	CP Probability and Statistics - 11th & 12th	
	Curriculum Updated:	May 2024
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CP Probability and Statistics - 11th & 12th

INSTRUCTIONAL TIME			
Length of Course (Weeks)	**Number of Class Periods (Per Week)**	**Length of Class Periods (Minutes)**	**Total Clock Hours/ Credit for this Course**
36 weeks	2-3 classes	90 minutes	1 credit

MAJOR RESOURCES		
Title	**Publisher**	**Copyright**
Elementary Statistics: Picturing the World 5th Edition	Pearson	2003

SPECIAL NOTES

Technology Used Throughout the Course: Matt Bognar Statistics Calculator and Google Sheets

MAJOR TOPICS		
Est. Time	**Unit Number & Name**	**Standard(s)**
8 days	1: Introduction to Statistics	CC.2.4.HS.B.1,4
20 days	2: Descriptive Statistics	CC.2.4.HS.B.2; CC 2.4.HS.B.1,3,5
15 days	3: Probability	CC.2.4.HS.B.4,6,7
15 days	4: Probability Distributions	CC.2.4.HS.B.1,4,5,7
16 days	5: Normal Probability & Distributions	CC.2.4.HS.B.1,4
18 days	6: Confidence Intervals	CC.2.4.HS.B.1,4,5
10 days	7: Hypothesis Testing - One Sample (Time permitting at end of year)	CC.2.4.HS.B.1,4,5

	CP Probability & Statistics			
Unit #: 1	1	Unit Title:	Introduction to Statistics	
INSTRUCTIONAL DAYS: 8				
Lesson Title	**Standard(s)**	**Essential Question(s)**	**Knowledge/Skills**	**Summative Assessments**
1-1: Introduction to Statistics	CC.3.4.7.B.1: Draw inferences about populations based on random sampling concepts	1. How can we make generalizations from a sample to a population?	Students will be able to identify the difference between a sample and a population and how one is used to make inferences about the other. Students will be able to apply these basic definitions in this section while reading an article and identifying what, who, and when the article is talking about.	Researching an article online, newspaper/magazine, or news broadcast and identifying the population, sample, population proportion and the sample proportion (if applicable) from the source. Students will also be able to give a summary about the conclusions from the article.
1-2: Data Classification	CC.2.4.HS.B.4: Recognize and evaluate random processes underlying statistical underlying statistical experiments	1. How can we classify data?	Students will be able to categorize data into the 4 different levels of measurement.	Lessons 1-1 & 1-2 Quiz
1-3: Experimental Design	CC.2.4.HS.B.5: Make inferences and justify conclusions based on sample surveys, experiments, and observational studies	1. Is all data "created equal"? To what extent is data biased? To what extent can data be purposely biased?	Students will be able to identify different collection techniques for sampling and how they may affect interpretations and results compared to another method of collecting samples. Students will be able to independently use their learning of sample surveys, experiments, and observational studies to design a study of choice or design a study based off of a given scenario.	Students will be given a scenario and they will have to go about designing a study to collect their data and identifying who the poulation and sample will be in their experimental design. From the article in section 1-1, students will identify which data collection technique best fits the article if not already given and explain why they would collect their data using that technique.

	CP Probability & Statistics			
Unit #: 2	2	Unit Title:	Descriptive Statistics	
INSTRUCTIONAL DAYS: 15				
Lesson Title	**Standard(s)**	**Essential Question(s)**	**Knowledge/Skills**	**Summative Assessments**
2-1: Frequency Distributions & Graphs	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable	How can you use intervals, tables and graphs to organize data?	Students will be able to independently use their learning and knowledge of frequency tables to organize datasets into columns and rows and create visual displays to draw conclusions from the distribution.	Google Sheets Lab - students get familiar with using functions in Google Sheets and how to create freqeuncy histograms and cumulative frequency graphs in Google Sheets
2-2: Graphs & Displays	CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables	How can we use place values to represent data graphically?	Students will be able to independently use their learning of graphical and numerical analysis of data distributions to display and summarize different datasets.	Google Sheets Quiz - students complete frequency distribution tables and create displays from those tables to help interpret and discuss data and their trends
2-3:Measures of Central Tendency	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable	Why is describing numerical values important for measures of central tendency? How can we describe the shape of distributions for different data sets?	Students will be able to describe data using a number summary of mean, median, mode as well as compare their shapes to other distributions. Students will analyze how outliers affect the mean and how the shapes of graphs change when outliers are removed from the dataset.	Graded Assignment - Students take a weighted average of different test scores, create a frequency distribution to approximate the mean of a given frequency table, and descibe/recognize the different shapes of distributions give a graph
2-4: Measures of Variation	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable	How can you use shape, center and spread to characterize a data distribution?	Students will be able to calculate the range of a data set as well as variance and standard deviation for a population and a sample. They will be able to use the Empirical Rule and these numerical quantities to summarize the dataset and explain any means of variation between data values.	Sunflower Lab - Students use technology (TI-84 Calculator) to calculate the mean, standard deviation, maximum and minimum values of a table of values. They then interpret the results in context to the sunflowers.
2-5: Measures of Position	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable	Why is the normal distribution essential to the study of statistics?	Students will be able to independently use their learning and knowledge of the mean, standard deviation and normal distributions to analyze datasets.	Chapter 2 Test (Version A and B)

	CP Probability & Statistics			
Unit #: 3		Unit Title:	Probability	
INSTRUCTIONAL DAYS: 15				
Lesson Title	**Standard(s)**	**Essential Question(s)**	**Knowledge/Skills**	**Summative Assessments**
3-1: Basic Concepts of Probability	CC.2.4.HS.B.4 Recognize and evaluate random processes underlying statistical experiments	How can diagrams or pictoral representations be used to evaluate probability scenarios? What is the difference betwenn experimental and theoretical probabiility?	Students will be able to identify the sample space of a probability experiment and identify simple events. They will be able to apply the fundamental counting principle to find the total number of ways multiple events may occur using a tree diagram. Students will also be able to classify the different types of probabilities.	Mini Lab to use the fundamental counting principle to determine how many different ways they can order items at a resturante given specific limitations and guidelines
3-2: Conditional Probability & Multiplication Rule	CC.2.4.HS.B.6 Use the concepts of independence and conditional probability to interpret data	How can we use modeling to form a prediction?	Students will be able to determine if two or more events are dependent or independent, then be able to calculate it's probability by using the multiplication rule .	Lessons 3-1 & 3-2 Quiz
3-3: Addition Rule	CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model	What determines whether an event is dependent or independent? Mutually exclusive or not mutually exclusive? What influences the probability that a given event will occur?	Students will be able to determine if two or more events are mutually exclusive or not mutually exclusive, then calculate it's probability by using the addition rule.	none for this section but will be in the next
3-4: Combinations & Permutations	CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model	In what situations are permutations more appropriate than combinations? What strategies can be used to determine whether to use combinations or permutations in a given problem?	Students will be able to calculate the number of ways a group of objects can be arranged in order as well as without regard to order. Students will then be able to use the counting principles to find the respective probabilities.	Chapter 3 Graded Assignment/Test - analyze the different arrangements of scrabble words and how many different scabble words you can make from a given number of tiles

	CP Probability & Statistics			
Unit #: 4		Unit Title:	Discrete Probability Distributions	
INSTRUCTIONAL DAYS: 15				
Lesson Title	**Standard(s)**	**Essential Question(s)**	**Knowledge/Skills**	**Summative Assessments**
4-1: Probability Distributions	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable	How are probabilities assigned to outcomes in a discrete probability distribution, and what properties must these probabilities satisfy? How do you interpret and analyze the shape of a discrete probability distribution?	Students will be able to construct different probability distributions and analyze their shape based on prior knowledge regarding displaying data back in chapter 2	None. Formative assessment given on siblings lab where students determine if the scenario is discrete or continuous, verifying probability distributions, describing in words what the probabilities mean, and determining probable values in the distribution
4-2: Binomial Distributions	CC.2.4.HS.B.4: Recognize and evaluate random processes underlying statistical underlying statistical experiments CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model	What defines a binomial distribution, and how does it differ from other probability distributions? What are the key properties and assumptions of a binomial distribution, and how do they impact the outcomes? Why is the concept of inependence crucial in binomial experiments, and how does it influence the calculation of probabilities?	Students will provide a framework for analyzing discrete outcomes in repeated independent trials and to make predictions, calculate probabilities, and draw conclusions based on the data models.	Lesson 4-1 & 4-2 Quiz SkeeBall Lab to verify binomial distributions and interpret probabilities as a formative assessment
4-3: Geometric & Poisson Distributions	CC.2.4.HS.B.5: Make inferences and justify conclusions based on sample surveys, experiments, and observational studies CC.2.4.HS.B.4: Recognize and evaluate random processes underlying statistical underlying statistical experiments CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model	What is the significance of mean and variance in geometric and Poisson distributions, and how do they affect the shape of the distributions? How are geometric distributions applied to model events like the first sucess in repeated trials, and what insights can be gained from analyzing such scenarios? How do geometric and Poisson distributions help in decision-making, risk assessment, and forecasting in various fields such as insurance, telecommunications, and quality control?	Students will be able to determine probable and improbable outcomes from geometric and Poisson distributions and analyze these outcomes to make logical decisions.	Chapter 4 Test (Version A & B)

	CP Probability & Statistics			
Unit #: 5		Unit Title:	Normal Probability Distributions	
INSTRUCTIONAL DAYS: 16				
Lesson Title	**Standard(s)**	**Essential Question(s)**	**Knowledge/Skills**	**Summative Assessments**
5-1: Introduction to Normal Distributions	CC.2.4.HS.B.4: Recognize and evaluate random processes underlying statistical underlying statistical experiments	How do outliers affect the shape of a normal distribution? In what ways can understanding the normal distribution improve decision-making processes? What role does the empirical rule play in analyzing data within a normal distribution?	Students will be able to recognize the structure of the normal and standard normal distirbutions while interpreting their graphs.	n/a - Lesson Quiz in Section 5-2
5-2: Finding Probabilities	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable	Why is the z-score important in finding probabilities in the standard normal distribution? How can we interpret probabilities using z-scores in the standard normal distribution? What role does the empirical rule play in determining probabilities within a normal distribution?	Students will apply their knowledge about the sturcture of the normal distributions to calculate probabilities under the empirical rule. They will also interpret their results in order to effectively communicate their mathematical reasoning and findings.	Lesson 5-1 & 5-2 Quiz (A & B)
5-3: Finding Values	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable	What is the significance of the mean and standard deviation when determining x-values in a normal distribution? How do we interpret z-scores in relation to the mean and standard deviation in a normal distribution? How can the concept of finding x-values and z-scores in a normal distirbution be applied to real-world situations or data analysis?	Students will determining x-values and z-scores in a normal distribution given a probability to help locate where the data points lie in relation to the rest of the distribution	Lesson Lab on finding different SAT scores given specific probabilities under the normal distribution. Students will have a summative assessment at the end of the chapter
5-4: Sampling Distributions & Central Limit Theorem	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable	How do sampling distributions help us make inferences about population parameters? What is the significance of the central limit theorem in statistical analysis? Why is it important to understand the relationship between sample size and the shape of sampling distributions? How does the central limit theorem impact the shape of sampling distributions?	Sampling distributions help in making predictions and drawing conclusions about the population parameters. By analyzing the components of sampling distributions and the central limit theorem, students can effectively analyze data, draw valid conclusions, and make informed decisions based on sample data.	Chapter 5 Test & Central Limit Theorem Lab

	CP Probability & Statistics			
Unit #: 6		Unit Title:	Confidence Intervals	
INSTRUCTIONAL DAYS: 18				
Lesson Title	**Standard(s)**	**Essential Question(s)**	**Knowledge/Skills**	**Summative Assessments**
6-1: Conficence Intervals (Large Samples)	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable CC.2.4.HS.B.4: Recognize and evaluate random processes underlying statistical underlying statistical experiments CC.2.4.HS.B.5: Make inferences and justify conclusions based on sample surveys, experiments, and observational studies	What is the purpose of using confidence intervals in statistical analysis? How does the sample size affect the width and precision of a confidence interval? What are the implications of confidence intervals in making decisions based on statistical data analysis?	Students will apply confidence intervals to draw conclusions and make decisions based on data analysis with large sample sizes. Confidence intervals provide a range of values that likely contain the population parameter of interest and tend to be narrower and more precise compared to confidence intervals with smaller samples	Mystery Mean Lab - students create confidence intervals for the average score on a math test Section 6-1 Lesson Quiz
6-2: Confidence Intervals (Small Samples)	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable CC.2.4.HS.B.4: Recognize and evaluate random processes underlying statistical underlying statistical experiments CC.2.4.HS.B.5: Make inferences and justify conclusions based on sample surveys, experiments, and observational studies	How does sample size impact the width and precision of confidence intervals for small samples? Why are confidence intervals wider for small samples compared to large samples? What strategies can be employed to improve the reliability of confidence intervals when working with small sample sizes?	With small samples, confidence intervals tend to be wider and less precise compared to larger samples. This is due to the increased variability and uncertainty associated with smaller sample sizes. Students will compare confidence intervals with large samples to smaller samples and interpret their results in order to make valid statistical inferences and draw reliable conclusions.	Small Samples Calculator Lab - creating confidence intervals from pre-determined datasets Section 6-2 Lesson Quiz
6-3: Confidence Intervals for Population Proportions	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable CC.2.4.HS.B.4: Recognize and evaluate random processes underlying statistical underlying statistical experiments CC.2.4.HS.B.5: Make inferences and justify conclusions based on sample surveys, experiments, and observational studies	What is the significance of population proportions in statistics? How do you interpret a confidence interval in the context of population proportions? In what real-world scenarios are confidence intervals for population proportions commonly used?	Students create confidence intervals for population proportions to estimate the true proportion/percentage of the dataset. They are used to estimate the likely range of values for the unknown population proportion. In this lesson, students construct confidence intervals for proportions/percentages and interpret them in context to the scenario.	Heryshey Kiss Lab - construct confidence intervals for the proportion of Hershey Kisses that land flat
6-4: Confidence Intervals for Variance & Standard Deviation	CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable CC.2.4.HS.B.4: Recognize and evaluate random processes underlying statistical underlying statistical experiments CC.2.4.HS.B.5: Make inferences and justify conclusions based on sample surveys, experiments, and observational studies	How can confidence intervals for variance and standard deviation help in making statistical inferences? What methods are used to calculate confidence intervals for variance and standard deviation?	Creating a confidence interval for the variance and standard deviation of a dataset requires the use of the chi-square distribution. In manufacturing, it is necessary to control the amount that a process varies. It is important that the items vary little or not at all. How can you measure, and consequently control, the amount of variation in the parts?	Chapter 6 Test on Confidence Intervals

Marking Period	Unit	Lesson	Number of Instructional Days	Estimated Dates:	Special Notes:					
Marking Period 1	1 - Intro to Statistics	1 - Intro to Statistics	4							
		2 - Data Collection	2		IXL Benchmark #1					
		3 - Experimental Design	4							
	2 - Descriptive Statistics	1 - Frequency Distributions	6		Mid-Quarter Progress					
		2 - Graphs & Displays	4							
		3 - Measures of Central Tendency	3							
		4 - Measures of Variation	4		End of Marking Period 1					
Marking Period 2		5 - Measures of Position	3		IXL Benchmark #2					
	3 - Probability	1 - Basics of Probability	4							
		2 - Conditionals & Multiplication Rule	4							
		3 - Addition Rule	4		Mid-Quarter Progress					
		4 - Permutations & Combinations	4		Midterm Exam					
	4 - Probability Distributions	1 - Probability Distributions	5		IXL Benchmark #3					
		2 - Binomial Distributions	5							
Marking Period 3		3 - Geometric & Poisson	5							
	5 - Normal Probability Distributions	1 - Intro to Normal	3		Mid-Quarter Progress					
		2 - Finding Probabilities	5							
		3 - Finding Values	3							
		4 - Sampling Distributions & CLT	5		IXL Benchmark #4					
Marking Period 4	6 - Confidence Intervals	1 - Large Samples	5							
		2 - Small Samples	5							
		3 - Population Proportions	4							
		4 - Variance & Standard Deviation	4		Mid-Quarter Progress					
	7 - Hypothesis Testing (Time Permitting)	1 - Intro to Hypothesis Testing	5		Final Exams (Or at the end of the year)					
		2 - Testing for the Mean (Large Sample)	4							
		3 - Testing for the Mean (Small Sample)	4							
		4 - Proportions	3							
		5 - Variance & Standard Deviation	3							
					IXL Benchmark #4					