



OFFICE OF CURRICULUM, INSTRUCTION & PROFESSIONAL DEVELOPMENT

HIGH SCHOOL COURSE OUTLINE

(Revised February 2011)

Department	Mathematics	Course Title		Pre Calculus	Course Code		3057		
Grade Level	9 – 12	Short Title		PRE CALCULUS	Grad Requirement			No	
Course Length	2 semesters	Credits per Semester	5	Approved for Honors	Yes	Required	No	Elective	Yes
Prerequisites	C or better in Intermediate Algebra 1-2 or Intermediate Algebra/Trig Accelerated								
Co-requisites	None								
Articulated with LBCC		No		Articulated with CSULB			No		
Meets UC "a-g" Requirement		Yes (c)		Meets NCAA Requirement			Yes		

COURSE DESCRIPTION:

This course combines the content standards of Trigonometry and Mathematical Analysis from the California Mathematics Framework. Emphasis is placed on the many trigonometric, geometric and algebraic techniques needed for the preparation of the study of Calculus. The course takes a functional point of view towards topics and is designed to strengthen and enhance conceptual understanding and mathematical reasoning used when solving problems. The course also emphasizes the use of the graphing calculator as a tool to interpret results as well as a method of obtaining an answer. Students in Precalculus are required to use a graphing calculator and a scientific calculator throughout the course.

COURSE PURPOSE: GOALS

- CONTENT**
 - Students will understand the structure of the systems of real and complex numbers, and the concept of functions and their unifying role in mathematics.
- SKILLS**
 - Students will utilize algebraic and trigonometric concepts and skills, will be able to analyze and graph a variety of functions, and will acquire the necessary skills used in calculus such as evaluating limits and the concept of continuity.
 - In addition, students are expected to apply the following common skills that are relevant across all curriculum areas and career pathways: students will use technology, apply problem solving and critical thinking skills; adapt to varied roles and responsibilities while working together in teams; understand and apply ethical behavior in the classroom and workplace; and understand and apply the characteristics of teamwork, leadership and citizenship in the community and workplace.
- LITERACY**
 - Students communicate precisely about quantities, logical relationships, and unknown values through the use of signs, symbols, models, graphs, and mathematical vocabulary.
 - Regular opportunities are provided for students to communicate through oral and written explanations of math concepts.
- APPLICATIONS**
 - Students learn to apply mathematics to everyday life. They will develop an interest in pursuing advanced studies in mathematics in a wide array of mathematically related career choices.

COURSE PURPOSE: EXPECTED OUTCOMES

Students are expected to perform at a proficient level on a variety of tasks and assessments addressing both the content and skill standards for Precalculus. Levels of proficiency are defined near the end of this course outline under Performance Criteria.

Trigonometry

- 1.0 Students understand the notion of angle and how to measure it, in both degrees and radians. They can convert between degrees and radians.
- 2.0 Students know the definition of sine and cosine as y - and x -coordinates of points on the unit circle and are familiar with the graphs of the sine and cosine functions.
- 3.0 Students know the identity $\cos^2(x) + \sin^2(x) = 1$:
 - 3.1 Students prove that this identity is equivalent to the Pythagorean Theorem (i.e., students can prove this identity by using the Pythagorean Theorem and, conversely, they can prove the Pythagorean Theorem as a consequence of this identity).
 - 3.2 Students prove other trigonometric identities and simplify others by using the identity $\cos^2(x) + \sin^2(x) = 1$. For example, students use this identity to prove that $\sec^2(x) = \tan^2(x) + 1$.
- 4.0 Students graph functions of the form $f(t) = A \sin(Bt + C)$ or $f(t) = A \cos(Bt + C)$ and interpret A , B , and C in terms of amplitude, frequency, period, and phase shift.
- 5.0 Students know the definitions of the tangent and cotangent functions and can graph them.
- 6.0 Students know the definitions of the secant and cosecant functions and can graph them.
- 7.0 Students know that the tangent of the angle that a line makes with the x -axis is equal to the slope of the line.
- 8.0 Students know the definitions of the inverse trigonometric functions and can graph the functions.
- 9.0 Students compute, by hand, the values of the trigonometric functions and the inverse trigonometric functions at various standard points.
- 10.0 Students demonstrate an understanding of the addition formulas for sines and cosines and their proofs and can use those formulas to prove and/or simplify other trigonometric identities.
- 11.0 Students demonstrate an understanding of half-angle and double-angle formulas for sines and cosines and can use those formulas to prove and/or simplify other trigonometric identities.
- 12.0 Students use trigonometry to determine unknown sides or angles in right triangles.
- 13.0 Students know the law of sines and the law of cosines and apply those laws to solve problems.
- 14.0 Students determine the area of a triangle, given one angle and the two adjacent sides.
- 15.0 Students are familiar with polar coordinates. In particular, they can determine polar coordinates of a point given in rectangular coordinates and vice versa.
- 16.0 Students represent equations given in rectangular coordinates in terms of polar coordinates.
- 17.0 Students are familiar with complex numbers. They can represent a complex number in polar form and know how to multiply complex numbers in their polar form.
- 18.0 Students know DeMoivre's Theorem and can give n^{th} roots of a complex number given in polar form.
- 19.0 Students are adept at using trigonometry in a variety of applications and word problems.

Mathematical Analysis

- 1.0 Students are familiar with, and can apply, polar coordinates and vectors in the plane. In particular, they can translate between polar and rectangular coordinates and can interpret polar coordinates and vectors graphically.
- 2.0 Students are adept at the arithmetic of complex numbers. They can use the trigonometric form of complex numbers and understand that a function of a complex variable can be viewed as a function of two real variables. They know the proof of DeMoivre's Theorem.
- 3.0 Students can give proofs of various formulas by using the technique of mathematical induction.
- 4.0 Students know the statement of, and can apply, the fundamental theorem of algebra.
- 5.0 Students are familiar with conic sections, both analytically and geometrically:
 - 5.1 Students can take a quadratic equation in two variables; put it in standard form by completing the square and using rotations and translations, if necessary; determine what type of conic section the equation represents; and determine its geometric components (foci, asymptotes, and so forth).
 - 5.2 Students can take a geometric description of a conic section - for example, the locus of points whose sum of its distances from $(1, 0)$ and $(-1, 0)$ is 6 - and derive a quadratic equation representing it.
- 6.0 Students find the roots and poles of a rational function and can graph the function and locate its asymptotes.
- 7.0 Students demonstrate an understanding of functions and equations defined parametrically and can graph them.
- 8.0 Students are familiar with the notion of the limit of a sequence and the limit of a function as the independent variable approaches a number or infinity. They determine whether certain sequences converge or diverge.

Probability and Statistics

- 1.0 Students know the definition of the notion of independent events and can use the rules for addition, multiplication and complementation to solve for probabilities of particular events in finite sample spaces.
- 2.0 Students know the definition of conditional probability and use it to solve for probabilities in finite sample spaces.
- 7.0 Students compute the variance and the standard deviation of a distribution of data.

COURSE PURPOSE: EXPECTED INTEGRATED OUTCOMES

Students are also expected to proficiently apply common skills that are relevant across curriculum areas and career pathways. The following are those skills most applicable to Precalculus.

CTE Foundation Standards: from the California Career Technical Education Model Curriculum Standards, adopted by the California State Board of Education in May, 2005.

Foundation Standard 2: CommunicationsWritten and Oral English Language Conventions (Grades 9 and 10)

- 1.4 Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
- 1.1 Formulate judgments about the ideas under discussion and support those judgments with convincing evidence.
- 1.7 Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
- 1.12 Evaluate the clarity, quality, effectiveness, and general coherence of a speaker's important points, arguments, evidence, organization of ideas, delivery, diction, and syntax.

Foundation Standard 3: Career Planning and Management

- 3.5 Understand the past, present, and future trends that affect careers, such as technological developments and societal trends, and the resulting need for lifelong learning.
- 3.6 *Know important strategies for self-promotion in the hiring process, such as job applications, resume writing, interviewing skills, and preparation of a portfolio.*

Foundation Standard 4: Technology

- 4.2 Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.

Foundation Standard 5: Problem Solving and Critical Thinking

- 5.1 Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
- 5.3 *Use critical thinking skills to make informed decisions and solve problems.*

Foundation Standard 7: Responsibility and Flexibility

- 7.1 Understand the qualities and behaviors that constitute a positive and professional work demeanor.
- 7.2 *Understand the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.*
- 7.3 Understand the need to adapt to varied roles and responsibilities.
- 7.4 Understand that individual actions can affect the larger community.

Foundation Standard 8: Ethics and Legal Responsibilities

- 8.2 Understand the concept and application of ethical and legal behavior consistent with workplace standards.
- 8.3 *Understand the role of personal integrity and ethical behavior in the workplace.*

Foundation Standard 9: Leadership and Teamwork

- 9.1 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.3 *Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.*
- 9.4 Know multiple approaches to conflict resolution and their appropriateness for a variety of situations in the workplace.
- 9.5 Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others.

The italicized standards are the CTE "Power" Standards addressed across the content areas.

OUTLINE OF CONTENT AND SUGGESTED TIME ALLOTMENT:

The Task Analysis and Key Vocabulary presented here are drawn from the Mathematics Framework for California Public Schools, which defines the intent and scope of the Mathematics Content Standards. For additional information on the context and the benchmark standards to assess, refer to the Blueprints for the Summative High School Mathematics Content Standards Test (CST). Standards marked with an asterisk (*) are key standards that comprise a minimum of 70% of the Summative High School Mathematics CST. Content sequencing, activities, and time allocations are only suggestions and may be adjusted to suit school site curriculum plans, available materials, and student needs.

AI	refers to the Algebra I standards of the Mathematics Standards for CA Public Schools
T	refers to Trigonometry standards in the Mathematics Standards for CA Public Schools
LA	refers to Linear Algebra standards in the Mathematics Standards for CA Public Schools
G	refers to Geometry standards in the Mathematics Standards for CA Public Schools
MA	refers to Mathematical Analysis standards in the Mathematics Standards for CA Public Schools
All	refers to Algebra II standards in the Mathematics Standards for CA Public Schools
PS	refers to Probability & Statistics standards in the Mathematics Standards for CA Public Schools
FS	refers to the Foundation Standards of the CA CTE Pathway Standards

Functions and Their Graphs		18 Days (9 Blocks)	
<i>Sample Essential Question:</i> When specific variables within a function are manipulated, what is the effect on the graph of the function?			
Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill	
...the characteristics of six most commonly used functions in algebra.	Determine the midpoint of a segment using the Midpoint Formula. (G-17) Determine the distance between two points using the Distance Formula. (G-15, 17) Solve linear equations and inequalities by graphing and algebraic methods. (AI-5*, 6*) Solve quadratic equations and inequalities by graphing and algebraic methods, and by using Quadratic Formula. (AI-14*, 19, 20*, 21, 22, All-8*) Solve absolute value equations and inequalities by graphing and algebraic methods. (AI-3, All-1*) Determine slope of a line and write equations in slope-intercept, point-slope, and standard form. (AI-7*) Determine the relationship of slopes for parallel and perpendicular lines. (AI-8) Know definitions of relation, function and 1-to-1 function, and determine domain and range. (AI-16, 17, 18) Determine relative maximum and minimum values of a relation or function. (All-10*) Determine if a function has symmetry, is odd or even. Identify and graph step functions and other piecewise-defined functions. Identify and perform transformations (translations, reflections, scale changes) to graphs of functions. (All-9, G-22) Determine a composition of two functions. (All-24) Determine the inverse of a function or relation if one exists. (All-24) Construct scatter plots of linear relations and interpret correlation. Use scatter plots and a graphing utility to find linear models for data (line of best fit). Use props, visual aids, graphs, and electronic media to enhance the appeal and	Key Assignment: Functions Portfolio: A student portfolio collection of the most common functions, their graphs, characteristics and applications. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i> Suggested Activities: Stack of Cups: Graph relationship of the number of cups to height of the stack and use to estimate. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i> Don't Fence Me In: Application of finding maximum area of a garden. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i> Match the Function Game: Card game to review function names, shapes, domains and ranges. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i>	BASIC TEXTBOOK CORRELATION: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7 B.1, B.2, B.3, B.4 KEY VOCABULARY: Constant on an interval Increasing on an interval Critical numbers Independent variable Decreasing on an interval Interval notation Dependent variable Inverse function Domain Odd function Even function One-to-one Extraneous solution Piecewise defined-function Function notation Range Graph of a function Step function Horizontal Line Test Vertical Line Test SUPPLEMENTAL MATERIALS CORRELATION: LBUSD Math Intranet/ Instructional Tools/ Precalculus Supplemental Resources: <ul style="list-style-type: none"> • Functions Portfolio • Stack of Cups • Don't Fence Me In • Match the Function Game

accuracy of presentations. (FS-2.1.7)

Polynomial and Rational Functions**14 Days (7 Blocks)**

Sample Essential Question:

How are polynomial and rational functions similar and different?

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill	
...the characteristics of polynomial and rational functions.	Write quadratic functions in standard form and use the results to sketch graphs of functions. (AI-21)	Suggested Activity: Rational Functions: An investigation of different rational functions (LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)	BASIC TEXTBOOK CORRELATION: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7 KEY VOCABULARY: Complex conjugates Continuous Descartes' Rule of Signs Imaginary number Intermediate Value Theorem Leading Coefficient Test Linear function Multiplicity Polynomial function Quadratic function Rational function Repeated zeros Slant (oblique) asymptote Synthetic division Upper and lower bounds
	Find minimum and maximum values of quadratic functions in real-life applications. (AI-10*)		
	Use transformations to sketch graphs of polynomial functions. (AI-9)		
	Use the Leading Coefficient Test to determine the end behavior of graphs of polynomial functions.		
	Find and use zeros of polynomial functions as sketching aids.		
	Use the Intermediate Value Theorem to help locate zeros of polynomial functions.		
	Determine the roots of a quadratic or polynomial function using a graph, synthetic division or factoring. (AI-4*, 8*, 10*)		
	Know and apply various theorems to find the solutions of a polynomial; such as the Remainder and Factor Theorems, the Rational Zero Test, Descartes's Rule of Signs, the Upper and Lower Bound Rules, and the Fundamental Theorem Of Algebra. (MA-4)		
	Use the imaginary unit i to write complex numbers.		
	Add, subtract, and multiply complex numbers. (AI -6*)		
	Use complex conjugates to write the quotient of two complex numbers in standard form.		
	Plot complex numbers in the complex plane. (AI-5)		
	Find all zeros of polynomial functions, including complex zeros.		
	Find conjugate pairs of complex zeros.		
	Find domains, horizontal and vertical asymptotes of rational functions, and use rational functions to model and solve real-life problems. (MA-6)		
	Analyze and sketch graphs of rational functions including those with slant asymptotes. (MA-6)		
	Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations. (FS-2.1.7)		
Use critical thinking skills to make informed decisions and solve problems. (FS-5.3)			

Exponential and Logarithmic Functions**12 Days (6 Blocks)**

Sample Essential Question:

How are exponential and logarithmic functions similar and different?

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support																
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill																	
...the characteristics of exponential and logarithmic functions.	Recognize, evaluate, and graph exponential functions with base a . (AII-12*)	<p>Suggested Activities: Just How Old is It? An investigation of exponential decay of C_{14} dating. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p> <p>Exponential Models: An investment problem requiring students to graph exponential curves and compare them. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p>	<p>BASIC TEXTBOOK CORRELATION: 3.1, 3.2, 3.3, 3.4, 3.5</p> <p>KEY VOCABULARY:</p> <table border="0"> <tr> <td>Bell-shaped curve</td> <td>Gaussian model</td> </tr> <tr> <td>Change-of-base formula</td> <td>Logarithmic function</td> </tr> <tr> <td>Common logarithmic function</td> <td>Logarithmic models</td> </tr> <tr> <td>Continuous compounding</td> <td>Logistic curve</td> </tr> <tr> <td>Exponential decay model</td> <td>Natural base</td> </tr> <tr> <td>Exponential function</td> <td>Natural exponential function</td> </tr> <tr> <td>Exponential growth model</td> <td>Natural logarithmic function</td> </tr> <tr> <td></td> <td>Normally distributed</td> </tr> </table> <p>SUPPLEMENTAL MATERIALS CORRELATION: LBUSD Math Intranet/ Instructional Tools/ Precalculus Supplemental Resources:</p> <ul style="list-style-type: none"> • Just How Old Is It? • Exponential Models 	Bell-shaped curve	Gaussian model	Change-of-base formula	Logarithmic function	Common logarithmic function	Logarithmic models	Continuous compounding	Logistic curve	Exponential decay model	Natural base	Exponential function	Natural exponential function	Exponential growth model	Natural logarithmic function		Normally distributed
	Bell-shaped curve			Gaussian model															
	Change-of-base formula			Logarithmic function															
	Common logarithmic function			Logarithmic models															
	Continuous compounding			Logistic curve															
	Exponential decay model			Natural base															
	Exponential function			Natural exponential function															
	Exponential growth model			Natural logarithmic function															
	Normally distributed																		
Recognize, evaluate, and graph exponential functions with base e . (AII-12*)																			
Recognize, evaluate and graph logarithmic functions with base a . (AII-11.1*)																			
Recognize, evaluate and graph natural logarithmic functions. (AII-11.1*)																			
Simplify exponential expressions and solve exponential equations. (AII-11.1*)																			
Convert logarithmic to exponential format and vice versa. (AII-11.1*)																			
Know and use properties of logarithms. (AII-11.2, 13, 14)																			
Solve problems using logarithmic equations and exponential equations, including exponential growth or decay. (AII-12*)																			
Use critical thinking skills to make informed decisions and solve problems. (FS-5.3)																			

Trigonometric Functions**12 Days (6 Blocks)**

Sample Essential Question:

What are the similarities and differences between the two common perspectives of trigonometry: the unit circle and the right triangle?

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support																								
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill																									
...the characteristics of trigonometric functions.	Use and apply degree and radian measure. (T-1)	<p>Key Assignment: Trigonometric and Inverse Trigonometric Functions Portfolio: A student portfolio collection of the trigonometric and inverse trigonometric functions, their graphs, characteristics and applications. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p> <p>Suggested Activities: Biorhythm Chart Investigation of Biorhythm Theory <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p> <p>Fitting a Model to Data Use the regression feature of a graphing utility to find a model for data relating to the carbon dioxide level of the earth's atmosphere. <i>(Chapter 4 Project from text, LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p>	<p>BASIC TEXTBOOK CORRELATION: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8</p> <p>KEY VOCABULARY:</p> <table> <tr> <td>Angle of depression</td> <td>Positive, negative angles</td> </tr> <tr> <td>Angle of elevation</td> <td>Reference angle</td> </tr> <tr> <td>Angular speed</td> <td>Simple harmonic motion</td> </tr> <tr> <td>Bearings</td> <td>Solving right triangles</td> </tr> <tr> <td>Central angle</td> <td>Standard position</td> </tr> <tr> <td>Complementary angles</td> <td>Supplementary angles</td> </tr> <tr> <td>Coterminal angles</td> <td>Terminal side of an angle</td> </tr> <tr> <td>Damping factor</td> <td>Unit circle</td> </tr> <tr> <td>Frequency</td> <td>Vertex of an angle</td> </tr> <tr> <td>Initial side of an angle</td> <td></td> </tr> <tr> <td>Linear speed</td> <td></td> </tr> <tr> <td>Phase shift</td> <td></td> </tr> </table> <p>SUPPLEMENTAL MATERIALS CORRELATION: LBUSD Math Intranet/ Instructional Tools/ Precalculus Supplemental Resources:</p> <ul style="list-style-type: none"> Trigonometric and Inverse Trigonometric Functions Portfolio Biorhythm Chart Fitting a Model to Data 	Angle of depression	Positive, negative angles	Angle of elevation	Reference angle	Angular speed	Simple harmonic motion	Bearings	Solving right triangles	Central angle	Standard position	Complementary angles	Supplementary angles	Coterminal angles	Terminal side of an angle	Damping factor	Unit circle	Frequency	Vertex of an angle	Initial side of an angle		Linear speed		Phase shift	
	Angle of depression			Positive, negative angles																							
	Angle of elevation			Reference angle																							
	Angular speed			Simple harmonic motion																							
	Bearings			Solving right triangles																							
	Central angle			Standard position																							
	Complementary angles			Supplementary angles																							
	Coterminal angles			Terminal side of an angle																							
	Damping factor			Unit circle																							
	Frequency			Vertex of an angle																							
	Initial side of an angle																										
	Linear speed																										
	Phase shift																										
Evaluate trigonometric functions using the unit circle and a calculator. (T-2)																											
Use domain and period to evaluate sine and cosine functions. (T-4)																											
Use and apply definitions of trigonometric and circular functions. (G-18*, T-2, 5, 6)																											
Use trigonometry to determine unknown sides or angles in right triangles. (G-19*, T-12)																											
Use and apply values of trigonometric functions for special and quadrant angles. (G-20, T-9)																											
Create and interpret the graphs of the trigonometric functions and their variations. (T-4, 5, 6)																											
Know the definitions of the inverse trigonometric functions and graph the functions. (T-8)																											
Use trigonometric principles to solve real-life problems involving right triangles, directional bearings, and harmonic motion. (T-19)																											
Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization. (FS-2.1.4)																											
Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations. (FS-2.1.7)																											
Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services. (FS-4.2)																											
Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals. (FS-9.3)																											

Linear Systems and Matrices**10 Days (5 Blocks)**

Sample Essential Question:

Under what conditions is it more appropriate to solve a system of equations using matrices than with substitution, graphing or elimination?

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support																										
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill																											
...the characteristics of linear systems and matrices.	Solve a system of equations by graphing, algebraic methods or using matrices. (All-2*, LA 1, 2, 3)	<p>Assessment: District Precalculus Semester Exam</p> <p>Suggested Activities: Two Ships An investigation of two ships headed on a course toward a collision. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p> <p>Solving Systems of Equations Working in groups students demonstrate their ability to solve systems by various methods. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p>	<p>BASIC TEXTBOOK CORRELATION: 7.1, 7.2, 7.3 F.1, F.2</p> <p>KEY VOCABULARY:</p> <table border="0"> <tr> <td>Area of a triangle</td> <td>Properties of matrix multiplication</td> </tr> <tr> <td>Consistent</td> <td>Reduced row-echelon form</td> </tr> <tr> <td>Cryptogram</td> <td>Row-echelon form</td> </tr> <tr> <td>Determinant</td> <td>Row-equivalent matrices</td> </tr> <tr> <td>Diagonal matrix</td> <td>Scalar, scalar multiple</td> </tr> <tr> <td>Equivalent systems</td> <td>Solution of a system</td> </tr> <tr> <td>Gauss-Jordan elimination</td> <td>Systems of equations</td> </tr> <tr> <td>Identify matrix of order n</td> <td>Test for collinear points</td> </tr> <tr> <td>Inconsistent</td> <td>Triangular matrix</td> </tr> <tr> <td>Independent, dependent</td> <td>Zero matrix</td> </tr> <tr> <td>Minor, cofactor</td> <td></td> </tr> <tr> <td>Partial fraction decomposition</td> <td></td> </tr> <tr> <td>Properties of matrix addition</td> <td></td> </tr> </table> <p>SUPPLEMENTAL MATERIALS CORRELATION: LBUSD Math Intranet/ Instructional Tools/ Precalculus Supplemental Resources:</p> <ul style="list-style-type: none"> • Two Ships • Solving Systems of Equations 	Area of a triangle	Properties of matrix multiplication	Consistent	Reduced row-echelon form	Cryptogram	Row-echelon form	Determinant	Row-equivalent matrices	Diagonal matrix	Scalar, scalar multiple	Equivalent systems	Solution of a system	Gauss-Jordan elimination	Systems of equations	Identify matrix of order n	Test for collinear points	Inconsistent	Triangular matrix	Independent, dependent	Zero matrix	Minor, cofactor		Partial fraction decomposition		Properties of matrix addition	
	Area of a triangle			Properties of matrix multiplication																									
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Partial fraction decomposition																													
Properties of matrix addition																													
Solve a system of inequalities by graphing or algebraic methods. (All-2*)																													
Use linear programming to model and solve real-life problems. (All-2*)																													
Use critical thinking skills to make informed decisions and solve problems. (FS-5.3)																													
Understand the importance of accountability and responsibility in fulfilling personal, community, and workplace roles. (FS-7.2)																													

Analytic Trigonometry**16 Days (8 Blocks)**

Sample Essential Question:

How can re-writing and simplifying trigonometric expressions and using identities help you to solve trigonometric equations?

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill	
...the characteristics of trigonometric functions.	Verify trigonometric identities using algebraic and graphing methods, and using other trigonometric identities. (G-18*, T-3, 10, 11)	<u>Suggested Activity:</u> Verify Identities Working in groups, students verify identity statements for different angles and compare. (LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)	BASIC TEXTBOOK CORRELATION: 5.1, 5.2, 5.3, 5.4, 5.5 KEY VOCABULARY: Double-angle formulas Half-angle formulas Power-reducing formulas Product-to-sum formulas Reduction formulas Sum and difference formulas Sum-to-product formulas SUPPLEMENTAL MATERIALS CORRELATION: LBUSD Math Intranet/ Instructional Tools/ Precalculus Supplemental Resources: <ul style="list-style-type: none"> Verify Identities
	Use trigonometric identities to solve trigonometric equations. (T-11)		
	Use sum and difference formulas to evaluate trigonometric functions, verify trigonometric identities, and solve trigonometric equations. (T-10)		
	Use multiple-angle formulas, power-reducing formulas, half-angle formulas, and product-to-sum formulas to rewrite and evaluate trigonometric functions. (T-11)		
	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals. (FS-9.3)		

Additional Topics in Trigonometry**14 Days (7 Blocks)**

Sample Essential Question:

How can vectors be used to solve real-world problems such as finding the airspeed and direction of an airplane allowing it to maintain its groundspeed and direction?

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support																				
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill																					
...the applications of trigonometry to oblique triangles, vectors and complex numbers.	Use and apply the Law of Sines (AAS or ASA) and the Law of Cosines (SSS or SAS) to solve oblique triangles. (T-13)	<p>Suggested Activities: Indirect Measure Investigation of the use of trig relations to measure distance <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p> <p>Discus Throw Determining distance of throwing a discus <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p>	<p>BASIC TEXTBOOK CORRELATION: 6.1, 6.2, 6.3, 6.4, 6.5</p> <p>KEY VOCABULARY:</p> <table> <tr> <td>Absolute value of a complex number</td> <td>nth roots of unity</td> </tr> <tr> <td>Argument</td> <td>Oblique triangle</td> </tr> <tr> <td>DeMoivre's Theorem</td> <td>Parallelogram law</td> </tr> <tr> <td>Directed line segment</td> <td>Resultant</td> </tr> <tr> <td>Direction angle</td> <td>Standard position of a vector</td> </tr> <tr> <td>Horizontal and vertical components of \mathbf{v}</td> <td>Standard unit vector</td> </tr> <tr> <td>Linear combination</td> <td>Trigonometric form of a complex number</td> </tr> <tr> <td>Modulus</td> <td>Vector components</td> </tr> <tr> <td>nth root of a complex number</td> <td>Vector \mathbf{v} in the plane</td> </tr> <tr> <td></td> <td>Zero vector</td> </tr> </table> <p>SUPPLEMENTAL MATERIALS CORRELATION: LBUSD Math Intranet/ Instructional Tools/ Precalculus Supplemental Resources:</p> <ul style="list-style-type: none"> • Indirect Measure • Discus Throw 	Absolute value of a complex number	n th roots of unity	Argument	Oblique triangle	DeMoivre's Theorem	Parallelogram law	Directed line segment	Resultant	Direction angle	Standard position of a vector	Horizontal and vertical components of \mathbf{v}	Standard unit vector	Linear combination	Trigonometric form of a complex number	Modulus	Vector components	n th root of a complex number	Vector \mathbf{v} in the plane		Zero vector
	Absolute value of a complex number			n th roots of unity																			
	Argument			Oblique triangle																			
	DeMoivre's Theorem			Parallelogram law																			
	Directed line segment			Resultant																			
	Direction angle			Standard position of a vector																			
	Horizontal and vertical components of \mathbf{v}			Standard unit vector																			
	Linear combination			Trigonometric form of a complex number																			
	Modulus			Vector components																			
	n th root of a complex number			Vector \mathbf{v} in the plane																			
				Zero vector																			
	Find the area of a triangle, given one angle and the two adjacent sides. (T-14)																						
	Use Heron's Area Formula to find areas of triangles.																						
	Represent vectors as directed line segments, and write component forms of vectors. (MA-1)																						
Perform basic vector operations and represent vectors graphically. (LA-4, 5, MA-1)																							
Write vectors as linear combinations of unit vectors. (MA-1)																							
Find the direction angles of vectors. (LA-7)																							
Use and apply vectors and vector combinations to model and solve real world problems. (LA-7)																							
Find the dot product of two vectors and use properties of the dot product. (MA-1, LA-7, 12)																							
Find angles between vectors and determine whether two vectors are orthogonal. (LA-12)																							
Write vectors as sums of two vector components. (LA-4)																							
Use vectors to find the work done by a force.																							
Use and apply the trigonometric representation of complex numbers. (MA-2)																							
Use DeMoivre's Theorem to find powers of complex numbers, and give n th roots of a complex numbers. (MA-2, T-17, 18)																							
Use critical thinking skills to make informed decisions and solve problems. (FS-5.3)																							

Sequences, Series, and Probability**14 Days (7 Blocks)**

Sample Essential Question:

Compare and contrast sequences and series, and explain how they are used in the expansion of binomials and to find the probabilities of events.

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill	
...the characteristics of sequences and series. Students know terms and concepts related to probability.	Find the general term and the sums of arithmetic series and of both finite and infinite geometric series. (All-22)	<u>Suggested Activity:</u> Cuts of String: Hands-on activity developing a better understanding of sequences and series. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i>	BASIC TEXTBOOK CORRELATION: 8.1, 8.2, 8.3, 8.5, 8.6, 8.7 KEY VOCABULARY: Arithmetic sequence Binomial coefficients Common difference Common ratio Finite sequence First differences Fundamental Counting Principle Geometric sequence Infinite sequence Mutually exclusive events n factorial Pascal's Triangle Recursively defined sequence Sample space Second differences Series Summation notation
	Derive the summation formulas for arithmetic series and for both finite and infinite geometric series. (All-23*)		
	Use and apply sigma notation for sums. (All -23*)		
	Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers. (All-20*)		
	Use Pascal's Triangle to calculate binomial coefficients. (All-20*)		
	Use fundamental counting principles to compute combinations and permutations. (All-18*)		
	Use combinations and permutations to compute probabilities. (All-19*)		
	Know the definition of independent events and use the rules for addition, multiplication and complementation to solve for probabilities of events in finite sample spaces. (PS-1)		
	Know the definition of conditional probability and use it to solve for probabilities in finite sample spaces. (PS-2)		
Use critical thinking skills to make informed decisions and solve problems. (FS-5.3)		SUPPLEMENTAL MATERIALS CORRELATION: LBUSD Math Intranet/ Instructional Tools/ Precalculus Supplemental Resources: <ul style="list-style-type: none"> Cuts of String 	

Geometry Review and Appendix C: Concepts in Statistics**4 Days (2 Blocks)***Sample Essential Question:**Describe a data set for which the most appropriate measure of central tendency is the mean. ...the median.
... the mode.*

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill	
...the basic terms and concepts related to statistics.	Know the definitions of the mean, median and mode of a distribution of data and compute each in particular situations. (PS-6)		BASIC TEXTBOOK CORRELATION: C.1, B.5 KEY VOCABULARY: Bar graph Line plot Bimodal Mean Box-and-whisker plot Median Mode Frequency Range Frequency distribution Standard deviation Histogram Variance
	Compute the variance and the standard deviation of a distribution of data. (PS-7)		
	Organize and describe distributions of data by using a number of different methods, including frequency tables, histograms, standard line and bar graphs, stem-and-leaf displays, scatterplots, and box-and-whisker plots. (PS-8)		
			SUPPLEMENTAL MATERIALS CORRELATION: None

Topics in Analytic Geometry**20 Days (10 Blocks)**

Sample Essential Question:

Explain the difference between the Polar coordinate system and the Cartesian coordinate system, and how are the graphs of the circle, parabola, ellipse and hyperbola affected?

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support																																						
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill																																							
...the characteristics of conic sections and equations in parametric and polar form.	<p>Take a quadratic equation in two variables; put it in standard form by completing the square and using rotations and translations, if necessary; determine what type of conic section the equation represents; and determine its geometric components (foci, asymptotes, and so forth). (MA-5.1)</p> <p>Use and apply the definitions of for parabolas, circles, hyperbolas and ellipses as a locus of points satisfying a certain geometric property. (MA-5.2)</p> <p>Create and interpret the graphs of the conic sections. (AI-16, MA-5.1)</p> <p>Interpret translations of the graphs of the conic sections. (AI-17, MA-5.1)</p> <p>Translate between polar and rectangular coordinates and interpret polar coordinates graphically. (T-15, MA-1)</p> <p>Represent equations given in rectangular coordinates in terms of polar coordinates. (T-16)</p> <p>Graph polar equations, and identify and graph special polar functions.</p> <p>Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization. (FS-2.1.4)</p> <p>Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations. (FS-2.1.7)</p> <p>Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services. (FS-4.2)</p> <p>Use critical thinking skills to make informed decisions and solve problems. (FS-5.3)</p>	<p>Key Assignment: Portfolio of Conics and Polar Equations A student portfolio collection of conics and polar equations, their graphs, characteristics and applications. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p> <p>Suggested Activities: Conic Sections by Paper Folding Construction technique used to find the translated equation of a conic. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p> <p>Polar, Rectangular and Parametric Forms Students compare the polar, rectangular, and parametric forms of equations for conics. <i>(Chapter 9 Project from text, LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p>	<p>BASIC TEXTBOOK CORRELATION: 9.1, 9.2, 9.3, 9.4, 9.6, 9.7</p> <p>KEY VOCABULARY:</p> <table> <tr> <td>Asymptotes (of a hyperbola)</td> <td>Invariant under rotation</td> </tr> <tr> <td>Axis (of a parabola)</td> <td>Limaçon</td> </tr> <tr> <td>Branches</td> <td>Major axis (of an ellipse)</td> </tr> <tr> <td>Center (of a circle)</td> <td>Minor axis (of an ellipse)</td> </tr> <tr> <td>Center (of a hyperbola)</td> <td>Orientation</td> </tr> <tr> <td>Center (of an ellipse)</td> <td>Parabola</td> </tr> <tr> <td>Circle</td> <td>Parameter equations</td> </tr> <tr> <td>Conic (conic section)</td> <td>Plane curve</td> </tr> <tr> <td>Conjugate axis</td> <td>Polar axis</td> </tr> <tr> <td>Degenerate conic</td> <td>Polar coordinate system</td> </tr> <tr> <td>Directrix</td> <td>Polar coordinates</td> </tr> <tr> <td>Discriminant</td> <td>Pole</td> </tr> <tr> <td>Eccentricity</td> <td>Radius</td> </tr> <tr> <td>Eliminating the parameter</td> <td>Rose curve</td> </tr> <tr> <td>Ellipse</td> <td>Rotation of axes</td> </tr> <tr> <td>Foci (of an ellipse)</td> <td>Transverse axis</td> </tr> <tr> <td>Foci (of a hyperbola)</td> <td>Vertex (of a parabola)</td> </tr> <tr> <td>Focus (of a parabola)</td> <td>Vertices (of a hyperbola)</td> </tr> <tr> <td>Hyperbola</td> <td>Vertices (of an ellipse)</td> </tr> </table> <p>SUPPLEMENTAL MATERIALS CORRELATION: LBUSD Math Intranet/ Instructional Tools/ Precalculus Supplemental Resources:</p> <ul style="list-style-type: none"> • Portfolio of Conics and Polar Equations • Conic Sections by Paper Folding • Polar, Rectangular and Parametric Forms 	Asymptotes (of a hyperbola)	Invariant under rotation	Axis (of a parabola)	Limaçon	Branches	Major axis (of an ellipse)	Center (of a circle)	Minor axis (of an ellipse)	Center (of a hyperbola)	Orientation	Center (of an ellipse)	Parabola	Circle	Parameter equations	Conic (conic section)	Plane curve	Conjugate axis	Polar axis	Degenerate conic	Polar coordinate system	Directrix	Polar coordinates	Discriminant	Pole	Eccentricity	Radius	Eliminating the parameter	Rose curve	Ellipse	Rotation of axes	Foci (of an ellipse)	Transverse axis	Foci (of a hyperbola)	Vertex (of a parabola)	Focus (of a parabola)	Vertices (of a hyperbola)	Hyperbola	Vertices (of an ellipse)
Asymptotes (of a hyperbola)	Invariant under rotation																																								
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Foci (of an ellipse)	Transverse axis																																								
Foci (of a hyperbola)	Vertex (of a parabola)																																								
Focus (of a parabola)	Vertices (of a hyperbola)																																								
Hyperbola	Vertices (of an ellipse)																																								

Limits and An Introduction to Calculus**10 Days (5 Blocks)**

Sample Essential Question:

Explain how the limit process can be used to find areas of regions bounded by the graphs of functions.

Content Standards		Performance Standard Measures <i>(Reflects rigor and integration of CTE Foundation Standards and may vary by SLC)</i>	Instructional Support
Students Know... (Content)	Students are Able to... (Skill)	Students Demonstrate Knowledge and Skill	
...the basic concepts and terms related to finding the tangent lines of a function and finding the area of a region in calculus.	Use the definition of a limit to estimate limits, and determine whether limits of given functions exist. (MA-8)	<p>Key Assignment: District Precalculus End of Course Exam</p> <p>Suggested Activity: Limits Investigation: Hands-on activity developing a better understanding of limits. <i>(LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)</i></p>	<p>BASIC TEXTBOOK CORRELATION: 11.1, 11.2, 11.4 11.3, 11.5 <i>Enrichment</i></p> <p>KEY VOCABULARY: Converge Limit Difference Limits at infinity quotient One-sided limit Direct Rationalizing substitution technique Diverge Secant line Dividing out Slope of a graph technique Tangent line Indeterminate form</p> <p>SUPPLEMENTAL MATERIALS CORRELATION: LBUSD Math Intranet/ Instructional Tools/ Precalculus Supplemental Resources: • Limits Investigation</p>
	Evaluate a limit of a function as the independent variable approaches a number or infinity. (MA-8)		
	Use a tangent line to approximate the slope of a graph at a point; use the limit definition of slope to find exact slopes of graphs; and find derivatives of functions and use derivatives to find slopes of graphs.		
	Determine limit of a sequence and if the sequence diverges or converges. (MA-8)		
	Find limits of summations; use rectangles to approximate areas of plane regions; and use limits of summations to find areas of plane regions.		
	Use critical thinking skills to make informed decisions and solve problems. (FS-5.3)		

KEY ASSIGNMENTS/ASSESSMENTS:

Daily Homework and In-class Assignments	Throughout the course, students will complete daily homework and in-class assignments from the math textbook and supplemental materials that will be used to assess their knowledge of the information learned during class time.
Content-Based Activities	Students will participate in a variety of in-class rigorous and relevant standards-based activities which may include investigations, discovery activities, cooperative group activities, and creative ways to summarize concepts learned.
Unit Tests	Common unit tests are developed by a team of Precalculus teachers at each high school site and administered to each student enrolled in the course. Tests include a variety of free-response and multiple choice items. Free-response items may be graded allowing an opportunity for students to receive partial credit if they demonstrate conceptual understanding, but make arithmetic errors. Tests include a variety of objective questions that assess basic knowledge of content, vocabulary, procedures, skills, conceptual understanding, or problem-solving ability.
Comprehensive Semester Exam	Students taking Precalculus in LBUSD take a district-developed 50-item multiple-choice exam assessing proficiency in the state standards taught in the first semester.
Comprehensive End of Course Exam	Students taking Precalculus in LBUSD take a district-developed 50-item multiple-choice exam assessing proficiency in all of the state standards addressed in the course.
Performance-Based Projects – especially Quad D and Service Learning	Students may complete rigorous and relevant standards-based projects which may integrate more than one subject area, relate to real-life or a career application, and may include service learning. The projects can be completed individually or in a small group, and can be completed during class time and/or at home. The projects can include a presentation to a small or group or the whole class. Service Learning activities involve research, preparation, action/demonstration, and reflection of experiential applications of the content and will be credited toward the district's high school Service Learning requirement. Students are expected to complete a Service Learning activity with a minimum of 5 hours, prior to the completion of this course. The learning (any products developed, reflection on the service) will be graded by the instructor as one of the performance based assessments; the service itself will not be graded or judged.

Key Assignments (Performance-Based Projects)**Quarter 1****Functions Portfolio** (LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)

Students work in pairs to assemble a portfolio of functions including each of the following:

1. *the constant function*
2. *the linear function*
3. *the quadratic function*
4. *the cubic function*
5. *the radical (square root) function*
6. *the cubic function*
7. *the greatest integer (step) function*
8. *the absolute value function*
9. *the piecewise function*
10. *the rational function*
11. *the logarithmic function*
12. *the exponential function*

For each function students will provide the name of the function, the standard form of the function, and generate an example of the function. For each example students will provide the equation, its graph, the domain and range including undefined values, the roots if applicable, the y-intercept(s), a description of increasing, decreasing and/or constant intervals, the inverse function and any restrictions, any asymptotes, and whether the example is an even function or an odd function.

IN THE CONCLUSION OF THE REPORT, give a real life application of one of the functions above, and identify a career or field in which the function would be used.

The portfolio will be assigned at the start of the quarter, and completed at the conclusion of chapter 3.

Quarter 2**Trigonometric and Inverse Trigonometric Functions Portfolio** (LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)

Students work in pairs to assemble a portfolio of functions including each of the following:

1. *the sine function*
2. *the cosine function*
3. *the tangent function*
4. *the inverse sine function*
5. *the inverse cosine function*
6. *the inverse tangent function*

Optional/Extra credit, reciprocal functions

7. *the secant function*
8. *the cosecant function*
9. *the cotangent function*

For each function students will provide the name of the function, the standard form of the function, and generate an example of the function. For each example students will provide the equation, its graph, the domain and range including undefined values, the period and range, and any asymptotes.

IN THE CONCLUSION OF THE REPORT, give a real life application of one of the functions above, and identify a career or field in which the function would be used.

The portfolio will be assigned at the start of the quarter, and completed at the conclusion of chapter 4.

Semester 2**Portfolio of Conics and Polar Equations** (LBUSD Math Intranet/Instructional Tools/Precalculus Supplemental Resources)

Students work in pairs to assemble a portfolio of conics and polar equations including each of the following:

Conics

1. *circle*
2. *parabola*
3. *ellipse*
4. *hyperbola*

For each of the conics, students will provide the name of the conic, the standard form of the equation, and an example of the equation. For each example students will provide the equation, its graph, center, radius, intercepts, vertex, focus (foci), directrix, eccentricity, and asymptotes as appropriate.

Polar Equations

5. *the limaçon family*
6. *the rose family*
7. *the circle family*
8. *the lemniscate family*

For each polar equation students will provide the name of the equation, the standard form of the equation, and an example of the equation. For each example students will provide the equation, its graph on a polar system, a description of any symmetry, the maximum value of $|r|$, and the zeros of r as appropriate.

IN THE CONCLUSION OF THE REPORT, give a real life application of one of the equations above, and identify a career or field in which the equation would be used.

The portfolio will be assigned at the start of the second semester, and completed at the conclusion of chapter 9.

INSTRUCTIONAL METHOD AND/OR STRATEGIES:

A variety of instructional strategies will be utilized to accommodate all learning styles:

Math-specific Methods:

1. lectures, structured note-taking, justification of reasoning
2. cooperative problem-solving, pair-teaching
3. activities, projects
4. manipulatives, drawing visual representations

Lesson Design & Delivery: Teachers will incorporate these components of lesson design during direct instruction and inquiry activities. The order of components is flexible, depending on the teacher's vision for the individual lesson. For instance, the objective and purpose, while present in the teacher's lesson plan, are not made known to the students at the beginning of an inquiry lesson.

E ssential E lements of E ffective I nstruction M odel for Lesson Design U sing Task Analysis	Anticipatory Set Objective Standard Reference Purpose Input Modeling Check for Understanding Guided Practice Closure Independent Practice
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Some components may occur once in a lesson, but others will recur many times. Checking for understanding occurs continually; input, modeling, guided practice and closure may occur several times. There may even be more than one anticipatory set when more than one content piece is introduced.

Active Participation: Teachers will incorporate the principles of active participation and specific strategies to ensure consistent, simultaneous involvement of the minds of all learners in the classroom. Teachers should include both covert and overt active participation strategies, incorporating cooperative learning structures and brain research. Some of the possible active participation strategies include:

COVERT	OVERT (Oral)	OVERT (Written)	OVERT (Gestures)
• Recall	• Think (Write)/Pair/Share	• Restate in Notes	• Hand Signals
• Imagine	• Idea Wave	• Response Boards	• Model with Hand Motions
• Observe	• Choral Response	• Graphic Organizers	• Stand up/ Sit down
• Consider	• Give One, Get One	• Folded Paper	• Point to Examples
	• Socratic Seminar	• Ticket Out of Class	
	• Cooperative Discussion Groups		

Baldrige Quality Tools: Students can become more positively involved in their education through goal setting, self-assessment, and data tracking and analysis by making use of the following strategies:

BALDRIGE TOOL	PURPOSES
Affinity Diagram	– finding consensus, organizing complex information
Flowchart	– describing a process, planning a project, identifying problem steps in a process
Force Field Diagram	– identifying obstacles, finding causes and solutions to problems
Issues / Ideas Bin	– handling individual questions/requests without stopping a group activity, providing anonymous input, obtaining diverse input in specific areas.
Data Folder	– tracking goals and actual results
Plus / Delta	– tracking improvement efforts, identifying opportunities for change, finding out what's working and what's not working in a process, procedure, activity, etc.
Class Data Graphs	– displaying trends for goal setting

Diverse learning styles may be addressed by implementing combinations of the following:

Significant, Proven Strategies for ALL Precalculus Students

- | | | | |
|------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|
| <input type="checkbox"/> Cooperative Problem-solving | <input type="checkbox"/> Short/Long-term projects | <input type="checkbox"/> Manipulatives | <input type="checkbox"/> Structured Note-taking |
| <input type="checkbox"/> Student Presentations | <input type="checkbox"/> Peer Teaching | <input type="checkbox"/> Drawing visual representations | |

Reading Strategies in Precalculus

- | | |
|------------------------------------------------------------------------------------------------------|----------------------------------------------|
| <input type="checkbox"/> Vocabulary Development (including conceptual and non-linguistic components) | <input type="checkbox"/> Text Structures |
| <input type="checkbox"/> Anticipation Guides | <input type="checkbox"/> Reciprocal Teaching |
| <input type="checkbox"/> Pre-teaching | <input type="checkbox"/> Functional Text |
| <input type="checkbox"/> Pre-reading | |

SDAIE Strategies for English Learners

- | | |
|----------------------------------------------------------------------------------------|--------------------------------------------------|
| <input type="checkbox"/> Lower the Affective Filter (including Processing Time) | <input type="checkbox"/> Multiple Intelligences |
| <input type="checkbox"/> Tapping/Building Prior Knowledge (Graphic Organizers, Schema) | <input type="checkbox"/> Adapt the Text |
| <input type="checkbox"/> Acquisition Levels | <input type="checkbox"/> Manipulatives & Visuals |
| <input type="checkbox"/> Language Sensitivity | |
| <input type="checkbox"/> Grouping Strategies | |
| <input type="checkbox"/> Home/School Connection (including Cultural Aspects) | |

Strategies for Students with Disabilities

- | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> IEP Accommodations (refer to student's IEP document or IEP summary sheet) |
| <input type="checkbox"/> Curricular Adaptations (e.g., quantity, input, participation, time, level of difficulty, level of support, output, substitute curriculum, alternate goals) |
| <input type="checkbox"/> Think Alouds |
| <input type="checkbox"/> Small Group Instruction / Learning Centers |
| <input type="checkbox"/> Manipulatives & Visuals |
| <input type="checkbox"/> Peer Assisted Learning |

Differentiation for Advanced Learners

- | | |
|------------------------------------------------|---------------------------------------------|
| <input type="checkbox"/> Curriculum Compacting | <input type="checkbox"/> Acceleration |
| <input type="checkbox"/> Depth and Complexity | <input type="checkbox"/> Tiered Assignments |
| <input type="checkbox"/> Flexible Grouping | <input type="checkbox"/> Independent Study |

Please note that these strategies often overlap and should not be limited to specifically defined courses or student populations.

TEXTBOOKS:

Basic Textbook: Read in entirety Excerpts used Precalculus with Limits, A Graphing Approach, Fifth Edition; Larson, Hostetler and Edwards, 2008; Houghton Mifflin Publishing

SUPPLEMENTAL INSTRUCTIONAL MATERIALS:

In addition to the basic text, a variety of instructional tools will be used to meet the needs of all students.

RESOURCES:

Documents

- LBUSD Pacing.....LBUSD Mathematics Curriculum Internet
- Precalculus Supplemental ResourcesLBUSD Mathematics Curriculum Intranet
- STAR Testing Blueprints..... <http://www.cde.ca.gov/ta/tq/sr/blueprints.asp>
- CST Released Items..... <http://www.cde.ca.gov/ta/tq/sr/css05rtq.asp>

ASSESSMENT METHODS AND/OR TOOLS:

Student achievement in this course will be measured using multiple assessment tools including but not limited to:

Suggested Evaluation tools:

Source	Diagnostic (Diagnose)	Formative (Monitor)	Summative (Evaluate)
District Developed Assessments	Practice EOC Exam from previous math course	Practice Exams for Semester 1 and End-of-Course	Semester 1 exam End-Of-Course Exam
Houghton Mifflin	Chapter Test as Pretest	Chapter Project Synthesis & review exercises Chapter Summary	Chapter Test Cumulative Test
Teacher Developed Assessments	Warm Up Quizzes Homework Checking for Understanding using Active Participation Cooperative Learning	Warm Up Quizzes Homework Checking for Understanding using Active Participation Cooperative Learning	Quizzes Chapter Tests

PERFORMANCE STANDARDS CRITERIA:

Defines how good is good enough on which measures to demonstrate achievement of content standards.

State Performance Standards:

The California State Board of Education has identified the following performance levels for the California Standards Test (CST) in Summative High School Mathematics. The objective of Long Beach Unified School District is to have all students achieve at or above the Proficient Performance Standard (Level). The table below indicates the number correct, the estimated percent correct and the Reported Scaled Score (SS) on the Content Standards Test (based on **2009** data).

Far Below Basic	Below Basic	Basic	Proficient	Advanced Proficient
0 – 22 Correct	23 – 38 Correct	39 – 48 Correct	49 – 58 Correct	59 – 65 Correct
0% – 34%	35% – 56%	57% – 72%	73% – 87%	88% – 100%
SS 150 – 234	SS 235 – 299	SS 300 – 349	SS 350 – 419	SS 420 – 600

District Performance Standards:

The Long Beach Unified School District has common assessments and key assignments that are required for Algebra. The Performance Standard Criteria is shown in the tables below. The goal is to have all students achieve at or above the Proficient Level and receive a C or better in the course.

Assessments

	Far Below Basic (FBB)	Below Basic (BB)	Basic (B)	Proficient (P)	Advanced Proficient (AP)
District Assessments: • Semester 1 • End-of-Course	0% – 34%	35% – 56%	57% – 72%	73% – 87%	88% – 100%

Key Assignments/Performance-Based Projects

F	D	C	B	A
Not Proficient 0 – 59%	Partial Proficient 60% – 69 %	Proficient 70% – 84%	Advanced Proficient 85% – 100%	
The student response makes little or no progress toward accomplishing the task. • Shows little or no grasp of the central mathematical idea(s) • Includes mathematical computations that are incorrect or inappropriate • Presents mathematical knowledge and ideas in a barely (if at all) comprehensible manner	The student response partially accomplishes the task. • Shows a limited grasp of the central mathematical ideas(s) • May include incomplete and/or misdirected mathematical computations • Presents mathematical knowledge and ideas in an unclear manner or without supporting evidence	The student response substantially accomplishes the task. • Shows an essential grasp of the central mathematical idea(s) • Includes appropriate and generally correct mathematical computations • Presents mathematical knowledge and ideas clearly with supporting evidence	The student response thoroughly accomplishes the task. • Shows thorough understanding and use of the central mathematical ideas(s) • Includes appropriate and accurate mathematical computations • Presents mathematical knowledge and ideas clearly and skillfully, using combinations of mathematical symbols and/or visual means as supporting evidence	

Classroom Performance Standards

The objective of instruction is to help all students achieve at or above the Proficient Level and receive a C or better in the course.

	F	D	C	B	A
	Not Proficient	Partial Proficient	Proficient	Advanced Proficient	
Assessment Tests and Quizzes	Less than 60%	60% – 69%	70% – 84%	85% – 100%	
Classwork/Activities	Less than 60%	60% – 69%	70% – 84%	85% – 100%	
Activities/Performance-Based Projects	Less than 60%	60% – 69%	70% – 84%	85% – 100%	
Homework	Less than 60%	60% – 69%	70% – 84%	85% – 100%	

Standard Grading Scale:

Advanced Proficient	A	90 – 100%
	B	80 – 89%
Proficient	C	70 – 79%
Partial Proficient	D	60 – 69%
Not Proficient	F	0 – 59%

Suggested Grade Weighting:

1. Assessment	60%
○ Tests (including quarter exam)	35 – 60%
○ Quizzes	0 – 25%
2. Semester Final Exam	10%
○ First semester final exam in the first semester	
○ End-of-course exam in the second semester	
3. Classwork/Activities	10 – 20%
○ Notes	
○ In-class assignments and activities	
4. Activities/Performance-Based Projects	5 – 10%
○ Activities are standards-based and may include:	
• Investigations	
• discovery activities	
• cooperative group activities	
• creative ways to summarize concepts learned	
○ Performance-Based Projects	
• Rigorous, standards-based activities	
• may integrate	
◆ more than one subject area	
◆ real-life or a career application	
◆ service learning	
• can be completed individually or in a small group	
• can be completed during class time and/or at home	
• can include a presentation to a small group or the whole class	
5. Homework	5 – 10%

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