Wallenpaupack Area School District

COURSE: Probability and Statistics

GRADE LEVEL: 11 & 12

LENGTH OF COURSE: 90 days/ semester / [block schedule]

TEXT: Elementary Statistics

PUBLISHER: Prentice Hall

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COURSE DESCRIPTION:

This course includes units from statistics and probability, advanced algebra and finance. It is recommended as a fourth year mathematics course for academic students who choose not to study Trigonometry or Calculus.

CURRICULUM WRITING TEAM:

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DATE OF REVISION:

2007

Course: Probability and Statistics
Grade Level: Grade 11&12
Unit: Introduction to Statistics
PA Standards: 2.2.11.A
2.6.11.G

7 blocks

Topics:	**Skills:**
An overview of statistics Data classification Experimental design	The definition of statistics Distinguish between a population and a sample and between a parameter and a statistic Distinguish between descriptive statistics and inferential statistics Distinguish between qualitative data and quantitative data Classify data with respect to the four levels of measurement: nominal, ordinal, interval, and ratio Design a statistical study Collect data be performing an experiment, using a simulation, taking a census, or using a sampling Create a sample using random sampling, stratified sampling, cluster sampling, systematic sampling, and convenience sampling
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Calculator work Computer work Research projects	Teacher produced tests and quizzes Class assignments Class participation Teacher observation Homework Graded projects

Course: Probability and Statistics

Grade Level: Grade 11&12

Unit: Descriptive Statistics

8 blocks

PA Standards:
2.1.11.A
2.2.11.B
2.2.11.C
2.2.11.E
2.2.11.F
2.4.11.C
2.5.11.A
2.5.11.B
2.5.11.C
2.5.11.D
2.6.11.A
2.6.11.B
2.6.11.C
2.6.11.D
2.6.11.E
2.8.11.H

Topics:	**Skills:**
Frequency distributions and graphs More graphs and displays Measures of central tendency Measures of variation Measures of position	Construct a frequency distribution including midpoints, relative frequencies, and cumulative frequencies Construct frequency histograms, frequency polygons, relative frequency histograms, and ogives Graph qualitative data sets using pie charts and Pareto charts Graph paired data sets using scatter plots and time series charts Find mean, median, and mode of a population and a sample Find a weighted mean and the mean of a frequency distribution Describe the shape of a distribution as symmetric, uniform, or skewed Find the range of a data set Find the variance and standard deviation of a population and of a sample Use the Empirical Rule and Chebychev's Theorem to interpret standard deviation Approximate the sample standard deviation for grouped data Find the first, second, and third quartiles of a data set Find the interquartile range of a data set Represent a data set graphically using a

	box-and-whisker plot Interpret other fractiles such as percentiles
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Calculator work Computer work Research projects	Teacher produced tests and quizzes Class assignments Class participation Teacher observation Homework Graded projects

Course: Probability and Statistics
Grade Level: Grade 11&12

Unit: Probability
PA Standards:
2.2.11.B
2.2.11.C
2.2.11.E
2.2.11.F
2.4.11.C
2.5.11.A
2.5.11.B
2.5.11.C
2.5.11.D
2.6.11.A
2.6.11.B
2.6.11.C
2.6.11.D
2.6.11.E
2.7.11.A
2.7.11.B
2.7.11.C
2.7.11.D
2.8.11.H

7 blocks

Topics:	**Skills:**
Basic concepts of probability Conditional probability and the Multiplication Rule The Addition Rule Counting principles	Identify the sample space of a probability experiment and to identify simple events Distinguish among classical probability, empirical probability, and subjective probability Find classical or theoretical probability Find empirical or statistical probability Use frequency distributions to find probability Identify and use properties of probability Find the probability of an event given that another event has occurred Distinguish between independent and dependent events Use the multiplication rule to find the probability of two events occurring in sequence Use the multiplication rule to find conditional probabilities Determine if two events are mutually exclusive Use the addition rule to find the probability of two events Use the Fundamental Counting Principle to

	find the number of ways two or more events can occur Find the number of ways a group of objects can be arranged in order Find the number of ways to choose several objects from a group without regard to order Use counting principles to find probabilities
Activities:	**Performance Assessments:**
Textbook problem solving Partner work Calculator work Computer work Research projects	Teacher produced tests and quizzes Class assignments Class participation Teacher observation Homework Graded projects

Course: Probability and Statistics

Grade Level: Grade 11&12

Unit: Discrete Probability Distributions

8 blocks

PA Standards:
2.1.11.A
2.2.11.B
2.2.11.C
2.2.11.E
2.2.11.F
2.4.11.C
2.5.11.A
2.5.11.B
2.5.11.C
2.5.11.D
2.6.11.A
2.6.11.B
2.6.11.C
2.6.11.D
2.6.11.E
2.8.11.H

Topics:	**Skills:**
Probability distributions Binomial distributions More discrete probability distributions	Distinguish between discrete random variables and continuous random variables Construct a discrete probability distribution and its graph Determine if a distribution is a probability distribution Find the mean, variance, and standard deviation of a discrete probability distribution Find the expected value of a probability distribution Determine if a probability experiment is a binomial experiment Find binomial probabilities using the binomial probability formula, a binomial probability table, and technology Construct a binomial distribution and its graph Find the mean, variance, and standard deviation of a binomial probability distribution Find probabilities using the geometric distribution Find probabilities using the Poisson

	distribution

Activities:	**Performance Assessments:**
Textbook problem solving Partner work Calculator work Computer work Research projects	Teacher produced tests and quizzes Class assignments Class participation Teacher observation Homework Graded projects

Course:	Probability and Statistics	**Grade Level:**	Grade 11&12
Unit:	Normal Probability Distributions	**PA Standards:**	2.1.11.A 2.2.11.B 2.2.11.C 2.2.11.E 2.2.11.F 2.4.11.C 2.5.11.A 2.5.11.B 2.5.11.C 2.5.11.D 2.6.11.A 2.6.11.B 2.6.11.C 2.6.11.D 2.6.11.E 2.6.11.I 2.8.11.H
	9 blocks		

Topics:	**Skills:**
Introduction to normal distributions The standard normal distribution Applications of normal distributions The Central Limit Theorem Normal approximations to binomial distributions	Interpret graphs of normal probability distributions Find areas under a normal curve, and use them to find probabilities for random variables with normal distributions Find and interpret standard z-scores and how to find the value of a variable when its standard score is given Find areas under the standard normal curve and how to find areas under any normal curve using a table Compare data from two normal distributions Find probabilities for normally distributed variables using a table and using technology Find a specific data entry of a normal distributions given the probability Find sampling distributions and verify their properties Interpret the Central Limit Theorem Apply the Central Limit Theorem to find the

	probability of a sample mean Decide when the normal distribution can approximate the binomial distribution Find the corrections for continuity Use the normal distribution to approximate binomial probabilities

Activities:	**Performance Assessments:**
Textbook problem solving Partner work Calculator work Computer work Research projects	Teacher produced tests and quizzes Class assignments Class participation Teacher observation Homework Graded projects

Course: Probability and Statistics

Grade Level: Grade 11&12

Unit: Confidence Intervals

9 blocks

PA Standards:
2.2.11.B
2.2.11.C
2.2.11.E
2.2.11.F
2.4.11.C
2.5.11.A
2.5.11.B
2.5.11.C
2.5.11.D
2.6.11.A
2.6.11.B
2.6.11.C
2.6.11.D
2.6.11.E
2.6.11.H
2.8.11.H

Topics:	**Skills:**
Confidence intervals for the mean (large samples) Confidence intervals for the mean (small samples) Confidence intervals for population proportions Confidence interval for variance and standard deviation	Find the point estimate and a maximum error of estimate Construct and interpret confidence intervals for the population mean Determine the required minimum sample size when estimating the mean Interpret the t-distribution and use a t-distribution table Construct confidence intervals when n<30 and standard deviation is unknown Find a sample proportion Construct a confidence interval for a population proportion Determine a minimum sample size when estimating a population proportion Interpret the chi-square distribution and use a chi-square distribution table Use the chi-square distribution to construct a confidence interval for the variance and standard deviation

Activities:	**Performance Assessments:**

Textbook problem solving Partner work Calculator work Computer work Research projects	Teacher produced tests and quizzes Class assignments Class participation Teacher observation Homework Graded projects

Course: Probability and Statistics

Unit: Hypothesis Testing with One Sample

8 blocks

Grade Level: Grade 11&12

PA Standards:
2.1.11.A
2.2.11.B
2.2.11.C
2.2.11.E
2.2.11.F
2.4.11.C
2.5.11.A
2.5.11.B
2.5.11.C
2.5.11.D
2.6.11.A
2.6.11.B
2.6.11.C
2.6.11.D
2.6.11.E
2.6.11.H
2.8.11.H

Topics:	**Skills:**
Introduction to hypothesis testing Hypothesis testing for the mean (large sample) Hypothesis testing for the mean (small sample) Hypothesis testing for proportions Hypothesis testing for the variance and standard deviation	Introduction to hypothesis tests State a null hypothesis and an alternative hypothesis Identify type I and type II errors and interpret the level of significance Know whether to use a one-tailed or two-tailed test Make a decision based on the results of a statistical test Write a claim for a hypothesis test Find critical values in a normal distribution Use the z-test to test a mean Find P-values and the then to test a mean Find critical values in a t-distribution Use the t-test to test a mean Use technology to find P-values and use them to test a mean Use the z-test to test a population proportion Find critical values for a x^2-test Use the x^2-test to test a variance or a standard deviation

Activities:	**Performance Assessments:**
Textbook problem solving Partner work Calculator work Computer work Research projects	Teacher produced tests and quizzes Class assignments Class participation Teacher observation Homework Graded projects

Course:	Probability and Statistics	**Grade Level:**	Grade 11&12
Unit:	Hypothesis Testing with Two Samples 8 blocks	**PA Standards:**	2.1.11.A 2.2.11.B 2.2.11.C 2.2.11.E 2.2.11.F 2.4.11.C 2.5.11.A 2.5.11.B 2.5.11.C 2.5.11.D 2.6.11.A 2.6.11.B 2.6.11.C 2.6.11.D 2.6.11.E 2.6.11.F 2.6.11.H 2.7.11.E 2.8.11.H

Topics:	**Skills:**
Testing the difference between means (large independent samples) Testing the difference between means (small independent samples) Testing the difference between means (dependent samples) Testing the difference between proportions	Perform two-sample hypothesis testing for the difference between two population parameters Perform a two-sample z-test for the difference between two means, using large independent samples Perform a t-test for the difference between two population means, using small independent samples Decide whether two samples are independent or dependent Perform a t-test to test the mean of the differences for a population of paired data Perform a z-test for the difference between two population proportions

Activities:	**Performance Assessments:**
Textbook problem solving	Teacher produced tests and quizzes

Partner work Calculator work Computer work Research projects	Class assignments Class participation Teacher observation Homework Graded projects

Course:	Probability and Statistics	**Grade Level:**	Grade 11&12
Unit:	Correlation and Regression 7 blocks	**PA Standards:**	2.1.11.A 2.2.11.B 2.2.11.C 2.2.11.E 2.2.11.F 2.4.11.C 2.5.11.A 2.5.11.B 2.5.11.C 2.5.11.D 2.6.11.A 2.6.11.B 2.6.11.C 2.6.11.D 2.6.11.E 2.8.11.H

Topics:	**Skills:**
Correlation Linear regression Measures of regression and prediction Intervals Multiple regression	Identify linear correlation, independent and dependent variables, and the types of correlation Construct a scatter plot Find a correlation coefficient Perform a hypothesis test for a population correlation coefficient Use the t-test for the correlation coefficient Find the equation of a regression line Predict y-values using a regression equation Interpret the three types of variation about a regression line Find and interpret the coefficient of determination Find and interpret the standard error of estimate for a regression line Construct and interpret a prediction interval for y Use technology to find a multiple regression equation Use a multiple regression equation to predict y-values

Activities:	**Performance Assessments:**
Textbook problem solving	Teacher produced tests and quizzes

Partner work Calculator work Computer work Research projects	Class assignments Class participation Teacher observation Homework Graded projects

Course: Probability and Statistics

Unit: Chi-Square Tests and the F-Distribution

8 blocks

Grade Level: Grade 11&12

PA Standards:
2.1.11.A
2.2.11.B
2.2.11.C
2.2.11.E
2.2.11.F
2.4.11.C
2.5.11.A
2.5.11.B
2.5.11.C
2.5.11.D
2.6.11.A
2.6.11.B
2.6.11.C
2.6.11.D
2.6.11.E
2.6.11.F
2.8.11.H

Topics:	**Skills:**
Goodness of fit Independence Comparing two variances	Use the chi-square distribution to test whether a frequency distribution fits a claimed distribution Find observed and expected frequencies Perform a Chi-Square Goodness of Fit test Use a contingency table to find expected frequencies Use a chi-square distribution to test whether two variables are independent Interpret the F-distribution and use an F-table to find critical values Perform a two-sample F-test to compare two variances.

Activities:	**Performance Assessments:**
Textbook problem solving Partner work Calculator work Computer work Research projects	Teacher produced tests and quizzes Class assignments Class participation Teacher observation Homework

	Graded projects

Course: Probability and Statistics

Unit: Nonparametric Tests

7 blocks

Grade Level: Grade 11&12

PA Standards:
2.1.11.A
2.2.11.B
2.2.11.C
2.2.11.E
2.2.11.F
2.4.11.C
2.5.11.A
2.5.11.B
2.5.11.C
2.5.11.D
2.6.11.A
2.6.11.B
2.6.11.C
2.6.11.D
2.6.11.E
2.6.11.F
2.8.11.H

Topics:	**Skills:**
The sign test The Wilcoxon tests	Use the sign test to test a population median Use the sign test to test the difference between two population medians (dependent samples) Use the Wilcoxon signed-rank test to determine if two dependent samples are selected from populations having the same distribution Use the Wilcoxon rank sum test to determine if two independent samples are selected from populations having the same distribution

Activities:	**Performance Assessments:**
Textbook problem solving Partner work Calculator work Computer work Research projects	Teacher produced tests and quizzes Class assignments Class participation Teacher observation Homework

	Graded projects