpreting Graphs of Functions2-1 Writing Equations1-5 EquationsTasksWorksheetsAdditional Resources |
| **Unit 5 – Solving Equations** |
| **Concepts*** Expressions vs Equations
* Equation vocabulary – expression, terms, coefficients
* Properties of Equalities
* Solving Literal Equations
* Algebraic Proofs of Linear functions
* Function addition, subtraction, multiplication and division
 | **Core*** **A.SSE.1.a** I know the vocabulary (expression, terms, factors, and coefficients) and can identify them in linear and exponential expressions.
* **A.REI.1** I can solve linear equations and justify each step in the solution using Algebraic properties.
* **A.REI.3.a** I can solve linear equations and inequalities in one variable.
* **A.REI.3.b** I can solve a literal equation for a given variable including equations with coefficients represented by letters.
* **For example:** A*x* + B*y* = c: solve for B
* **A.CED.4** I can isolate a variable in a formula.
* **For example:** Given , I can solve for *F*.
* **F.BF.1.b** I can combine standard function types using arithmetic operations.
* **For example:** Find , , ,  given  and .
 | **Resources**Book Sections2-2 Solving One Step2-3 Solving Multi-Step2-4 Solving Equations with variable on each side2-8 Literal EquationsTasksWorksheetsAdditional Resources |
| **Unit 6 – Constructions** |
| **Concepts*** Constructing segments and angles and bisect both justifying why the procedure is accurate
* Construct an equilateral triangle, a square, a regular hexagon inscribed in a circle
* Developing congruency of triangles
* Develop the midpoint and distance formulas
* Find area and perimeter on Euclidean plane and on a coordinate plane
 | **Core*** **G.CO.1** I can precisely define an angle, circle, perpendicular line, parallel line, and line segment based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
* **G.CO.12a** I can copy and construct a segment and an angle and explain why the procedure is accurate.
* **G.CO.12b** I can bisect a segment and an angle and explain why the procedure is accurate.
* **G.CO.13** I can construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle and explain why the procedure results in the desired object.
* **G.CO.7** I can show that two triangles are congruent if and only if corresponding pairs of sides and angles are congruent.
* **G.CO.8** I can identify the minimum conditions (ASA, SAS, AAS, SSS, or exceptions to SSA)
* **G.GPE.7** I can use tools of coordinate geometry (distance formula) to compute perimeters of any polygon and areas of right triangles.
* **A.CED.4** I can isolate a variable in a formula.
* **For example:** Given , I can solve for *F*.
 | **Resources**Book Sections10-3 Distance and Midpoints 10-7 Proving Segment Relationships10-8 Proving Angle Relationships0-7 Perimeter0-8 Area12-1 Classifying Triangles12-6 Isosceles and Equilateral Triangles12-2 Angles of Triangles12-3 Congruent Triangles 12-4/12-5 Proving Congruent TrianglesTasksWorksheetsAdditional Resources |
| **Unit 7 - Transformations** |
| **Concepts*** Develop parallel and perpendicular lines
* Develop geometrical idea for slope
* Symmetry, translations, rotations, dilations, reflections rigid and non-rigid on shapes and functions
* Use midpoint formula, slope and Pythagorean theorem to prove properties of quadrilaterals and parallelogram.
 | * **G.CO.12c** I can construct perpendicular lines, including the perpendicular bisector of a line segment; and construct a line parallel to a given line through a point not on a line and explain why the procedure results in the desired object.
* **G.GPE.5a** I can determine if two lines are parallel, perpendicular or neither.
* **G.GPE.4** I can use the midpoint formula, slope, and the Pythagorean Theorem (distance formula) with coordinates to prove the following (but not limited to):
	+ If both pairs of opposite sides of a quadrilateral are congruent then the quadrilateral is a parallelogram.
	+ Both pairs of opposite sides of a quadrilateral are parallel then the quadrilateral is a parallelogram.
	+ If one pair of opposite sides of a quadrilateral is parallel and congruent then the quadrilateral is a parallelogram.
	+ If the diagonals of a quadrilateral bisect each other then the quadrilateral is a parallelogram.
	+ If all four sides of a quadrilateral are parallel and congruent, then the quadrilateral is a rhombus.
	+ If all four angles of a quadrilateral are parallel and congruent, then the quadrilateral is a square.
	+ If the opposite sides of a quadrilateral are both parallel and the consecutive sides are perpendicular, the quadrilateral is a rectangle.
* **G.CO.2.a** I can identify different transformations (translation, rotation, dilation, reflection) on an object.
* **G.CO.2.c** I can distinguish between rigid and non-rigid transformations.
* **G.CO.6a** I can identify the types of transformations that result in a rigid motion on a figure.
* **G.CO.6b** I can predict the effect of transformations to determine if two figures are congruent.
* **G.CO.5.b** I can describe the series of transformations from an image to a pre-image.
* **G.CO.2.b** I can perform a series of transformations on an object.
* **G.CO.5.a** I can perform a series of transformations on a figure (using graph paper, tracing paper, technology, etc).
* **G.CO.3.b** I can recognize rotational and reflectional symmetry.
* **G.CO.3.a** I can describe the rotations and reflections of a rectangle, parallelogram, trapezoid or regular polygon that carry it onto itself.
* **G.CO.4** I can define transformations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
* **F.BF.3.a** I can identify and explain the following transformations on a linear or exponential function (with or without technology).
* **For example:**
* (Vertical translation)
* (Horizontal translation)
* (Vertical stretch/compression, vertical reflection)
* (Horizontal stretch/compression, horizontal reflection)
* **F.BF.3.b** I can determine the value of *k* (see above) given the graph.
 | **Resources**Book Sections11-1 Parallel Lines11-2 Angles and Parallel Lines11-3 Slope of Lines11-5 Proving Lines Parallel11-6 Perpendiculars and Distance12-7 Congruence Transformations12-8 Triangles and Coordinate Proof12-9 Area of Parallelograms and Triangles13-1 Parallelograms13-2 Test for Parallelograms13-3 Rhombi and Squares14-4 Reflections14-5 Translations14-6 Rotations14-9 DilationsTasksWorksheetsAdditional Resources |
| **Unit 8 - Linearity** |
| **Concepts*** Establish a recursive and explicit rule for linear functions using common differences
* Connect common difference to slope and first term to y-intercept
* Identify a linear function from a table, graph and equation
* Write linear equations in slope intercept form, point slope form and in **standard form.**
 | **Core*** **F.LE.1.b** I can recognize contextual situations with a common difference between terms.
* **F.BF.1.a** I can write an explicit expression (function rule) or recursive process that describes a linear or exponential relationship between two quantities.
* **F.LE.2.a** I can construct a linear function given either: **1)** an arithmetic sequence, **2)** a graph, **3)** a description or **4)** input/output pairs.
* **S.ID.7** Given a linear model, I can interpret the slope and the y-intercept in the context of the data.
* **G.GPE.5b** I can write an equation of a line through a point that is parallel or perpendicular to a given line.
* **F.IF.6.a** I can calculate and interpret the average rate of change of a function between two values.
* **F.IF.6.b** I can calculate and interpret the average rate of change of a function from a graph or table and explain what it means in terms of the function.
* **F.IF.6.c** I can estimate the (instantaneous) rate of change at a point from a graph.
* **F.LE.1.a** I understand and can prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.
 | **Resources**Book Sections4-2 Writing Equations in Slope-intercept Form4-3 Writing Equations in Point –Slope4-4 Parallel and Perpendicular Lines3-3 Rate of Change and SlopeTasksWorksheetsAdditional Resources |
| **Unit 9 – Graphing and Manipulating linear equations** |
| **Concepts*** Graph a linear equation by hand from a table, equation (from slope-intercept form, point slope and standard form)
* Identify: x and y intercepts, increasing and decreasing, positive and negative intervals, maximum and minimum, symmetry, end behavior
* Switch between slope-intercept, point slope and standard form
* Comparing two linear functions
 | **Core*** **F.IF.9** I can compare properties of two functions represented in different ways.
* **For example:** Given a table of one function and a graph of another, find the best way to determine which function grows faster or has a greater y intercept.
* **A.REI.10.a** I can identify the coordinates of a linear and exponential function from a graph as solutions to an equation/function.
* **A.REI.10.b** I can graph points that satisfy a linear or exponential function and explain the meaning of each coordinate in relation to the function, using function notation.
* **F.LE.2.a** I can construct a linear function given either: **1)** an arithmetic sequence, **2)** a graph, **3)** a description or **4)** input/output pairs.
* **S.ID.7** Given a linear model, I can interpret the slope and the y-intercept in the context of the data.
* **F.IF.7.a** I can graph linear functions and identify slope and intercepts (simple cases by hand and complex cases using technology).
* **A.CED.2.a** I can create two variable linear and exponential equations and use them to compare two quantities.
* **For example:** Given two populations that follow linear or exponential growth models, I can find when the populations will be the same, and which population is bigger in 20 years.
* **F.IF.4.a** Given a linear or exponential function , I can identify the following from a graph or a table:
* *x*- and *y*- intercepts
* Increasing and decreasing intervals
* Positive and negative intervals
* Maximum and minimum values (is this relevant to linear and exponential functions)
* Symmetry
* End behavior
 | **Resources** Book Sections3-1 Graphing Linear Equations3-2 Solving by Graphing4-1 Graphing in Slope-Intercept FormTasksWorksheetsAdditional Resources |
| **Unit 10 – Systems of Equations and Inequalities** |
| **Concepts*** Solve a systems of linear equations and linear inequities
* Determine number of solutions from a system of equations, tables, and graphs. Identify the graph of one, none and infinite solutions
* Shade and identify if the inequality line is included in the solution set
* Using a table or a graph find intersections and interpret solutions of systems of linear and exponential equations
* Write and solve systems of equations and inequalities in contextual situations
 | **Core*** **A.REI.3.a** I can solve linear equations and inequalities in one variable.
* **A.REI.12.a** I can graph the solution to linear inequalities in two variables and explain the meaning of the shaded regions (solutions) and non-shaded regions (not solutions).
* **A.REI.11.c** I can explain why the *x*-coordinate at the point of intersection of two functions is the solution to .
* **For example:** Use graphs and tables to find the *x*-value(s) that results in an equal output for both functions:
*
* **A.REI.11.a** I can approximate solutions to a system of equations by graphing (with and without technology) to approximate the intersection of the curves.
* **A.REI.11.b** I can approximate solutions to a system of equations using tables (with and without technology).
* **A.REI.6** I can solve systems of linear equations in two variables using the following methods:
* Substitution
* Linear combination/Elimination
* Graphing
* **A.REI.5** I can explain why using a linear combination produces another equation that has the same solution as the original system of equations.
* **A.REI.12.b** I can graph the solution to systems of linear inequalities in two variables and explain the meaning of the shaded regions (solutions) and non-shaded regions (not solutions).
* **A.CED.3** Write and graph equations and inequalities representing constraints in contextual situations.
* **For example:** If I have $300 to spend, and hot dogs cost $2 per pound and hamburger costs $4 per pound, Determine what possible amounts of hamburger and hot dogs I can buy.
* **A.CED.1** I can create linear and exponential equations and linear inequalities and use them to solve contextual situations.
 | **Resources**Book Sections6-1 Graphing Systems of Equations6-2 Substitution6-3 Elimination Using Addition and Subtraction6-4 Elimination Using Multiplication5-1 Solving Inequalities by Addition and Subtraction 5-2 Solving Inequalities by Multiplication and Division5-3 Solving Multi-step Inequalities6-6 Systems of InequaltiesTasksWorksheetsAdditional Resources |
| **Unit 11 – Exponential Equations** |
| **Concepts*** Establish the idea of a common ratio
* Write a recursive and explicit rule for exponential functions
* Growth and Decay – tables, equations and graphs
* Model exponential situations
* Graph exponential growth and decay
* Find intercepts and end behavior of exponential functions
 | **Core*** **F.LE.1.a** I understand and can prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.
* **F.BF.1.a** I can write an explicit expression (function rule) or recursive process that describes a linear or exponential relationship between two quantities.
* **A.CED.2.a** I can create two variable linear and exponential equations and use them to compare two quantities.
* **For example:** Given two populations that follow linear or exponential growth models, I can find when the populations will be the same, and which population is bigger in 20 years.
* **F.IF.9** I can compare properties of two functions represented in different ways.
* **For example:** Given a table of one function and a graph of another, find the best way to determine which function grows faster or has a greater y intercept.
* **F.LE.1.c** I can recognize contextual situations with a common ratio between terms.
* **F.BF.2.d** I can write an explicit rule given a recursive definition and vice versa.
* **F.LE.2.b** I can construct an exponential function given either: **1)** a geometric sequence, **2)** a graph, **3)** a description or **4)** input/output pairs.
* **F.IF7e** I can graph exponential functions and show the following key features of the graph (simple cases by hand and complex cases using technology):
* Intercepts
* End behavior
 | **Resources**Book Sections7-5 Exponential Functions7-6 Growth and DecayTasksWorksheetsAdditional Resources |
| **Unit 12 – Linear vs. Exponential and Sequences**  |
| **Concepts*** Find the similarities between common difference and a common ratio
* Connect the difference between recursive and explicit formulas
* Graph both linear and exponential equations on the same coordinate planes on a calculator and by hand
* Explain and justify why a exponential function increasing will eventual exceed a linear increasing function
* Recognize the relationship between linear functions and arithmetic sequences
* Recognize the relationship between exponential functions and geometric sequences
* Construct linear and exponential functions from arithmetic and geometric sequences
* Recognize a find values of recursive sequences and be able to write explicit and recursive rules.
* Model situations using arithmetic and geometric sequences
 | **Core*** **F.LE.3** I can explain and show why a quantity increasing exponentially will eventually exceed a quantity increasing linearly.
* **F.BF.1.a** I can write an explicit expression (function rule) or recursive process that describes a linear or exponential relationship between two quantities.
* **A.CED.2.b** I can graph a linear and exponential equation on the same coordinate axes with labels and scales
* **F.IF.4.b** I can sketch graphs of linear and exponential functions given the key features listed above.
* **F.LE.5** I can interpret the parameters of linear and exponential functions within a contextual situation.
* **A.CED.1** I can create linear and exponential equations and linear inequalities and use them to solve contextual situations.

**Sequences*** **F.IF.3.c** I can recognize the relationship between arithmetic sequences and linear functions.
* **F.BF.2.a** I understand that a linear relationship can be represented as an arithmetic sequence.
* **F.LE.2.a** I can construct a linear function given either: **1)** an arithmetic sequence, **2)** a graph, **3)** a description or **4)** input/output pairs.
* **F.BF.2.b** I understand that an exponential relationship can be represented as a geometric sequence.
* **F.IF.3.d** I can recognize the relationship between geometric sequences and exponential functions.
* **F.LE.2.b** I can construct an exponential function given either: **1)** a geometric sequence, **2)** a graph, **3)** a description or **4)** input/output pairs.
* **F.IF.3.b** I can recognize and find values of recursive sequences.
* **For example**: The Fibonacci sequence is defined recursively by *f(0) = f(1) =1*, *f(n+1)=f(n) +f(n-1)* for *n1*.
* **F.BF.2.d** I can write an explicit rule given a recursive definition and vice versa.
 | **Resources**Book Sections3-5 Arithmetic Sequences as Linear Functions7-7 Geometric Sequences as Exponential Functions7-8 RecursiveTasksWorksheetsAdditional Resources |
| **Unit 13 – Statistics**  |
| **Concepts*** Mean, median, mode, visual representations, spread (outliers), 5 # summary, frequency table
* Graphical displays of discrete data
* Create a best-fit line for data
* Interpret data sets from plots, histograms and box plots
* Create and interpret two-way tables
* Calculate residuals and correlation coefficients
* Make a residual plot without technology
* Distinguish between correlation and causation
* Determine if a plot is linear, exponential or neither
 | **Core*** **S.ID.6.c**  I can use technology to create a linear regression for the data set.
* **S.ID.1** I can create or interpret dot plots, histograms and box plots to represent data sets.
* **S.ID.2.a** I can compare distribution graphs using comparisons of center (median, mean) and spread (interquartile range, standard deviation).
* **S.ID.2.b** I can describe corresponding shapes of graphs given information about center and spread for data sets.
* **S.ID.3** I can describe the changes in shape, center and spread that are caused by outliers.
* **S.ID.5.a** I can create a two-way frequency table from categorical data.
* **S.ID.5.b** Given a 2-way table, I can count the following frequencies
	+ Joint frequency
	+ Marginal frequency
	+ Conditional relative frequency
* **For example:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Spanish Class | French Class | German Class | Total |
| Boy | 18 | 10 | 15 | 43 |
| Girl | 20 | 7 | 3 | 30 |
| Total | 38 | 17 | 18 | 73 |

* **Joint frequency:** What is the number of girls in German class?
* **Marginal frequency**: What is the number of students in French class?
* **Conditional relative frequency:** This really only applies to probability.
* **S.ID.6.a** I can fit a function to the data and use the function fitted to solve problems in the context of the data.
* **S.ID.6** I can make a scatter plot with and without technology and determine if the relationship is linear, exponential or neither.
* **S.ID.6.b.1** I can calculate the residuals. (Residuals are the vertical distances between each data point and a point on the regression function)
* **S.ID.6.b.2** I can make a residual plot with and without technology.
* **S.ID.6b.3** I can analyze a residual plot to assess the fit of the regression. (Good or bad fit)
* **S.ID.8** I can compute (using technology) and interpret the correlation coefficient.
* **S.ID.9** I can distinguish between correlation and causation.
 | **Resources**Book Sections0-11 Simple Probability and Odds0-12 Measures of Center, Variation, and Position0-13 Representing Data 9-1 Statistics and Parameters9-2 Distribution of Data9-3 Comparing Sets of DataTasksWorksheetsAdditional Resources |