Township of Ocean Schools

Assistant Superintendent
Office of Teaching and Learning

SPARTAN MISSION:
Meeting the needs of all students with a proud tradition of academic excellence.

Curriculum Documents

School: Ocean Township High School

Course: AP Statistics

Department: Math

Supervisor: Nichole Wynes

Board Approval	Supervisor	Notes
July 2014	Amanda Maltese	Update Standards
December 2017	Nichole Wynes	Update Standards

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DEPARTMENT Mathematics COURSE:AP Statistics

Number of Blocks	Marking Period 1 23 Blocks in Red/White Full Year Class	Number of Blocks	Marking Period 3 22 Blocks in Red/White
6	Exploration of Data	2	Sampling Distributions Continued
7	Modeling Distribution of Data	7	Estimating with Confidence
6	Describing Relationships	7	Test a Claim
3	Designing Studies	6	Comparing Two Populations or Groups
Number of Blocks	**Marking Period 2 22 Blocks in Red/White**	**Number of Blocks**	**Marking Period 4 22 Blocks in Red/White**
3	Designing Studies Continued	4	Inference for Distributions
7	Probability: What are the Chances?	3	Inference for Regression
7	Random Variables	3	AP Exam Review
5	Sampling Distributions	9	Final Project
	Midterm Exams		Final Exam

Time Frame	**6 Blocks**

Topic

Exploration of Data

Essential Questions

How can we classify a variable as categorical or quantitative data by examining the use of the data?
How can we organize and summarize the distribution of categorical variables by using frequency tables, graphic displays, and contingency tables?
How can we describe and discuss patterns found in a contingency table and associated displays of conditional distributions?

Enduring Understandings

• We treat variables as either categorical or quantitative data sets, depending on what we want to learn from it. Categorical data identifies a category for each case and we examine the counts that fall into each category. Quantitative variables record measurements utilizing the correct units.
• he *Who, What, Where, Why,* and *How* of the data are important information that must be depicted in each given data set. If information is not given, it should be noted.

Alignment to NJSLS

TEC.9-12.8.1.12 TEC.9-12.8.2.12 Math.Content.HS.S-ID.A.1

Key Concepts and Skills

• Identify the individuals and variables in a set of data.
• Identify each variable as categorical or quantitative.
• Make and interpret bar graphs, pie charts, dot plots, stem plots, and histograms of distributions of a categorical variable.
• Look for overall patterns and skewness in a distribution given in any of the above forms.
• Give appropriate numerical measures of center tendency and dispersion.
• Recognize outliers.
• Compare distributions using graphical methods.
• Graphing calculator is used to obtain summary statistics and to include the 5-number summary.
• Spreadsheet software is used to create pie charts and histograms.

Learning Activities

Textbook exercise, AP sample questions and one other additional projects similar to the following:
*Ice Cream Survey, Surveying Projec*t, Representing Data with Graphics Lab

Assessments

Homework, Quiz and Test

21st Century Skills

	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
	Life & Career Skills	x	Information Literacy		Media Literacy		

Interdisciplinary Connections

Connection with Math and Business Curriculum

Technology Integration

Graphing Calculator and Excel

Time Frame	**7 Blocks**

Topic

Modeling Distribution of Data

Essential Questions

•How can we construct and interpret graphical displays of distributions using univariate data?
•How do we summarize and compare distributions of univariate data using shape, center, and spread?
•How can we utilize both standard deviation and normal distribution as a tool to compare data?

Enduring Understandings

•The distribution of quantitative data can be displayed using a histogram, stem-and leaf plot, or a dot plot.
•The shape, center, and spread are important characteristics to note of each distribution.

Alignment to NJSLS

TEC.9-12.8.1.12 TEC.9-12.8.2.12 Math.Content.HS.S-ID.A.1

Key Concepts and Skills

• Know that areas under a density curve represent proportions.
• Approximate median and mean on a density curve.
• Recognize the shape and significant characteristics of a normal distribution, including the 68-95-99.7 rule.
• Find and interpret the standardized value (z-score) of an observation.
• Find proportions above or below a stated measurement given relevant measures of central tendency and dispersion or between two measures.
• Determine whether a distribution approaches normality

Learning Activities

Textbook exercise, AP sample questions and one other additional projects similar to the following:
Be Puzzled, M&M Activity, How Much is a Handful?

Assessments

Homework, Quiz and Test

21st Century Skills

	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
	Life & Career Skills	x	Information Literacy		Media Literacy		

Interdisciplinary Connections

Connection with Math and Business Curriculum

Technology Integration

Graphing Calculator

Time Frame	**6 Blocks**

Topic

Describing Relationships: ***Scatter Plots, Correlation; Least-Squares Regression***

Essential Questions

•How can we use a scatter plot to describe the direction, form, and strength of bivariate data?
•How can we use a linear equation, correlation coefficient, and standard deviation of the residuals to make a prediction?
•How can we ensure that the relationship between two variables can be used with confidence to make a prediction?
•Describe a regression model that was fit to re-expressed data in terms of the re-expressed variables?

Enduring Understandings

Scatter plots should be described using direction, form, and strength.
•The correlation coefficient determines the magnitude of the strength of a linear relationship between two variables *x* and *y*.

Alignment to NJSLS

TEC.9-12.8.1.12 TEC.9-12.8.2.12 Math.Content.HS.S-ID.B.6

Key Concepts and Skills

• Identify variables as quantitative or categorical.
• Identify explanatory and response variables.
• Make and analyze scatter plots to assess a relationship between two variables.
• Find and interpret the correlation *r* between two quantitative variables.
• Find and analyze regression lines.
• Use regression lines to predict values and assess the validity of these predictions.
• Calculate residuals and use their plots to recognize unusual patterns

Learning Activities

Textbook exercise, AP sample questions and one other additional projects similar to the following:
Is It Too Much of A Handful?: Tootsie Rolls & Hand Span,

Assessments

Homework, Quiz and Test

21st Century Skills

	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
	Life & Career Skills	x	Information Literacy		Media Literacy		

Interdisciplinary Connections

Connection with Math and Business Curriculum

Technology Integration

Graphing Calculator

Time Frame	**6 Blocks**

Topic

Designing Studies

Essential Questions

•How can we use a simulation study that models random behavior to draw conclusions about the question under investigation?
•How can the different methods of random sampling be used to adequately gain accurate data about a target population?
•Analyze and describe the results of an experiment or observational study using comparisons, graphical displays, statistical significance, and any possible bias.

Enduring Understandings

A simulation model can be created using random values generated by a computer or randomizing device (die, spinner, etc) and can be useful to investigate a question for which many outcomes are possible if we were to perform an analytical study collecting data.

Alignment to NJSLS

TEC.9-12.8.1.12 TEC.9-12.8.2.12 Math.Content.HS.S-IC.B.3

Key Concepts and Skills

• Identify populations in sampling situations.
• Identify different methods of sampling, strengths and weaknesses of each, and possible bias that might result from sampling issues.
• Recognize the difference between an observational study and an experiment.
• Design randomized experiments.
• Recognize confounding of variables and the placebo effect, explaining when double-blind and block design would be appropriate.
• Explain how to design an experiment to support cause-and-effect relationships.

Learning Activities

Textbook exercise, AP sample questions and one other additional projects similar to the following:
Restaurant Sampling Lab

Assessments

Homework, Quiz and Test

21st Century Skills

	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
	Life & Career Skills	x	Information Literacy		Media Literacy		

Interdisciplinary Connections

Connection with Math and Business Curriculum

Technology Integration

Graphing calculator

Time Frame	**14 Blocks**

Topic

Probability and Random Variables

Essential Questions

•Describe the effects of the Law of Large Numbers and how this can be useful in designing a study.
•How do we find the probabilities for compound events for independent, dependent, and compound events?
•How can we use expected value and standard deviation of a random variable to describe the theoretical distribution of the outcomes?
•Describe a situation which we can we utilize the geometric, binomial, or normal model for a random variable to calculate probabilities.

Enduring Understandings

•Probability is based on relative frequencies.
•The Law of Large Numbers is an important concept when simulating probability experiments but should be interpreted carefully.
•The basic rules for calculating probabilities of events can be combined to calculate the probabilities of more complex events. These rules include the Probability Assignment Rule, Complement Rule, Addition Rule for disjoint events, and Multiplication rule for independent events.

Alignment to NJSLS

Math.Content.HS.S-CP.B.6-9

Key Concepts and Skills

• Describe and generate sample spaces for random events.
• Apply the basic rules of probability.
• Use multiplication and addition rules of probability appropriately.
• Identify disjointed, complementary, and independent events.
• Use tree diagrams, Venn diagrams, and counting techniques in solving probability problems.

Learning Activities

Textbook exercise, AP sample questions and one other additional projects similar to the following:
Remove One, Dependence vs. Independence

Assessments

Homework, Quiz and Test

21st Century Skills

	Creativity	X	Critical Thinking	X	Communication	x	Collaboration
	Life & Career Skills	X	Information Literacy		Media Literacy		

Interdisciplinary Connections

Connection with Math and Business Curriculum

Technology Integration

Graphing calculator

Time Frame	**20 Blocks**

Topic

Confidence Intervals and Tests of Significance about Means and Proportions

Essential Questions

•What are the roles of sample size, power, and probability of a Type I error in the statistical significance attained from hypothesis tests, p-Value, and confidence intervals?
•How can we use the Central Limit Theorem to understand the variability of a statistic?
•Interpret and discuss the uses of a confidence interval and the effects of the degree of confidence.
•How can we utilize a one-proportion z-test to interpret the results utilizing the performed hypothesis test and associated p-Value?

Enduring Understandings

•The assumptions and the needs of statistical inference about means is identical to that of proportions. The t-models are a family of curves identified by degrees of freedom of which all are unimodal, symmetric, and bell shaped. As the degrees of freedom increases, the model approaches the normal curve. Confidence intervals can be used in the same way as with proportions, with different mechanics.
•The Central Limit Theorem describes the behavior of sample proportions using shape, center, and spread and assumes that a sample is independent, random, and large enough to expect at least 10 successes and failures. If these conditions are met, the sampling distribution is approximately normal, the mean of the sampling model is the true proportion of the population and the standard deviation of the sample proportion is . Square root of (pq/ n)

Alignment to NJSLS

TEC.9-12.8.1.12 *TEC.9-12.8.2.12* *Math.Content.HS.S-MD.A.4*

Key Concepts and Skills

• Describe confidence intervals and use them to determine sample size.
• State null and alternative hypotheses in a testing situation involving a population mean.
• Calculate the one-sample z statistics and p-value for both one-sided and two-sided tests about the mean μ using the graphing calculator.
• Assess statistical significance by comparing values.
• Analyze the results of significance tests.
• Explain Type I error, Type II error, and power in significance testing
• Identify parameters and statistics in a sample.
• Interpret a sampling distribution, including bias and variability and how to influence each.
• Recognize when a problem involves a sample proportion.
• Analyze problems involving sample proportions, including using the normal approximation to calculate probabilities.
• Recognize when a problem involves sample means.
• Analyze problems involving sample means and understand how to use the central limit theorem to approximate a normal distribution

Learning Activities

Textbook exercise, AP sample questions

Assessments

Homework, Quiz and Test

21st Century Skills

	Creativity	x	Critical Thinking	X	Communication	X	Collaboration
	Life & Career Skills	X	Information Literacy		Media Literacy		

Interdisciplinary Connections

Connection with Math and Business Curriculum

Technology Integration

Graphing calculator

Time Frame	**6 Blocks**

Topic

Comparing Two Population or Groups

Essential Questions

•Describe the process of performing a significance test utilizing a Two Sample t-test.
•Discuss the differences and requirements when using a Two-Sample t-test and a Matched Pair t-test.

Enduring Understandings

The assumptions and the needs of statistical inference about means is identical to that of proportions. The t-models are a family of curves identified by degrees of freedom of which all are unimodal, symmetric, and bell shaped. As the degrees of freedom increases, the model approaches the normal curve. Confidence intervals can be used in the same way as with proportions, with different mechanics.

Alignment to NJSLS

TEC.9-12.8.1.12 *TEC.9-12.8.2.12* *Math.Content.HS.S-MD.A.2*

Key Concepts and Skills

•Construct and interpret a confidence interval to compare two proportions
•Perform a significance test to compare two proportions
•Construct and interpret a confidence interval to compare two means.
•Perform a significance test to compare two means.
•Determine when it is appropriate to use two-sample t procedures versus paired t procedures

Learning Activities

Textbook exercise, AP sample questions

Assessments

Homework, Quiz and Test

21st Century Skills

	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
	Life & Career Skills	x	Information Literacy		Media Literacy		

Interdisciplinary Connections

Connection with Math and Business Curriculum

Technology Integration

Graphing calculator

Time Frame	**7 Blocks**

Topic

Statistical Inference about Distribution and Regression

Essential Questions

•How can we interpret the chi-square as a test of goodness-of-fit, homogeneity, and independence?
•Discuss the meaning of the true regression slope, the standard error of the estimated slope, and the standard deviation of the true errors.
•How can we use the scatter plot, displays of the residuals, confidence interval for the slope of a regression, and the p-Value to give us insight on the question being investigated?

Enduring Understandings

•Hypothesis tests about categorical variables can be done using three methods: Goodness of fit, tests of homogeneity, and tests of independence. All look at the counts of data in categories and rely on the chi-square model. The chi-square model is a family of curves based on degrees of freedom. The degrees of freedom for a chi-square test depends on the dimensions of the table and not on the sample size, thus increasing the sample size increases the ability of chi-square procedures to reject the null hypothesis.
•Standardized residuals can be examined to divulge more about the data. When a chi-square test is rejected, generally we examine the standardized residuals to reveal more about the nature of the deviations from the null hypothesis. We can apply our knowledge of examining the relationship between two quantitative variables in a scatter plot, the strength of correlation, and least squares regression lines.

Alignment to NJSLS

TEC.9-12.8.1.12 *TEC.9-12.8.2.12* *Math.Content.HS.S-ID.B.6c*

Key Concepts and Skills

• Choose the appropriate chi-square procedure for a given situation.
• Perform chi-square tests and calculate the various relevant components.
• Interpret chi-square test results obtained from computer output.
• Recognize when linear regression inference is appropriate for a set of data.
• Interpret the meaning of a regression for a given set of data.
• Interpret the results of computer output for regression.

Learning Activities

Textbook exercise, AP sample questions

Assessments

Homework, Quiz and Test

21st Century Skills

	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
	Life & Career Skills	X	Information Literacy		Media Literacy		

Interdisciplinary Connections

Connection with Math and Business Curriculum

Technology Integration

Graphing calculator