Blackhawk School District

CURRICULUM

Course Title:	**PreCalculus**
Grade Level(s):	**11-12**
Length of Course:	**Daily for Semester**
Faculty Author(s):	**Heather McCowin and Melody Woodward**
Date:	**November 2011**

COURSE DESCRIPTION: PreCalculus begins with a focus on the concepts of analytical geometry which concentrate on the relationship between Algebra and Geometry as related to functions. It then covers an in-depth study of the trigonometric functions.

The following outline provides a general overview of the course content, not a chronological timetable. The weeks denoted for each area provide an idea for the overall time spent working with a given topic throughout the school year.

Course Outline	Objectives (PA Standards)	Proposed Time	Resourncs	LESSON REFLECTION (for future revisions)
<u>Analysis of Graphs and Functions</u> **Graphs of Elementary Functions and Relations** **Vertical and Horizontal Shifts of Graphs of Functions** **Stretching, Shrinking, and Reflecting Graphs of Functions** **The Absolute Value Function : Graphs, Equations, and Inequalities** **Piece-wise Defined Functions** **Further Functions in the Study of Functions**	2.9.11.G Solve problems using analytic geometry. **M11.D.1.1 Identify the domain (may be presented as ordered pairs or a table).** **M11.D.1.1 Identify the range (may be presented as ordered pairs or a table).** M11.D.1.1 Identify functions on a coordinate plane. **M11.D.1.1 Graph functions on a coordinate plane.** **M11.D.4.1 Match the graph of a given function to its equation.** **M11.A.2.2 Simplify expressions involving roots (may contain all types of real numbers).** **M11.A.2.2 Evaluate expressions involving roots (may contain all types of real numbers).** **M11.A.2.2 Simplify expressions involving absolute value (may contain all types of real numbers).** **M11.A.2.2 Evaluate expressions involving absolute value (may contain all types of real numbers).** 2.8.11.J Demonstrate the connection between algebraic equations and inequalities and the geometry of relations in the coordinate plane. **M11.D.4.1 Match the graph of a given function to its equation.**	**15 Days**	**Harper Collins A Graphical Approach to Pre-Calculus** **TGM**	

<u>Polynomial Functions</u> **Complex Numbers on the complex plane** **Quadratic Functions and Their Graphs** **Solution of Quadratic Equations and Inequalities** **Applications of Quadratic Functions and Models** **Higher Degree Polynomial Functions and Their Graphs** **Topics in the Theory of Polynomial Functions** **Solutions of Polynomial Equations and Inequalities and their Applications**	**M11.D.1.1 Determine if a relation is a function given a graph.** **M11.D.1.1 Identify the domain (may be presented as ordered pairs or a table).** **M11.D.1.1 Identify the range (may be presented as ordered pairs or a table).** **M11.D.1.1 Identify functions on a coordinate plane.** M11.D.1.1 Graph functions on a coordinate plane. **M11.D.2.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is not equal to 0).** **M11.D.4.1 Match the graph of a given function to its equation.** 2.8.11.E Use equations to represent curves (parabolas and higher degree polynomials). 2.8.11.N Solve linear, quadratic, and exponential equations both symbolically and graphically. 2.8.11.O Determine the domain and range of a relation, given a graph or set of ordered pairs. 2.8.11.Q Represent functional relationships in tables, charts and graphs. 2.8.11 S Analyze properties and relationships of functions. 2.8.11.T Analyze and categorize functions by their characteristics. 2.9.11.G Solve problems using analytic geometry. 2.9.11.J Analyze figures in terms of the kinds of symmetries they have 2.11.11.A Determine maximum and minimum values of a function over a	**18 Days**	**Harper Collins A Graphical Approach to Pre-Calculus** **TGM**	

	specified interval. 2.11.11.B Interpret maximum and minimum values in problem situations. 2.2.11.F Demonstrate skills for using computer spreadsheets and scientific and graphing calculators. N.CN.4,5,6			

<u>Rational and Root Functions</u> **Graphs of Rational Functions** **Rational Equations, Inequalities, and Applications** **Graphs of Root Functions** **Root Equations, Inequalities, and Applications** **Inverse Functions**	**M11.D.1.1 Determine if a relation is a function given a graph.** **M11.D.1.1 Identify the domain (may be presented as ordered pairs or a table).** **M11.D.1.1 Identify the range (may be presented as ordered pairs or a table).** **M11.D.1.1 Identify functions on a coordinate plane.** M11.D.1.1 Graph functions on a coordinate plane. 2.8.11.O Determine the domain and range of a relation, given a graph or set of ordered pairs. 2.8.11.Q Represent functional relationships in tables, charts and graphs. 2.8.11 S Analyze properties and relationships of functions. 2.8.11.T Analyze and categorize functions by their characteristics. 2.9.11.G Solve problems using analytic geometry. 2.9.11.J Analyze figures in terms of the kinds of symmetries they have 2.11.11.A Determine maximum and minimum values of a function over a specified interval. 2.11.11.B Interpret maximum and minimum values in problem situations. 2.2.11.F Demonstrate skills for using computer spreadsheets and scientific and graphing calculators. **M11.D.1.1 Identify the inverse of a relation (may be presented as ordered pairs or a table).**	**17 Days**	**Harper Collins A Graphical Approach to Pre-Calculus** **TGM**	

Exponential and Logarithmic Functions **Introduction to Exponential Functions** **Logarithms and their Properties** **Introduction to Logarithmic Functions** **Exponential and Logarithmic Equations and Inequalities** **Applications of Exponential and Logarithmic functions**	**M11.D.1.1 Determine if a relation is a function given a graph.** **M11.D.1.1 Identify the domain (may be presented as ordered pairs or a table).** **M11.D.1.1 Identify the range (may be presented as ordered pairs or a table).** **M11.D.1.1 Identify functions on a coordinate plane.** M11.D.1.1 Graph functions on a coordinate plane. 2.8.11.O Determine the domain and range of a relation, given a graph or set of ordered pairs. 2.8.11.Q Represent functional relationships in tables, charts and graphs. 2.8.11 S Analyze properties and relationships of functions. 2.8.11.T Analyze and categorize functions by their characteristics. 2.9.11.G Solve problems using analytic geometry. 2.9.11.J Analyze figures in terms of the kinds of symmetries they have 2.11.11.A Determine maximum and minimum values of a function over a specified interval. 2.11.11.B Interpret maximum and minimum values in problem situations. 2.2.11.F Demonstrate skills for using computer spreadsheets and scientific and graphing calculators. **M11.D.1.1 Identify the inverse of a relation (may be presented as ordered pairs or a table).**	**16 Days**	**Harper Collins A Graphical Approach to Pre-Calculus** **TGM**	

<u>Conic Sections</u> **Circles and Parabolas** **Ellipses and Hyperbolas** **Systems of linear and non-linear equations**	**G.GPE.3**	**15 Days**	**Harper Collins A Graphical Approach to Pre-Calculus** **TGM**	

Course Outline	Objectives (PA Standard)	Proposed Time	Resources	LESSON REFLECTION (for future revisions)
<u>The Trigonometric Functions</u> **Basic Concepts** **Angles** **Angle Relationships and Similar Triangles** **Definitions of the Trigonometric Functions** **Using the Definitions of the Trigonometric Functions**	**M11.A.1.1 Find the square root of an integer to the nearest tenth using either a calculator or estimation.** **M11.A.1.1 Simplify square roots. (e.g., Ö24 = 2Ö6)** **M11.A.2.1 Solve problems using direct proportions** **M11.A.2.1 Use proportional relationships in problem solving settings.** **M11.A.2.1 Identify proportional relationships in problem solving settings.** **M11.A.2.2 Simplify expressions involving roots (may contain all types of real numbers).** **M11.A.2.2 Evaluate expressions involving roots (may contain all types of real numbers).** **M11.A.3.2 Use estimation to solve problems.** **M11.C.3.1 Calculate the distance between 2 points on a number line. (formula provided on the reference sheet).** **M11.C.3.1 Calculate the distance between 2 points on a coordinate plane (formula provided on the reference sheet).** **M11.C.1.4 Find the measure of a side of a right triangle using the Pythagorean Theorem (Pythagorean Theorem included on the reference sheet).** 2.2.11.A Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations. 2.2.11.F Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.	**13 Days**	**Harper Collins Trigonometry Fifth Edition** **TGM**	

	2.3.11.B Measure and compare angles in degrees and radians. 2.5.11.A Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems. 2.5.11.B Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas, and results. 2.5.11.C Present mathematical procedures and results clearly, systematically, succinctly and correctly. 2.8.11 S Analyze properties and relationships of functions (trigonometric). 2.8.11.T Analyze and categorize functions by their characteristics.			

<u>Acute Angles and Right Angles</u> **Trigonometric Functions of Acute Angles** **Reference Angles: Coterminal Angles** **Finding Trigonometric Function Values Using a Calculator** **Trigonometric Function Values: Exact and Approximate** **Solving Right Triangles** **Further Applications of Right Triangles** **Trigonometric Equations**	**M11.A.1.1 Find the square root of an integer to the nearest tenth using either a calculator or estimation.** **M11.A.1.1 Simplify square roots. (e.g., Ö24 = 2Ö6)** **M11.A.2.2 Simplify expressions involving roots (may contain all types of real numbers).** **M11.A.2.2 Evaluate expressions involving roots (may contain all types of real numbers).** **M11.A.3.2 Use estimation to solve problems.** 2.2.11.A Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations. 2.2.11.F Demonstrate skills for using computer spreadsheets and scientific and graphing calculators. 2.3.11.B Measure and compare angles in degrees and radians. 2.5.11.A Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems. 2.5.11.B Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas, and results. 2.5.11.C Present mathematical procedures and results clearly, systematically, succinctly and correctly. 2.8.11 S Analyze properties and relationships of functions (trigonometric). 2.8.11.T Analyze and categorize functions by their characteristics.	**20 Days**	**Harper Collins** **Trigonometry Fifth Edition** **TGM**	

Applications of Trigonometry **Oblique Triangles and the Law of Sines** **The Ambiguous Case for the Law of Sines** **The Law of Cosines** **Vector Quantities**	2.10.11.B Identify, create and solve practical problems involving right triangles using the trigonometric functions and Pythagorean Theorem. **M11.A.2.2 Simplify expressions involving roots (may contain all types of real numbers).** **M11.A.2.2 Evaluate expressions involving roots (may contain all types of real numbers).** **M11.A.3.2 Use estimation to solve problems.** 2.2.11.A Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations. 2.2.11.F Demonstrate skills for using computer spreadsheets and scientific and graphing calculators. 2.5.11.A Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems. 2.5.11.B Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas, and results. 2.5.11.C Present mathematical procedures and results clearly, systematically, succinctly and correctly. **N.V.M.1,2,3** **N.V.M.4A,4B,4C,5A,5B**	**13 Days**	**Harper Collins Trigonometry Fifth Edition** **TGM**	

Radian Measure and The Circular Functions **Radian Measure** **Applications of Radian Measure** **Circular Functions of Real Numbers** **Linear and Angular Velocity**	**M11.A.3.2 Use estimation to solve problems.** 2.2.11.A Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations. 2.2.11.F Demonstrate skills for using computer spreadsheets and scientific and graphing calculators. 2.3.11.B Measure and compare angles in degrees and radians. 2.5.11.A Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems. 2.5.11.B Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas, and results. 2.5.11.C Present mathematical procedures and results clearly, systematically, succinctly and correctly.	**9 Days**	**Harper Collins Trigonometry Fifth Edition** **TGM**	

<u>Graphs of the Circular Functions</u> **Graphs of the Sine and Cosine** **Graphs of the Other Circular Functions**	2.3.11.B Measure and compare angles in degrees and radians. 2.2.11.F Demonstrate skills for using computer spreadsheets and scientific and graphing calculators. **M11.D.1.1 Identify the domain (may be presented as ordered pairs or a table).** **M11.D.1.1 Identify the range (may be presented as ordered pairs or a table).** 2.8.11.E Use equations to represent curves. 2.8.11.O Determine the domain and range of a relation, given a graph or set of ordered pairs. 2.10.11.A Use graphing calculators to display periodic and circular functions; describe properties of the graphs. 2.11.11.A Determine maximum and minimum values of a function over a specified interval. 2.11.11.B Interpret maximum and minimum values in problem situations.	**11 Days**	**Harper Collins Trigonometry Fifth Edition** **TGM**	

<u>Trigonometric Identities</u> **Fundamental Identities** **Verifying Trigonometric Identities** **Sum and Difference Identities for Cosine** **Sum and Difference Identities for Sine and Tangent** **Double Angle Identities** **Half Angle Identities**	2.5.11.A Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems. 2.5.11.B Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas, and results. **M11.D.2.2 Multiply polynomial expressions (express answers in simplest form – nothing larger than a binomial multiplied by a trinomial).** **M11.D.2.2 Factor algebraic expressions, including difference of squares and trinomials (trinomials limited to the form ax2+bx+c where a is not equal to 0).** **M11.A.3.1 Simplify expressions using the order of operations to solve problems (any rational numbers may be used).** **M11.A.3.1 Evaluate expressions using the order of operations to solve problems (any rational numbers may be used).**	**15 Days**	**Harper Collins Trigonometry Fifth Edition** **TGM**	