**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 Sections  0-2 Real Numbers  0-3 Operations with integers  1-2 Order of Operations  1-4 Distributive Property  1-3 Properties of Numbers  7-1 Multiplication Properties of Exponents  7-2 Division Properties of Exponents  Tasks  Worksheets  Additional 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 Sections  0-4/0-5 Fractions  10-1 Points, Lines and Planes  10-2 Linear Measure  10-4 Angle Measure  Tasks  Worksheets  Additional 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 Sections  1-1 Variables and Expressions  1-6 Relations  Tasks  Worksheets  Additional 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 Sections  1-7 Functions  1-8 Interpreting Graphs of Functions  2-1 Writing Equations  1-5 Equations  Tasks  Worksheets  Additional 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 Sections  2-2 Solving One Step  2-3 Solving Multi-Step  2-4 Solving Equations with variable on each side  2-8 Literal Equations  Tasks  Worksheets  Additional 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 Sections  10-3 Distance and Midpoints  10-7 Proving Segment Relationships  10-8 Proving Angle Relationships  0-7 Perimeter  0-8 Area  12-1 Classifying Triangles  12-6 Isosceles and Equilateral Triangles  12-2 Angles of Triangles  12-3 Congruent Triangles  12-4/12-5 Proving Congruent Triangles  Tasks  Worksheets  Additional 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 Sections  11-1 Parallel Lines  11-2 Angles and Parallel Lines  11-3 Slope of Lines  11-5 Proving Lines Parallel  11-6 Perpendiculars and Distance  12-7 Congruence Transformations  12-8 Triangles and Coordinate Proof  12-9 Area of Parallelograms and Triangles  13-1 Parallelograms  13-2 Test for Parallelograms  13-3 Rhombi and Squares  14-4 Reflections  14-5 Translations  14-6 Rotations  14-9 Dilations  Tasks  Worksheets  Additional 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 Sections  4-2 Writing Equations in Slope-intercept Form  4-3 Writing Equations in Point –Slope  4-4 Parallel and Perpendicular Lines  3-3 Rate of Change and Slope  Tasks  Worksheets  Additional 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 Sections  3-1 Graphing Linear Equations  3-2 Solving by Graphing  4-1 Graphing in Slope-Intercept Form  Tasks  Worksheets  Additional 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 Sections  6-1 Graphing Systems of Equations  6-2 Substitution  6-3 Elimination Using Addition and Subtraction  6-4 Elimination Using Multiplication  5-1 Solving Inequalities by Addition and Subtraction  5-2 Solving Inequalities by Multiplication and Division  5-3 Solving Multi-step Inequalities  6-6 Systems of Inequalties  Tasks  Worksheets  Additional 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 Sections  7-5 Exponential Functions  7-6 Growth and Decay  Tasks  Worksheets  Additional 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 Sections  3-5 Arithmetic Sequences as Linear Functions  7-7 Geometric Sequences as Exponential Functions  7-8 Recursive  Tasks  Worksheets  Additional 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 Sections  0-11 Simple Probability and Odds  0-12 Measures of Center, Variation, and Position  0-13 Representing Data  9-1 Statistics and Parameters  9-2 Distribution of Data  9-3 Comparing Sets of Data  Tasks  Worksheets  Additional Resources |