



HIGH SCHOOL COURSE OUTLINE

Department	Mathematics			Course Title	Finite Math		
Course Code	3150	Grade Level	11-12	Course Length	2 semesters	Credits/Semester	5
Required for Graduation		Meets H.S. Grad Requirement		Elective Credit	Yes		
Prerequisites	"C" or better in Intermediate Algebra 1-2						
Meets UC "a-g" Requirement	Yes (c) (g)		Meets NCAA Requirement	Yes			

COURSE DESCRIPTION

This course is a one year program in advanced mathematics. It is comparable to the Finite Mathematics courses taught at the college level. Topics include Linear Algebra, Matrices, Linear Programming, Finance, Counting Techniques, Probability and Statistics. The course is designed for students as a senior level mathematics course. It is recommended for students who plan to pursue a college major that does not require calculus and the higher levels of mathematics.

GOALS: (Student needs the course is intended to meet)

Students who take math each year that they are in high school are better prepared to pass College Entry Level Math Exams and are therefore ready to take college level math when they enter college.

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.

CONTENT STANDARDS**Algebra I**

- 5.0** Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
- 6.0** Students graph a linear equation and compute the x - and y -intercepts (e.g., graph $2x + 6y = 4$). They are also able to sketch the region defined by linear inequality (e.g., sketch the region defined by $2x + 6y < 4$).
- 8.0** Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.

Algebra II

- 2.0 Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.
- 18.0 Students use fundamental counting principles to compute combinations and permutations.
- 19.0 Students use combinations and permutations to compute probabilities.
- 20.0 Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers.
- 22.0 Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series.

Linear Algebra

- 1.0 Students solve linear equations in any number of variables by using Gauss-Jordan elimination.
- 2.0 Students interpret linear systems as coefficient matrices and the Gauss-Jordan method as row operations on the coefficient matrix.
- 3.0 Students reduce rectangular matrices to row echelon form.
- 4.0 Students perform addition on matrices and vectors.
- 5.0 Students perform matrix multiplication and multiply vectors by matrices and by scalars.
- 9.0 Students demonstrate an understanding of the notion of the inverse to a square matrix and apply that concept to solve systems of linear equations.
- 10.0 Students compute the determinants of 2×2 and 3×3 matrices and are familiar with their geometric interpretations as the area and volume of the parallelepipeds spanned by the images under the matrices of the standard basis vectors in two-dimensional and three-dimensional spaces.
- 11.0 Students know that a square matrix is invertible if, and only if, its determinant is nonzero. They can compute the inverse to 2×2 and 3×3 matrices using row reduction methods or Cramer's rule.

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.
- 3.0 Students demonstrate understanding of the notion of discrete random variables by using them to solve for the probabilities of outcomes, such as the probability of the occurrence of five heads in fourteen coin tosses.
- 4.0 Students are familiar with the standard distributions (normal, binomial, and exponential) and can use them to solve for events in problems in which the distribution belongs to those families.

- 5.0 Students determine the mean and the standard deviation of a normally distributed random variable.
- 6.0 Students know the definitions of the mean, median, and mode of a distribution of data and can compute each in particular situations.
- 7.0 Students compute the variance and the standard deviation of a distribution of data.
- 8.0 Students 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.

Advanced Placement Probability and Statistics

- 4.0 Students understand the notion of a continuous random variable, and can interpret the probability of an outcome as the area of a region under the graph of the probability density function associated with the random variable.

STATE PERFORMANCE STANDARDS

The California State Board of Education has identified the following performance levels for the California Content Standards Test, 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 indicates the estimated percent correct on the Content Standards Test.

	Far Below Basic	Below Basic	Basic	Proficient	Advanced Proficient
%	0% - 34%	35% - 56%	57% - 72%	73% - 87%	88% - 100%
# Correct	Less than 23	23 – 36	37 – 47	48 – 56	57 – 65

DISTRICT PERFORMANCE STANDARDS

The Long Beach Unified School District requires assessments and key assignments for Finite Mathematics. The Performance Standard Criteria is shown in the table below. The goal is to have all students achieve at or above the Proficient Level and receive a C or better in the course.

Mathematics Performance Standard Criteria

Assignments	Far Below Basic (FBB)	Below Basic (BB)	Basic (B)	Proficient (P)	Advanced Proficient (AP)
Key Assignments: practice exams for semester 1 and EOC exams	The student completes at least 50%; not all work is shown.	The student completes at least 60%; not all work is shown.	The student completes 70% - 79% showing all work.	The student completes 80% - 89% showing all work.	The student completes at least 90% showing all work.
Assessments	FBB	BB	B	P	AP
Semester 1 Exam and End-Of-Course Exam	0% - 34%	35% - 56%	57% - 72%	73% - 87%	88% - 100%

Systems of Linear Equations

Topics	Curriculum Objectives California Content Standards	Text Correlation	Assessment	Key Vocab	Time
Systems of Linear Equations	Students solve systems of equations and inequalities by elimination and by graphing. (All – 2.0*) CST	2.1	Informal questioning, Warm-Ups, at least one quiz, and a chapter exam	Back-substitution Consistent system Dependent system Equilibrium price Equilibrium quantity Equivalent system Inconsistent system Independent system Market price Parameter Solution of a system System of linear equations	2 Weeks
Solving Systems of Linear Equations by substitution, elimination or graphing		2.1			

Matrices

Topics	Curriculum Objectives California Content Standards	Text Correlation	Assessment	Key Vocab	Time
Solve Linear Systems using Augmented Matrices (Gauss-Jordan)	Students solve simultaneous linear equations in any number of variables using Gauss-Jordan elimination. (LA – 1.0) Students interpret linear systems as coefficient matrices and the Gauss-Jordan method as row operations on the coefficient matrix. (LA – 2.0) Students reduce rectangular matrices to row echelon form. (LA – 3.0)	2.2, 2.3	Informal questioning, Warm-Ups, at least one quiz, and a chapter exam	Augmented matrix Identity matrix Inverse matrix Leontief model Matrix Method of least squares Row Echelon form Row operations Scalar product Square matrix Transpose matrix	5 Weeks
Properties of Matrices Matrix Operations	Students perform addition on matrices. (LA – 4.0) Students perform matrix multiplication, and multiply matrices by a scalar. (LA – 5.0)	2.4, 2.5			

Inverse Matrices	Students demonstrate understanding of notion of the inverse to a square matrix, and apply it to solve systems of linear equations. (LA – 9.0)	2.6			
Optional: Leontief Input-Output Model.	Students know that a square matrix is invertible if, and only if, its determinant is non-zero. (LA – 11.0)	2.7			
The Method of Least Squares					
Optional: Cramer’s Rule	Students compute the determinant of a 2x2 and 3x3 matrix. (LA – 10.0)	Supplement			

Linear Programming: A Geometric Approach

Topics	Curriculum Objectives California Content Standards	Text Correlation	Assessment	Key Vocab	Time
Graphing Systems of Linear Inequalities in Two Variables	Students solve systems of equations and inequalities by elimination and by graphing. (All – 2.0*) CST	3.1	Informal questioning, Warm-Ups, at least one quiz, and a chapter exam	Bounded Constraint Feasible points Half-plane Linear inequality Linear programming Maximize a function Minimize a function Objective function System of linear inequalities Unbounded	2 Weeks
Setting-Up a Linear Programming Problem		3.2			
Graphical Solutions to Linear Programming Problems					

Linear Programming: An Algebraic/Matrix Approach (The Simplex Method)

Topics	Curriculum Objectives California Content Standards	Text Correlation	Assessment	Key Vocab	Time
Simplex Tableau and Pivot Operations	Students solve systems of equations and inequalities by elimination, by graphing or with matrices. (All – 2.0*) CST	4.1	Informal questioning, Warm-Ups, at least one quiz, and a chapter exam	Augmented matrix Basic solution Basic variable Constraints Dual problem Duality Principle Iteration maximization Non-basic variable Non-standard problem Objective function Optimal solution Parameters Pivot column Pivot element Pivot row Primal problem Simplex method Simplex Tableau Slack variable Standard Standard minimization	3 Weeks
Standard Maximization Problem		4.2			
Standard Minimization Problem		4.3			
Optional: Nonstandard Problems		4.4			

Mathematics of Finance

Topics	Curriculum Objectives California Content Standards	Text Correlation	Assessment	Key Vocab	Time
Simple Interest	Students find the general term and sum of arithmetic and geometric series. (All – 22.0) CST	5.1	Informal questioning, Warm-Ups, at least one quiz, and a chapter exam	Amortization Annuity Arithmetic progression Compound interest Compounded continuously Discount Down payment Effective rate Conversion period Future value Geometric progression Installment Interval Lump sum Nominal rate Premium Present value Principal Recursive sequence Schedule Simple interest Sinking fund Stated rate Term Mortgage True interest rate True yield	5 Weeks
Compound Interest Annuities		5.2			
Annuities		5.3			
Amortization and Sinking Funds		5.4			
Annuities and Amortization using Recursive Sequences		5.5			
Optional: Arithmetic and Geometric Progressions		Supplement			

Sets and Counting

Topics	Curriculum Objectives California Content Standards	Text Correlation	Assessment	Key Vocab	Time
Sets and their Operations	<p>Students know the fundamental counting principle. (All – 18.0*) CST</p> <p>Students use combinations and permutations. (All – 19.0*) CST</p> <p>Students know and use the Binomial Theorem. (All – 20.0)</p>	6.1	<p>Informal questioning, Warm-Ups, at least one quiz, and a chapter exam</p>	<p>Binomial coefficient Binomial Theorem Combination Complement Counting Formula De Morgan's Properties Disjoint Element Empty set Factorial Intersection Set Multiplication principle Pascal triangle Permutation Proper subset Roster notation Set Set-builder notation Subset Tree diagram Union Universal set Venn diagram</p>	3 Weeks
The Number of Elements in a Finite Set		6.2			
The Multiplication Principle		6.3			
Permutations		6.4			
Combinations		6.5			
Binomial Theorem		6.6			

Probability

Topics	Curriculum Objectives California Content Standards	Text Correlation	Assessment	Key Vocab	Time
Experiments, Sample Spaces, and Events	<p>Students know the definition of the notion of independent events, and can use the addition, multiplication, and complementation rules to solve for probabilities of particular events in finite sample space. (PS – 1.0)</p> <p>Students know the definition of conditional probability, and use it to solve for probabilities in finite sample spaces. (PS – 2.0)</p>	7.1	<p>Informal questioning, Warm-Ups, at least one quiz, and a chapter exam</p>	<p>Additive rule Complement of an event Conditional probabiity Dependent events Event Experiment Fair Finite sample space Impossible Independent events Mutually exclusive events Odds Outcome Probability Product Rule Sample point Sample space</p>	3 Weeks
Definition of Probability		7.2			
Rules of Probability And Counting Techniques		7.3			
Conditional Probability		7.4			
Independent Events		7.5			

Probability Distributions

Topics	Curriculum Objectives California Content Standards	Text Correlation	Assessment	Key Vocab	Time
Bayes' Theorem	Students demonstrate understanding of the notion of discrete random variables by using them to solve for the probabilities of outcomes, such as the probability of the occurrence of five heads in fourteen coin tosses. (PS – 3.0)	8.1	Informal questioning, Warm-Ups, at least one quiz, and a chapter exam	Bayes' Theorem Bernoulli Trial Binomial probability model Expected value Partition Random variable	3 Weeks
Binomial Probability Model: Bernoulli Trials		8.2			
Expected Value	8.3				
Random Variables	8.4				
	Students are familiar with the standard distributions (normal, binomial and exponential) and can use them to solve for events in problems where the distribution belongs to these families. (PS – 4.0)				
	Students understand the notion of a continuous random variable, and can interpret the probability of an outcome as the area of a region under the graph of the probability density function associated with the random variable. (APPS – 4.0)				

Statistics

Topics	Curriculum Objectives California Content Standards	Text Correlation	Assessment	Key Vocab	Time
Data and Sampling Techniques	<p>Students organize and describe distributions of data using a number of different methods, including frequency tables, histograms, standard line and bar graphs, stem and leaf displays, scatter plots, and box-whisker plots. (PS – 8.0)</p> <p>Students know the definitions of the mean, median and mode of distribution of real valued data, and can compute them in particular situations. (PS – 6.0)</p> <p>Students determine the mean and standard deviation of a normally distributed random variable. (PS – 5.0)</p> <p>Students compute the variance and standard deviation of a distribution of data. (PS – 7.0)</p>	9.1	<p>Informal questioning, Warm-Ups, at least one quiz, and a chapter exam</p>	<p>Binomial Box-Whisker Plot Expected value Chebychev's Theorem Continuous Discrete Distribution Finite Histogram Mean Median Mode Random variable Normal curve Normal distribution Odds Scatter Plot Standard deviation Standard normal curve Variance</p>	<p>4 Weeks</p>
Representing Qualitative Data Graphically and in Tables		9.2, 9.3			
Measures of Central Tendency		9.4			
Measures of Dispersion: Variance and Standard Deviation		9.5			
The Normal Distribution		9.6			

APPLICATION OF COURSE CONTENT

Career Connection:

Related Major Skills & Characteristics - Problem Solving , Organizational Skills, Numerical Computation, Ability to Analyze & Interpret Data, Critical Thinking, Computer Literacy, Logical Thinking, Team Skills Efficient, Systemizing Skills, Advanced Quantitative Skills, Testing Skills

Related Career Titles – Students who major in mathematics will be prepared for any of the following careers.

*Accountant *Contract Administrator *Information Scientist *Actuary *Cost Estimator/Analyst *Inventory Control Specialist *Aerospace Engineer *Cryptographer/Cryptologist *Investment Banker *Air Traffic Controller *Data Control Administrator *ISO 2000 Specialist *Applications Programmer *Data Processing Manager *Market Research Analyst *Applied Science Technologist *Database Manager
 *Mathematician *Artificial Intelligence Programmer *Demographer *Media Buyer *Astronomer *Econometrician
 *Meteorologist *Banking/Credit/ Investment Mgr *Economist *Mortgage Researcher
 *Biometrician/ Biostatistician *EDP Auditor *Network Programmer *Commodity Manager *Employee Relations Specialist *Numerical Analyst *Compensation/Benefits Administrator *Engineer *Operations Research Analyst *Computer Consultant *Engineering Lab Technician *Physicist *Computer Engineer
 *Environmental Technologist *Pollution Meteorologist *Computer Facilities Mgr *Estate Planner
 *Production Manager *Computer Installation *External Auditor *Production Support Specialist *Computer Marketing/Sales Rep *Financial Auditor *Psychometrician *Computer Programmer *Financial Consultant
 *Public Health Statistician *Computer Scientist *Financial Manager *Purchasing/Contract Agent *Computer-Aided Design Tech. *Hydro Geologist *Quality Assurance Analyst *Consumer Loan/Credit Officer
 *Hydrologist *Rate Analyst *Cartographer *Software Engineer *Teacher: Science/Math/Computers *Research Analyst *Software Support Specialist *Technical Support Rep. *Risk & Insurance Specialist *Statistician
 *Technical Writer *Risk Analyst *Systems Analyst *Transportation Planner *Robotics Programmer *Systems Engineer *Treasury Management Specialist *Satellite Communications Specialist *Systems Programmer
 *Underwriter *Software Development Specialist *Urban Planner *Value Engineer *Weight Analyst

Service Learning – Students who are Advanced Proficient on the Content Standards Tests or those who are earning an A in the course, can participate in after school tutoring programs to assist other students in learning mathematics. All hours can be credited towards the Service Learning requirement.

METHODS: A variety of instructional strategies will be utilized to accommodate all learning styles including, but not limited to:

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.

<p>Essential Elements of Effective Instruction Model for Lesson Design Using Task Analysis</p>	<p>Anticipatory Set Objective Standard Reference Purpose Input Modeling Check for Understanding Guided Practice Closure Independent Practice</p>
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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	• Pair/Share	• Restate in Journals / Notes	• Hand Signals
• Imagine	• Idea Wave	• Response Boards	• Model with Manipulatives
• Observe	• Choral Response	• Graphic Organizers	• Stand up/ Sit down
• Consider	• Give One, Get One	• Folded Paper	• Point to Examples
	• “Foggiest” point	• Ticket Out of Class	
	• Socratic Seminar		
	• Cooperative Discussion Groups (i.e. Talking Chips, Gambit Chips)		

Literacy and Differentiation Strategies

Learning styles and learning challenges of your students may be addressed by implementing combinations of the following:

<u>Reading Strategies in Mathematics</u>	<u>SDAIE Strategies for English Learners</u>	<u>Differentiation for Advanced Learners</u>
<ul style="list-style-type: none"> ▪ Learning Logs ▪ Pre-teaching ▪ Vocabulary ▪ Pre-reading ▪ Text Structures ▪ Trail Markers ▪ Reciprocal Teaching ▪ Functional Text ▪ Anticipation Guide 	<ul style="list-style-type: none"> ▪ Tapping/Building Prior Knowledge (Graphic Organizers, Schema) ▪ Grouping Strategies ▪ Multiple Intelligences ▪ Adapt the Text ▪ Interactive Learning (Manipulatives, Visuals) ▪ Acquisition Levels ▪ Language Sensitivity ▪ Lower the Affective Filter (including Processing Time) ▪ Home/School Connection (including Cultural Aspects) 	<ul style="list-style-type: none"> ▪ Curriculum Compacting ▪ Tiered Assignments ▪ Flexible Grouping ▪ Acceleration ▪ Depth and Complexity ▪ Independent Study

MATERIALS USED IN TEACHING THE COURSE: In addition to the basic text, a variety of instructional tools will be used to meet the needs of all students.

Basic Text :

Finite Mathematics An Applied Approach. Sullivan, Michael; Massachusetts: John Wiley & Sons, Inc., 2008.

Related Career Resources

There are many web sites that will help with career selection such as Eguidance.com, BRIDGES.com, and icouldbe.org. The software package COIN JR also has career information. Video tapes such as the Futures with Jamie Escalante - School to Career shows how math is used in various careers (FASE productions 800-404-FASE). Other videos are Career Futures. Call the Career/Tech Ed Office (562-989-7872 x 291) for more information on careers.

EVALUATION: Student achievement in this course will be measured using multiple assessment tools including but not limited to chapter tests, cumulative tests (End-of-Course Exam), quizzes, homework, classwork, notebooks and projects.

Textbook	Diagnose	Monitor	Evaluate
John Wiley & Sons	Preparing for This Section Chapter Test as Pre-Test	Now Work Problems Skill Building Applications and Extensions Discussion and Writing Chapter Review	Chapter Test Basic Assessment – Free Response Chapter Project

Scoring Guide for Written Response/Projects

Score	Description
4	The student response thoroughly accomplishes the task. <ul style="list-style-type: none"> 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
3	The student response substantially accomplishes the task. <ul style="list-style-type: none"> 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
2	The student response partially accomplishes the task. <ul style="list-style-type: none"> 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
1	The student response makes little or no progress toward accomplishing the task. <ul style="list-style-type: none"> 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

GRADING POLICY: A common grading policy ensures consistency between schools and classrooms across the district.

Suggested Percent of Grade

Classwork/Homework (10%)	15% - 20%
Notes/Projects	5%
Chapter Tests	35% - 40%
Quizzes	25% - 30%
Cumulative Tests/End-of-Course Exam	10% - 15%

Standard Grading Scale

A	90% - 100%
B	80% - 89%
C	70% - 79%
D	60% - 69%
F	Below 60%

Submitted by: Becky Afghani
School/Office: Math Office
Original Date: _____
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