Seymour Public Schools Curriculum

Grade: 11-12	Subject: AP/Uconn Statisitics Introduction to Statistics
CSDE Standard	25.4 MATHEMATICS - WORKING WITH DATA
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	What is purpose of statistics? How do we obtain samples to be a representation of a population? What are some problems that we experience when sampling and how can we correct them? How do we design an experiment?
Content Standard:	25.4.1.9.5 Students will recognize the limitations of mathematical models based on sample data as representations of real-world situations. 25.4.2.9.2 Students will use data from samples to make inferences about a population and determine whether claims are reasonable or false. 25.4.2.9.5 Students will describe characteristics of sampling methods and analyze the effects of random verses biased sampling. 25.4.2.9.5 Students will describe characteristics of sampling methods and analyze the effects of random verses biased sampling.
Performance Expectations (Student outcomes)	1. Understand basic definitions used in statistics 2. Recognize different Sampling methods a. Random b. Stratified c. Cluster d. Systematic e. Samples of Convenience

Seymour Public Schools Curriculum

	3. Identify problems with sampling a. Nonresponse Bias b. Response Bias 4. Recognize Abuses of Statistics 5. Design an Experiment 6. Understand the basic terminology for a population verses a sample. 7. Recognize a sampling method used or obtain a sample based on a given sampling method. 8. Identify the components of an experiment 9. Differentiate between good statistics and abused statistics

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**
	Text pages 1-17 Mandatory Homework – Chapter 1 1-5, 15-19, 26 Getting to Know the Class – Questionaire Code Breaking for Cryptology	

Seymour Public Schools Curriculum

Grade: **11-12**	Subject: AP/Uconn Statisitics Organizing and Describing Data
CSDE Standard	25.4 MATHEMATICS – WORKING WITH DATA
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	How do we organize or summarize data? How can we describe data by means of numerical characteristics?
Content Standard:	25.4.1.9.1 Students will collect real data and create meaningful graphical representations of the data. 25.4.1.9.3 Students will investigate and solve relevant problems, through designing statistical experiments and collecting, organizing, displaying, and analyzing data in tabular, graphical, and symbolic forms. 25.4.2.9.3 Students will determine and use measures spread and of central tendency to describe and compare sets of data.
Performance Expectations (Student outcomes)	1. Classify data as (i) Qualitative data or (ii) Quantitative data. 2. Describe and summarize data using graphical techniques. 3. For qualititative data, describe the construction and use of (i) the bar graph and (ii) the pie graph. 4. For quantitative data, construct a graphical display called the Stem-and-leaf plot, which is very useful for Exploratory Data Analysis (EDA). 5. For quantitative data, construct a frequency distribution table, a relative frequency distribution, a cumulative frequency distribution and a cumulative relative frequency distribution. 6. Construct graphical displays called histograms. 7. Locate information about the data, such as the central values, spread, symmetry, extreme observations etc.

Seymour Public Schools Curriculum

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
Summarizing data using frequency distributions Graphical representations of data a. Pie Chart b. Dot Diagram c. Bar Graph d. Histogram Stem-and Leaf Plots Box Plots Measures of Central Tendency Measures of Dispersion 1. Classify data as (i) Qualitative data or (ii) Quantitative data. 2. Describe and summarize data using graphical techniques. 3. For qualitative data, we will describe the construction and use of (i) the bar graph and (ii) the pie graph. 4. For quantitative data, we will construct a graphical display called the Stem-and-leaf plot, which is very useful for Exploratory Data Analysis (EDA). 5. For quantitative data, we will construct a frequency distribution table, a relative frequency distribution, a cumulative frequency distribution and a cumulative relative frequency distribution**.** 6. Based on these frequency distribution tables, we will construct graphical displays called histograms. 7. We will use these graphical displays to locate information about the data, such as the central values, spread, symmetry, extreme observations etc.	Text Book Chapter 2 Related topics from Uconn Notes Estimating Sizes Activity Pulse Rate Activity Comparing Brands of Chocolate Chip Cookies Female/Male Life Expectancy Stem-and-Leaf Plot Generate lots of class data to use to illustrate data	Stroop Effect Activity Estimating Sizes Activity Pulse Rate Activity Comparing Brands of Chocolate Chip Cookies Brinks Data Framingham Heart Study Chapter 2 quiz

Seymour Public Schools Curriculum

Grade: 11-12	Subject: AP/Uconn Statisitics Regression Analysis and Correlation Analysis
CSDE Standard	25.4 MATHEMATICS – WORKING WITH DATA
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	How do we know if a relationship exists between two variables? Assuming a relationship exists, how can we use this relationship to make predictions?
Content Standard:	25.4.1.9.4 Students will apply and defend regression models for bivariate data and use them to formulate predictions. 25.4.1.9.5 Students will recognize the limitations of mathematical models based on sample data as representations of real-world situations. 25.4.2.9.1 Students will estimate an unknown value between data points on a graph (interpolation) and make predictions by extending the graph (extrapolation).
Performance Expectations (Student outcomes)	1. Describe bivariate Data and Explanatory and Response variables 2. Prepare and describe scatterplots 3. Calculate and interpret r-values. 4. Plot data to determine if a linear model is appropriate 5. Calculate and interpret the slope 6. Calculate and interpret the y-intercept 7. Use the Least Squares Regression Line to find the predicted y-value for a given x-value 8. Interpret the R^2 value (given in a calculator or computer printout) 9. Calculate and interpret residual values

Seymour Public Schools Curriculum

	10. Examine the scatterplot and Minitab output to find Influential points 11. Understand cautions of extrapolation, lurking variables, correlation ≠ causation.

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
	Is there a relationship between: distance from bellybutton to toes and total height? Wing span and Height? Waist Size and Head Circumference?	

Seymour Public Schools Curriculum

Grade: 11-12	Subject: AP/Uconn Statisitics Probability Distributions
CSDE Standard	25.4 MATHEMATICS - WORKING WITH DATA
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	Assuming that the population is known, what is the probability of drawing different samples? What is the different between a permutation and a combination and why do we need both?
Content Standard:	25.4.3.9.1 Students will solve problems involving the probabilities of mutually exclusive events or complementary events. 25.4.3.9.2 Students will explore the concepts of conditional probability and independent events in real world contexts. 25.4.3.9.3 Students will use theoretical probabilities to solve problems and predict experimental outcomes. 25.4.3.9.4 Students will understand and use permutations, combinations, recursion, and mathematical induction to solve problems. 25.4.1.9.3 Students will investigate and solve relevant problems, through designing statistical experiments and collecting, organizing, displaying, and analyzing data in tabular, graphical, and symbolic forms.
Performance Expectations (Student outcomes)	1. Determine the number of outcomes to a sequence of events using a tree diagram. 2. Find the total number of outcomes in a sequence of events using the multiplication rules. 3. Find the number of ways r objects can be selected from n objects using permutation and combination rules. 4. Determine sample spaces and find the probability of an event using classical or empirical probability 5. Find the probability of compound events using the multiplication rules. 6. Find the conditional probability of an event. 7. Find the probability of an event using the counting rules.

Seymour Public Schools Curriculum

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
Tree Diagrams The Multiplication Rules of Counting Permutations Combinations Sample Spaces and Probability Addition Rules for Probability Multiplication and Conditional Probability Probability and Counting Techniques	Connecticut State Lottery The Beginning of Probability - Fermat and Pascal Pascal's Triangle	

Seymour Public Schools Curriculum

Grade: 11-12	Subject: AP/Uconn Statisitics Discrete Random Variables
CSDE Standard	25.4 MATHEMATICS-WORKING WITH DATA
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	What are the ways to illustrate a probability distribution for a discrete random variable? What are the properties of a probability distribution for a discrete random variable?
Content Standard:	25.4.1.9.1 Students will collect real data and create meaningful graphical representations of the data. 25.4.1.9.3 Students will investigate and solve relevant problems, through designing statistical experiments and collecting, organizing, displaying, and analyzing data in tabular, graphical, and symbolic forms. 25.4.2.9.4 Students will determine statistical measures to describe univariate data.
Performance Expectations (Student outcomes)	1. Describe sample observations as numerical quantities using the notion of random variables. 2. Distinguish between discrete random variables and continuous random variables. 3. Define the probability distribution for discrete random variables. 4. Represent the probability distribution using a table, point graph and a histogram. 5. Compute the mean and variance of a discrete random variable. 6. Study a special discrete probability distribution called the Binomial distribution.

Seymour Public Schools Curriculum

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
	Hot Tub Exercise Multiple Children Exercise	

Seymour Public Schools Curriculum

Grade: 11-12	Subject: AP/Uconn Statisitics Continuous Random Variables
CSDE Standard	25.4 MATHEMATICS - WORKING WITH DATA
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	What is a continuous random variable? How can we determine a probability distribution for a continuous random variable? How can a binomial experiment be approximated using the normal probability?
Content Standard:	25.4.2.9.3 Students will determine and use measures spread and of central tendency to describe and compare sets of data. 25.4.3.9.6 Students will explore the characteristics and applications of the normal distribution and standardized scores.
Performance Expectations (Student outcomes)	1. Define the probability density function (p.d.f.) of a continuous random variable. 2. Describe the Normal random variable and the normal distribution. This is the most widely used distribution in Statistics. 3. Define the standard normal variable having mean 0 and standard deviation 1 and describe the standard normal distribution. 4. Show how to compute probabilities corresponding to the standard normal variable (areas under the standard normal curve) and relate that to probabilities corresponding to the normal random variable x. 5. Learn to compute the z-value corresponding to areas under the standard normal curve. 6. Study the Normal approximation to the Binomial distribution, when it is valid. 7. Define a very simple continuous distribution called the Uniform distribution and study its properties.

Seymour Public Schools Curriculum

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
The Normal Distribution The Standard Normal Distribution Normal Approximations to the Binomial Distribution The Central Limit Theorem Identify the properties of the normal distribution. Find the area under the standard normal distribution, given various z values. Find the probability for a normally distributed variable by transforming it into a standard normal variable. Find specific data values for given percentages using the standard normal distribution. Use the central limit theorem to solve problems involving sample means for large and small samples. Use the normal approximation to compute probabilities for a binomial variable.	Spinning Pennies experiment Penny Distribution	

Seymour Public Schools Curriculum

Grade: 11-12	Subject: AP/Uconn Statisitics Sampling Distributions
CSDE Standard	25.4 MATHEMATICS - WORKING WITH DATA 25.2 MATHEMATICS - NUMERICAL & PROP REASONING
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	Will a probability distribution of a sample model the probability distribution of the population the sample was drawn from? As a sample size increases, how does that affect the standard deviation of the sampling distribution?
Content Standard:	25.4.3.9.6 Students will explore the characteristics and applications of the normal distribution and standardized scores. 25.4.3.9.3 Students will use theoretical probabilities to solve problems and predict experimental outcomes.
Performance Expectations (Student outcomes)	1. Define an unknown population parameter and a sample statistic. 2. Introduce the notion of a point estimator of the parameter, which is a random variable with its own probability distribution, called its sampling distribution. 3. Show that the sample mean is a point estimator. 4. Derive its sampling distribution 5. State the Central Limit Theorem, which is one of the most powerful and useful theorems in Statistics.

Seymour Public Schools Curriculum

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)

Seymour Public Schools Curriculum

Grade: 11-12	Subject: AP/Uconn Statisitics Statistical Inference – Single Sample and Two Sample
CSDE Standard	25.4 MATHEMATICS - WORKING WITH DATA 25.2 MATHEMATICS - NUMERICAL & PROP REASONING
Seymour High School Learning Expectations	• Students will think critically • Students will communicate effectively and creatively • Students will access, evaluate, and use information for a variety of tasks and purposes
Essential Questions	How do we determine a level of confidence for the value of a parameter? What criteria do we use to deterrmine the appropriate test (Z, T or Chi-Square) for a single sample or two sample test?
Content Standard:	25.4.3.9.7 Students will construct and interpret confidence intervals. 25.4.3.9.8 Students will explore a variety of statistical tests such as chi-squares and t-tests and understand the meaning of hypothesis testing. 25.4.3.9.6 Students will explore the characteristics and applications of the normal distribution and standardized scores. 25.4.2.9.2 Students will use data from samples to make inferences about a population and determine whether claims are reasonable or false. 25.4.1.9.3 Students will investigate and solve relevant problems, through designing statistical experiments and collecting, organizing, displaying, and analyzing data in tabular, graphical, and symbolic forms. 25.2.1.9.3 Students will use technological tools such as spreadsheets, probes, computer algebra systems and graphing utilities to organize and analyze large amounts of numerical information.
Performance Expectations (Student outcomes)	1. Discuss point estimation, and confidence interval estimation for a population mean, and a population proportion, based on information from a single sample. 2. Discuss **reliability** of estimation and **sample size** determination. 3. Distinguish between two cases depending on the sample size - **large sample** or **small sample**. 4. Discuss *z* intervals and use the normal probability table.

Seymour Public Schools Curriculum

	5. Discuss *t* intervals and use the table based on the Student's *t* distribution based on a certain number of degrees of freedom. 6. Find confidence intervals for estimating a population mean 7. Prepare statistical tests of hypotheses about an unknown population parameter. 8. Define a null hypothesis and an alternate hypothesis. 9. Distinguish between a one-tailed test of hypothesis,(which includes an upper-tailed test) and a lower-tailed test) and a two-tailed test. 10. Define a test statistic, a rejection region and two types of errors that may occur, called the Type I error and the Type II error. 11. Estimate the proportion of a population 12. Describe the sampling distribution of the difference between two means. 13. Describe inference for the difference between two population means in the large sample case and the small sample case. 14. Derive the pooled estimate of the common variance. 15. Derive the pooled t-test for the difference between two means. 16. Derive the confidence interval estimate for the difference between two means. 17. Discuss estimation for the difference between two means in the paired sample case. 18. Describe the sampling distribution for the difference between two sample proportions from large independent samples 19. Construct a large sample confidence interval estimate for the difference between two population proportions Define tests of hypotheses and carry out the test under the large sample case, using a z-statistic.

Strategies/Modes (examples)	**Materials/Resources (examples)**	**Assessments (examples)**

Seymour Public Schools Curriculum