Foundations of Algebra and Geometry Modules

Unit 1 – Algebraic Modeling: Variables and Expressions

Unit 2 - Algebraic Modeling: Equations and Inequalities

Unit 3 - Algebraic Modeling: Linear Functions

Unit 4 - Algebraic Modeling: Nonlinear Functions

Unit 5 - Algebraic Modeling: Systems of Equations and Inequalities

Unit 6 - Algebraic Modeling: Polynomials and Quadratic Functions

Course Description:

The purpose of Foundations of Algebra & Geometry is to extend the mathematics that students learned in the middle grades. The overall structure continues the model of learning mathematics as a whole so that students experience mathematics as a coherent, useful, and logical subject that emphasizes using mathematics to solve problem situations. Students will blend their study of number and quantity measurements, equations and inequalities, linear and exponential functions, geometric congruence and reasoning, and statistical data. This course is a pre-algebra course.

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 1 – ALGEBRAIC MODELING: VARIABLES AND EXPRESSIONS

Desired Results

Priority Standards

A.SSE.1. Interpret expressions that represent a quantity in terms of its context.

Supporting Standards

G.CO.1. Demonstrates understanding of key geometrical definitions, including angle and line segment. Understand undefined notions of point, line, plane, and distance along a line.

G.GMD.4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

N.Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas.

N.Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

G.MG.1. Use geometric shapes, their measures, and their properties to describe objects.

S.ID.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean, mode) and spread (range).

S.ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Transfer

Students will be able to independently use their learning to…

Interpret real-world problems using the eight mathematical practices, algebraic expressions, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Algebraic expressions are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Statistics are an essential tool when interpreting and comparing data sets.
- Arithmetic operations with whole numbers and integers support the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using algebraic expressions? What is the best way to interpret expressions in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I use statistics to interpret and compare data sets?
- How can I use arithmetic operations with whole numbers and integers to support my study of algebra and geometry?

Acquisition

Students will know…

- To use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.
- Ways algebraic expressions to interpret real-world problems.
- Interpret real-world problems using geometric modeling and formulas.
- Use statistical reasoning to interpret data.
- Operate with whole numbers and integers.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can translate english phrases to algebraic expressions.
- I can use variables and algebraic symbols.
- I can identify and combine like terms.
- I can simplify expressions with absolute value.

		Geometry: • I can define key geometrical terms. • I can find the area of squares, rectangles, parallelograms, and triangles. • I can choose and interpret appropriate units consistently in formulas. • I can measure with accuracy and attend to precision. • I can visualize two-dimensional cross sections of three-dimensional objects. • I can generate a three-dimensional object through two-dimensional rotations. • I can model real world objects using geometric shapes. **Statistics & Probability:** • I can summarize, represent, and interpret data using statistics appropriate to the data distribution (e.g., mean, median, mode, range). • I can interpret differences in shape, center, and spread between two data sets. • I can account for possible effects of extreme data points (i.e., outliers). **Number & Quantity:** • I can use place value with whole numbers. • I can identify multiples and apply divisibility tests. • I can find prime factorizations and least common multiples. • I can simplify expressions using the order of operations. • I can use negatives and opposites of integers. • I can add, subtract, multiply, and divide integers.

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 1 – ALGEBRAIC MODELING: VARIABLES AND EXPRESSIONS

Evidence	
Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 2 – ALGEBRAIC MODELING: EQUATIONS AND INEQUALITIES

Desired Results

Priority Standards

A.REI.1. Apply properties of mathematics to justify steps in solving equations in one variable.

A.REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A.CED.1. Create linear equations and inequalities in one variable and use them to solve problems.

Supporting Standards

G.CO.1. Demonstrates understanding of key geometrical definitions including polygons and their attributes.

G.CO.10. Using methods of proof including direct, indirect, and counter examples to prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°. (Emphasis is on use of inductive reasoning to formula correct conjectures.)

N.Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

N.Q.2. Define appropriate quantities for the purpose of descriptive modeling.

S.ID.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Transfer

Students will be able to independently use their learning to…

Interpret real-world problems using the eight mathematical practices, algebraic equations and inequalities, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Algebraic equations are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Graphs and fitted lines are essential tools used to summarize, represent, and interpret data on quantitative variables.
- Arithmetic operations with fractions and decimals support the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using algebraic equations? What is the best way to interpret equations in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I summarize, represent, and interpret data on a scatter plot using a graph and fitted line?
- How can I use arithmetic operations with fractions and decimals to support my study of algebra and geometry?

Acquisition

Students will know…

- Use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.
- Algebraic equations are used to interpret real-world problems.
- Geometric modeling and formulas help us to interpret real-world problems.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can verify a solution of an equation.
- I can solve equations using the subtraction, addition, division, and multiplication properties of equality.

	• Graphs and fitted lines help us to summarize, represent and interpret data on a scatter plot.	• I can use a general strategy to solve equations with variables and constants on both sides. • I can operate with fractions and decimals. • I can solve equations with fraction and decimal coefficients. • I can translate a written description to an equation and solving it. • I can use equations to solve real-world problems. • I can use the distance, rate, and time formula. • I can solve simple formulas for a specific variable. • I can graph inequalities on the number line. • I can solve inequalities using the subtraction, addition, division, and multiplication properties of inequality. • I can use a general strategy to solve inequalities with variables and constants on both sides. • I can translate a written description to an inequality and solve it. • I can plot points in a rectangular coordinate system. • I can identify points on a graph. **Geometry:** • I can define polygons and describe their attributes. • I can use inductive reasoning to derive the formula for the number of diagonals in a polygon. • I can use inductive reasoning to derive the formula for the interior angle sums of polygons. **Statistics & Probability:** • I can summarize, represent, and interpret data on a scatter plot using a graph and fitted line. **Number & Quantity:** • I can find equivalent fractions and decimals. • I can simplify equivalent fractions.

		• I can add, subtract, multiply, and divide decimals and fractions with like and different denominators. • I can simplify expressions written with a fraction bar. • I can use the order of operations to simplify expressions containing fractions and decimals. • I can evaluate variable expressions with fractions and decimals. • I can translate phrases to expressions with fractions and decimals.

Evidence	
Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 3 – ALGEBRAIC MODELING: LINEAR FUNCTIONS

Desired Results

Priority Standards

F.IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).

F.IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercept and slope

F.IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

A.REI.10. 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).

A.CED.2. Create equations in two variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

F.BF.1. Write a function that describes a relationship between two quantities.

Transfer

Students will be able to independently use their learning to…

Interpret real-world problems using the eight mathematical practices, linear functions, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Linear functions are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Linear models are essential tools used to summarize, represent, and interpret data on quantitative variables.
- Using graphing and geometry software supports the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using linear functions? What is the best way to interpret linear functions in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I compute and interpret a line of best fit using technology to solve real-world problems?
- How can I use inductive reasoning to support my study of algebra and geometry?

Acquisition

Students will know…

- The eight Standards of Mathematical Practice help us solve problems in a variety of contexts.
- Linear functions help us to interpret real-world problems.
- Geometric modeling and relationships help us analyze and interpret real-world problems.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can plot points in a rectangular coordinate system.
- I can identify points on a graph.
- I can verify solutions to an equation in two variables.

a. Determine an explicit expression, a recursive process, or steps for calculation from a context. **Supporting Standards** **F.IF.7.** Graph functions expressed symbolically and show key features of the graph, by using technology. (Graph linear functions and interpret slope and intercepts.) **G.CO.4.** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. **G.CO.2.** Represent transformations in the plane using pencil/paper and geometry software. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). **G.CO.5.** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. **G.CO.10.** Using methods of proof including direct, indirect, and counter examples to prove theorems about triangles. (Emphasis is on use of inductive reasoning to formula correct conjectures.) **S.ID.7.** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **S.ID.8.** Compute (using technology) and interpret the correlation coefficient of a linear fit.	• Technology can help us compute a line of best fit to summarize, represent and interpret real-world data.	• I can complete a table of solutions to a linear equation. • I can find solutions to a linear equation. • I can recognize the relation between the solutions of an equation its graph. • I can graph a linear equation by plotting points. • I can graph vertical and horizontal lines. • I can identify the x and y intercepts on a graph. • I can find the x and y intercepts from an equation of a line. • I can graph a line using the intercepts. • I can use concrete materials to model slope (e.g., slides, geoboards). • I can use $m = \frac{rise}{run}$to find the slope of a line from its graph. • I can find the slope of horizontal and vertical lines. • I can use the slope formula to find the slope of a line between two points. • I can graph a line given a point and the slope. • I can solve slope applications. • I can recognize the relation between the graph and the slope-intercept form of an equation of a line. • I can identify the slope and y-intercept from an equation of a line. • I can graph a line using its slope and intercept. • I can choose the most convenient method to graph a line. • I can graph and interpreting applications of slope-intercept. • I can use slopes to identify parallel lines. • I can find the equation of the line given the slope and y-intercept.

		• I can verify solutions to an inequality in two variables. • I can recognize the relation between the solutions of an inequality and its graph. • I can graph linear inequalities. **Geometry:** • I can transform geometric figures on the coordinate plane (e.g., rotating, reflecting, translating, dilating). • I can use inductive reasoning to determine relationships about triangles (e.g., base angles of isosceles triangles are congruent; midsegment of a triangle is parallel to and half the length of third side; medians, altitudes and perpendicular bisectors of triangles intersect at points of concurrency). **Statistics & Probability:** • I can interpret the slope and intercepts of a linear model in the context of real-world data. • I can use technology to compute a line of best fit.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 4 – ALGEBRAIC MODELING: NONLINEAR FUNCTIONS

Desired Results

Priority Standards

F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology.

F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; and symmetries.

F.IF.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically, in tables, or by verbal descriptions.

F.LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

a. Show that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

F.LE.2. Construct linear and exponential functions, including arithmetic and geometric

Transfer

Students will be able to independently use their learning to…
Interpret real-world problems using the eight mathematical practices, nonlinear functions, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Nonlinear functions are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Linear and nonlinear models are essential tools used to summarize, represent, and interpret data.
- Using graphing and geometry software supports the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using nonlinear functions? What is the best way to interpret nonlinear functions in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I use technology to compare and interpret linear and nonlinear models to solve real-world problems?
- How can I use inductive reasoning to support my study of algebra and geometry?

Acquisition

Students will know…

- The eight Standards of Mathematical Practice to solve problems in a variety of contexts.
- How to use nonlinear functions to interpret real-world problems.
- Compare key features of functions represented in different ways.
- How to use technology to compare linear and nonlinear models to solve problems.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can identify points on a graph.
- I can verify solutions to an equation in two variables.
- I can complete a table of solutions to a nonlinear equation.

sequences, given a graph, a description of a relationship, or input-output table of values. **Supporting Standards** **A.CED.3**. Interpret solutions as viable or nonviable options in a modeling context. **A.REI.10.** 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). **F.IF.5.** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **G.CO.11.** Using methods of proof including direct, indirect, and counter examples to prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. **N.Q.1.** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **N.Q.3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. Use permutations and combinations to compute probabilities of compound events and solve problems (S-CP.9).	• How to use geometric modeling and relationships to interpret real-world problems.	• I can find solutions to a nonlinear equation. • I can recognize the relation between the solutions of an equation its graph. • I can graph a nonlinear equation by plotting points. • I can recognize key features of a nonlinear function (e.g., intercepts, maximums, minimums, symmetries, intervals of increase/decrease). • I can determine key features of a nonlinear function from its graph. • I can interpret key features of nonlinear functions to solve problems. • I can compare key features of linear, quadratic, and exponential models to solve problems. **Geometry:** • I can use inductive reasoning to determine relationships about quadrilaterals (e.g, opposite sides and angles of parallelograms are congruent, diagonals of parallelogram bisect each other, rectangles have congruent diagonals, midsegment of a trapezoid is parallel to the bases and the mean of the lengths of the two bases). • I can discover the area formula for trapezoids. • I can find the area of trapezoids. • I can choose and interpreting appropriate units consistently in formulas. • I can measure with accuracy and attending to precision. **Statistics & Probability:** • I can find permutations and combinations. • I can explain the difference between experimental and theoretical probability.

		• I can explain different methods to find the sample space of an experiment (e.g., organized lists, tree diagrams, and tables).

Evidence	
Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 5 – ALGEBRAIC MODELING: SYSTEMS OF EQUATIONS AND INEQUALITIES

Desired Results

Priority Standards

A.REI.6. Solve systems of linear equations exactly and approximately, e.g., with graphs or algebraically, focusing on pairs of linear equations in two variables.

A.REI.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically (Emphasis on graphically).

A.REI.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

A.REI.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Supporting Standards

G.SRT.2. Given two figures, use the definition of similarity in terms of transformations to explain whether or not they are similar.

G.SRT.3. Use the properties of similarity transformations to establish the AA criterion for

Transfer

Students will be able to independently use their learning to…

Interpret real-world problems using the eight mathematical practices, systems of equations and inequalities, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Systems of equations and inequalities are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Systems of equations and inequalities are essential tools used to summarize, represent, and interpret data.
- Using graphing and geometry software supports the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using systems of equations and inequalities? What is the best way to interpret systems of equations and inequalities in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I use technology to interpret systems of equations and inequalities to solve real-world problems?
- How can I use inductive reasoning to support my study of algebra and geometry?

Acquisition

Students will know…

- How to use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.
- How to solve systems of equations and inequalities in different ways (e.g., graphing, tables of values, substitution).
- How to use systems of equations and inequalities to interpret real-world problems.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can determine whether an ordered pair is a solution of a system of equations.
- I can solve a system of linear equations by tables of values.

two triangles to be similar. **G.CO.6.** Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. **G.CO.7.** Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. **G.CO.8.** Explain how the criteria for triangle congruence (ASA, SAS, SSS, AAS, and HL) follow from the definition of congruence in terms of rigid motions. Use permutations and combinations to compute probabilities of compound events and solve problems (S.CP.9).	• How to use technology to interpret systems of equations and inequalities to solve real-world problems. • How to use geometric modeling and relationships to interpret real-world problems.	• I can solve a system of linear equations by graphing. • I can determine the number of solutions of a linear system. • I can translate a real-world problem to a system of equations. • I can solve applications of systems of equations by graphing. • I can solve a system of equations by substitution. • I can solve applications of systems of equations by substitution. • I can determine if an ordered pair is a solution to a system of linear inequalities. • I can solve a system of linear inequalities by graphing. • I can solve applications of systems of inequalities. **Geometry:** • I can use the definition of similarity and transformations to explain whether or not two figures are similar. • I can use inductive reasoning to establish AA criterion for triangle similarity. • I can apply similarity (and proportions) to solve real-world problems. • I can use the definition of congruence and rigid motions to determine whether two figures are congruent. • I can use inductive reasoning to establish triangle congruence criteria for ASA, SAS, SSS, AAS, and HL. • I can apply congruence criteria to solve real-world problems. **Statistics & Probability:**

		• I can find probabilities of disjoint and overlapping events. • I can find probabilities of dependent and independent events. • I can find the probability of compound events.

Evidence	
Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 6 – ALGEBRAIC MODELING: POLYNOMIALS AND QUADRATIC FUNCTIONS

Desired Results

Priority Standards

A.SSE.1.a. Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.
A.SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A.APR.1. Add, subtract, and multiply polynomials.
A.APR.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
A.REI.4.b. Solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for $x^2 = 25$) and taking square roots.
G.SRT.8. Use the Pythagorean Theorem to solve right triangles in applied problems.

Supporting Standards

F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; and symmetries.
F.IF.5. Relate the domain of a function to its

Transfer

Students will be able to independently use their learning to…
Interpret real-world problems using the eight mathematical practices, polynomial functions, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Polynomial functions are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Polynomials are essential tools used to summarize, represent and interpret data.
- Using graphing and geometry software support the study of algebra and geometry.
- Arithmetic operations with exponents support the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using polynomials? What is the best way to interpret polynomials in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I use technology to interpret polynomials to solve real-world problems?
- How can I use inductive reasoning to support my study of algebra and geometry?

Acquisition

Students will know…

- How to use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.
- How to interpret, factor, and perform arithmetic operations on polynomials.
- How to use polynomials to interpret real-world problems.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can identify polynomials, monomials, binomials, and trinomials.
- I can determine the degree of polynomials.
- I can add and subtract polynomials.

graph and, where applicable, to the quantitative relationship it describes. **N.RN.3.** Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. **N.Q.1.** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **N.Q.3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **G.C.5.** Use and apply the concepts of arc length and areas of sectors of circles. Determine or derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector **G.GMD.1.** Explain how to find the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use permutations and combinations to compute probabilities of compound events and solve problems (S-CP.9)	• That technology can be used to interpret polynomials to solve real-world problems. • Geometric modeling and relationships can be used to interpret real-world problems.	• I can evaluate a polynomial for a given value. • I can multiply a polynomial by a monomial. • I can multiply a binomial by a binomial. • I can find the greatest common factor of two or more expressions. • I can factor the greatest common factor from a polynomial. • I can factor quadratics with a leading coefficient of 1. • I can solve quadratic equations using inspection. • I can solve quadratic equations using the Square Root Property. • I can use factoring to solve quadratic equations with a leading coefficient of 1 and set equal to zero. • I can solve applications modeled by quadratic equations. **Geometry:** • I can approximate pi by measuring. • I can discover the circumference and area formulas for circles. • I can find the circumference of circles. • I can determine the arc length of circles • I can solve the area of circles. • I can solve the area of sectors of circles. • I can discover the volume formulas for cubes, rectangular prisms, cylinders, rectangular pyramids and cones. • I can solve the volumes of cubes, rectangular prisms, cylinders, rectangular pyramids, and cones. • I can use the Pythagorean Theorem to solve right triangles in applied problems (Note: If time

		permits, including an understanding of sine, cosine and tangent ratios). • I can choose and interpret appropriate units consistently in formulas. • I can measure with accuracy and attend to precision. **Statistics & Probability:** • I can explain the difference between experimental and theoretical probability as it applies in game situations. • I can apply theoretical probability to win in game situations. **Number & Quantity:** • I can use the definition of a negative exponent. • I can simplify expressions with integer exponents. • I can simplify expressions by applying several properties (e.g., Product & Quotient Properties for Exponents, Power Property for Exponents, Product to a Power Property). • I can convert to and from decimal notation and scientific notation.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined