

Saint Patrick High School

Curriculum Guide

Department:	Mathematics	Grade and Level:	Seniors College Prep
Class:	Modeling and Statistics	Term (Semester or Year):	All Year

Required Text:	CK-12 Math Analysis CK-12 Advanced Probability and Statistics ½ CK-12 Trigonometry
Additional Resources (i.e. texts, materials, apps, etc.):	<u>iPad Apps</u> Nearpod Showbie GoodReader iBooks GoogleDrive <u>Other</u> TI-83/84 Graphing Calculator Notebook and Looseleaf Paper Pencil

Course Description

This course is designed to follow the 533 Algebra II-Trig course and is intended for those those students looking to take a fourth full year of mathematics. The pace of the course is not as quick or rigorous as 543 H Pre-Calculus. While the course covers all of the topics covered in 552 Probability and Statistics, it also includes an additional semester consisting of post-Algebra II-Trig topics. Some of the topics include systems of equations, matrices, Gauss-Jordan elimination, linear programming, exponential functions, including growth, decay, and compound interest problems, arithmetic and geometric series and sequences, and vectors. (1 credit / College Prep weight)

Units Cover by Chapters

Unit 1: Review	
Unit 2: Systems of Equations	
Unit 3: Matrices	
Unit 4: Sequences and Series	
Unit 5: Linear Functions	

Agreed Upon Assessments

Forms of assessments may include but are not limited to....

- Unit Tests
- Mid-Unit Quizzes
- Daily Quizzes

Unit:1	Review	Duration:	4 days instructional
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Essential Questions:

- What was learned in previous years?

Learning Targets:

Students will be able to...:

- Apply previously learned concepts to review questions.
- Recall specific formulas from Algebra I, Geometry, and Algebra II classes.

Academic Standards Addressed (CCSS):

Common Assessments:

- Daily quizzes

Unit:2	Solving Systems of Equations	Duration:	10 days instructional 1 day review 2 days assessment
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Essential Questions:

- What does the solution to a systems of equations represent?
- Which method would be best suited for solving a particular system of equations?

Learning Targets:

Students will be able to...:

- determine whether a point is a solution to a system of equations or inequalities in two, three, or many variables
- graph a system of equations to find the solution.
- apply the substitution method to solve a systems of equations.
- apply the Gaussian elimination method to solve a systems of equations.
- model and solve a real-world application using a systems of equations.
- extend their knowledge of systems of equations to systems of inequalities.

Academic Standards Addressed (CCSS):

- 8.EE.8
- A.REI.6
- A.REI.12

Common Assessments:

- Mid-Chapter Quiz
- Chapter Test

Unit:3	Matrices	Duration:	16 days instructional 1 day review 2 days assessment
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Essential Questions:

- How do we use matrices to represent data and systems of equations?

Learning Targets:

Students will be able to...:

- Perform basic operations on matrices
- Create matrices to represent systems of equations.
- Perform operations on matrices to obtain row-echelon form of matrices
- Calculate inverses of matrices
- Determine the determinants of any square matrix
- Use the properties of matrices in application-type problems

Academic Standards Addressed (CCSS):

- N-VM.1-12

Common Assessments:

- Mid-Chapter Quiz
- Chapter Test

Unit:4	Sequences and Series	Duration:	14 days instructional 1 day review 2 days assessment
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Essential Questions:

- What is the difference between a sequence and a series?
- How can sequences and series relate to applications?

Learning Targets:

Students will be able to...:

- Calculate specific terms in a sequence or series
- Express sequences or series using expressions
- Simplify factorial expressions completely
- Calculate expressions containing summation notation
- Calculate the sums of finite and infinite arithmetic and geometric sequences, if possible
- Use sequences and series to represent application problems such as compounded interest

Academic Standards Addressed (CCSS):

- F-IF.3
- F-BF.2
- F-LE.2

Common Assessments:

- Mid-Chapter Quiz
- Chapter Test

Unit:5	Trigonometry	Duration:	17 days instructional 1 day review 2 days assessment
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Essential Questions:

- How can missing parts of a triangle be calculated?
- How can triangles be applied to physics and other applications?

Learning Targets:

Students will be able to...:

- Find missing side lengths and angles of right triangles using trigonometric functions.
- Use inverse trigonometric functions to find missing information.
- Know when a triangle cannot exist given certain information.
- Use the Law of Sines and the Law of Cosines to find missing information about a triangle.
- Use the Laws to find the areas of triangles and other applications.
- Apply general knowledge of vectors to create triangles.
- Use trigonometric properties to represent vector change.
- Perform basic operations using vectors

Academic Standards Addressed (CCSS):

- G-SRT.6-11

Common Assessments:

- Mid-Chapter Quiz
- Chapter Test

Saint Patrick High School

Curriculum Guide

Department:	Mathematics	Grade and Level:	12 (CP)
Class:	Probability and Statistics	Term (Semester or Year):	Semester

Required Text:	• Elementary Statistics - Tenth Edition (Mario F. Triola) Pearson, 2006 (ISBN # 0-321-33183-4)
Additional Resources (i.e. texts, materials, apps, etc.):	<p><u>iPad Apps:</u> Showbie, Good Reader, and Numbers</p> <p><u>Other :</u> Triola Supplement CD - Power Point Presentations, Graphing Calculator, Microsoft Excel</p>

Course Description

552 PROBABILITY AND STATISTICS (1/2 credit/College Prep weight) Probability and Statistics are increasingly becoming an area of mathematics being used in a wide variety of academic areas in college studies, including the sciences, business disciplines, economics, psychology, education, etc. Among the topics to be covered in this course are data gathering, frequency distributions, graphical representation of data, measures of central tendency and variation, percentiles, ranks, z-scores, probability, counting problems, permutations, combinations, mathematical expectation, odds, probability functions and distributions, and the normal distribution

Academic Standards Addressed (CCSS or equivalent):

- CCSS.MATH.CONTENT.HSS.ID.A.1

Represent data with plots on the real number line (dot plots, histograms, and box plots).

- CCSS.MATH.CONTENT.HSS.ID.A.2

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

- CCSS.MATH.CONTENT.HSS.ID.A.3

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

- CCSS.MATH.CONTENT.HSS.ID.A.4

Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

- *CCSS.MATH.CONTENT.HSS.ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.*

- CCSS.MATH.CONTENT.HSS.ID.B.6

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

- CCSS.MATH.CONTENT.HSS.ID.B.6.A

Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

- CCSS.MATH.CONTENT.HSS.ID.B.6.B

Informally assess the fit of a function by plotting and analyzing residuals.

- CCSS.MATH.CONTENT.HSS.ID.B.6.C

Fit a linear function for a scatter plot that suggests a linear association.

- CCSS.MATH.CONTENT.HSS.ID.C.7

Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

- CCSS.MATH.CONTENT.HSS.ID.C.8

Compute (using technology) and interpret the correlation coefficient of a linear fit.

- CCSS.MATH.CONTENT.HSS.ID.C.9

Distinguish between correlation and causation.

Unit Themes (Table of Contents)

Theme 1:	Introduction to Statistics & Summarizing and Graphing Data
Theme 2:	Statistics for Describing, Exploring, and Comparing Data
Theme 3:	Probability
Theme 4:	Discrete Probability Distributions & The Binomial Distribution
Theme 5:	Normal Probability Distribution
Theme 6:	Correlation and Regression
Theme 7:	Survey Project

Agreed Upon Assessments

Forms of assessments may include but are not limited to....

- Chapter Quizzes and Tests
- Homework Assignments
- Partner Class Activities
- Excel / Numbers Lab Assignments
- Quarter Projects
- Semester Exam

Research and Writing Expectations

Students are expected to:

- Answer all homework questions using complete sentences or short essays.
- Use data to discover Theorems presented throughout the semester.
- Research to find graphs, or data as needed to draw conclusions on the population based on the sample drawn.

Unit: 1	Introduction to Statistics and Summarizing and Graphing Data	Duration:	2 Weeks
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Essential Questions:

- What is the meaning of sample, population, statistic, and parameter?
- What is the difference between qualitative and quantitative data?
- What makes a good statistical study?
- How do we design a statistically accurate experiment?
- Why are the characteristics of center, variation, distribution, outliers, and changes over time important for investigating the distribution of data?
- How do we correctly interpret a graph?

Affirmation Statements:

Students will be able to...:

- Distinguish between a population and a sample and distinguish between a parameter and a statistic.

- Understand the importance of good experimental design, including the control or variable effects, replication, and randomization.
- Recognize the importance of good sampling methods in general, and recognize the importance of a simple random sample.
- Summarize data by constructing a frequency distribution or relative frequency distribution.
- Visually display the nature of the distribution by constructing a histogram or relative frequency histogram.
- Investigate important characteristics of a data set by creating visual displays, such as a frequency polygon, dotplot, stemplot, Pareto chart, pie chart, scatterplot, or a time-series graph.

Common Assessments:

- Daily Homework Assignments
- Excel Project: Create Various Graphs Using Different Data Sets
- Mid-Chapter Quiz
- Unit Exam

Unit 2:	Statistics for Describing, Exploring, and Comparing Data	Duration:	2 weeks
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Essential Questions:

- What is a measure of center?
- What is a measure of variation?
- What determines the distribution of a data set?
- What is meant by an outlier?
- How do characteristics of data change over time?

Affirmation Statements:

Students will be able to...:

- Calculate the measures of center by finding the mean and median.
- Calculate the measures of variation by finding the standard deviation, variance, and range.
- Calculate the mean and standard deviation of a frequency distribution.
- Compare individual values in a data set by using z-scores, quartiles, or percentiles.
- Investigate and explore the spread of data, the center of the data, and the range of values by constructing a boxplot.
- Understand and interpret the calculated statistics.
- Determine whether a particular value would be considered usual or unusual in a particular data set.

Common Assessments:

- Daily Homework Assignments
- Mid-Chapter Quiz
- Excel Lab involving Measures of Center for Large Data Sets
- Unit Exam

Unit 3:	Probability	Duration:	2 weeks
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Essential Questions:

- What is the basic definition of the probability of an event?
- What is the difference between the probability of an event and the relative frequency of an event?
- How do you determine the probability of compound events that have the word “and”, “or”, or “given” in the example?
- Why is replacement vs no replacement important?
- How can we easily count the number of outcomes of an event?
- How can simulation be used to find the probability of an event?
- What is the difference between probability and odds?
- What is the difference between a combination and a permutation?

Affirmation Statements:

Students will be able to...:

- Calculate simple and compound probabilities.
- Complete a chart containing “probability for”, “probability against”, “odds for”, and “odds against”.
- Determine the number of outcomes in an event.
- Use combinations and permutations to determine probabilities.
- Use simulations to estimate the probabilities of events.

Common Assessments:

- Daily Homework Assignments
- Horse Racing Experiment to determine the sample space when a pair of dice is tossed
- Mid-Chapter Quiz
- Excel Lab: Use the random number generator function in excel to determine probabilities.
- Unit Exam

Unit 4:	Discrete Probability Distributions and The Binomial Distribution	Duration:	3 Weeks
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Essential Questions:

- What is a Random Variable?
- What conditions are necessary for a probability distribution to be considered valid?
- What is meant by expected value?
- How do you calculate the mean and standard deviation of a probability distribution?
- What are the four requirements of any Binomial Distribution?
- How do you calculate Binomial Probabilities?
- How do you find the mean and standard deviation of a Binomial Distribution?

Affirmation Statements:

Students will be able to...:

- Verify that a probability distribution is valid.
- Calculate the expected value of a probability distribution.
- Calculate the mean and standard deviation of any probability distribution.
- Decide if a procedure results in a binomial distribution.
- Determine the minimum and maximum usual values for a data set.

Common Assessments:

- Daily Homework Assignments
- Slot Machine Simulation
- Mid-Chapter Quiz
- Excel Lab: Does the Binomial Distribution Approach the Normal Distribution? When?
- Unit Exam

Unit 5: Normal Probability Distributions	Duration: 2 weeks
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Essential Questions:

- What is meant by a continuous probability distribution?
- What is the shape of any Normal Distribution when graphed?
- How do you standardize a Normal Distribution?
- What does the Central Limit Theorem tell us?
- How can we approximate a Binomial Distribution with a Normal Distribution?

Affirmation Statements:

Students will be able to...:

- Use the Normal Distribution Table to determine a probability under the Normal Curve.
- Use the given normal distribution data to draw and shade under the curve, standardize by finding a z-score, and calculating the corresponding probability.
- Determine mean and standard deviation of the sample means using the Central Limit Theorem.
- Visually look at a data set and decide if it comes from a Normal Distribution.

Common Assessments:

- Daily Homework Assignments
- Mid-Chapter Quiz
- Solving numerous real-life word problems involving normal distributions
- Unit Exam

Unit 6: Correlation and Regression	Duration: 2 weeks
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Essential Questions:

- How can we determine if a relationship exists between two variables?
- From a scatterplot how do we decide if there is a positive, negative, or no correlation between the variables?
- How do we calculate the correlation coefficient between two variables?
- How do we find a regression equation?

Affirmation Statements:

Students will be able to...:

- Create a scatterplot with a set of paired data.
- Determine the correlation coefficient between a set of paired data.
- Determine if the correlation is significant.
- Determine the regression equation.
- Use the regression equation to make predictions outside of the data set.

Common Assessments:

- Daily Homework Assignments
- Excel Lab: Draw Scatterplots, determine the correlation, and regression equation
- Mid-Chapter Quiz
- Unit Exam

Unit 7:	Survey Project	Duration:	3 weeks
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Essential Questions:

- What is meant by a valid project?
- How can you make sure your sample is accurate and representative of the population?
- How can you be sure not to include any misleading graphs or statements in your results?
- What is the best graph to show your data?

Affirmation Statements:

Students will be able to...:

- Create a survey on a topic they choose and are interested in.
- Gather data to be used to study the topic.
- Display the data using charts and graphs that are appropriate.
- Present the data and charts to the class.

Unit:	Duration:
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Essential Questions:

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Affirmation Statements:

Students will be able to...:

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Common Assessments:

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Appendix

CCSS Resources

Common Core Website: <http://www.corestandards.org/read-the-standards/>

Common Core App:

Essential Questions

Essential Questions help structure and plan an academic unit. For information regarding developing Essential Questions, please refer to the file shared with you on Google Drive.

Affirmation Verbage (Action Words)

Examples of Action Verbs:

Discuss, recall, state, measure, identify, collect, create, hypothesize, analyze, identify, define, describe

Appendix

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