Subject Area: AP Statistics (Grade 11-12)

CCSS Conceptual Category: Statistics and Probability

CCSS Domain: Interpreting Categorical and Quantitative Data (S-ID)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Summarize, represent, and interpret data on a single count or measurement variable	1. represent data with plots on the real number line (dot plots, histograms, and box plots). 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.	MA 3 1.8, 1.10, 3.1 MA 2 3.3	1-3a,4 Strategic Thinking	1-2. The students will be given sets of one-variable quantitative data. They will be able to draw an appropriate graph that will allow them to discuss the shape of the distribution. They will be able to calculate the quantitative data from the summary statistics. 2. Students will draw various graphs such as frequency polygons, histograms, and boxplots from a set a data. The graphs will be used to determine the shape of the distribution represented by the data. They will discuss characteristics such as whether the distribution is symmetric or skewed.	1-2. From a given set of one-variable quantitative data, the student will draw the appropriate graph and dicuss the shape of the distribution. The data set will be used to calculate the summary statistics. 2.Given a set of data, the student will draw an appropriate graph such as a frequency polygon, histogram or boxplot. From this graph they will discuss the shape of the distribution involving characteristics such as a symmetric or skewed distribution. (SMP 1,2,3,4,5,7)

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Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Summarize, represent, and interpret data on a single count or measurement variable	3. interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). 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.	MA 4 1.6, 3.6 MA 1 3.2	1-3a,4 Strategic Thinking 3b Extended Thinking	3a. The students will understand how adding a constant to every data value or multiplying every data value by a constant changes the shape, mean, and standard deviation of the distribution. 3b. Using a set of data, students will construct a histogram and/or a boxplot and find any outliers to determine if the data set can be modeled by a normal distribution. 4. When computing measures of central tendency (mean, median, mode, and standard deviation) students will look at the given data and judge whether the computations give a reasonable representation of the data.	3a. Students will demonstrate an understanding of the affect that adding or multiplying a constant to every data value has on the shape, mean, and standard deviation of the distribution. 3b. Given a set of data, the students will construct a histogram and/or boxplot, determine any outliers and make a judgment as to whether the data can be modeled by a normal distribution. 4. Given a set of data, students will compute the measures of central tendency and use those measures to judge whether they give a reasonable representation of the data. (SMP 1,2,3,4,5,7)

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Show-Me Standards

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	The students will:				
Interpret linear models	8. Compute (using technology) and interpret the correlation coefficient of a linear fit. 9. Distinguish between correlation and causation.	MA 3 1.4, 1.6	Extended Thinking	8. Determine whether the correlation coefficient shows a weak positive, strong positive, weak negative strong negative, or no correlation after computing it using the graphing calculator. 9. Choose two variables that could be correlated even though neither variable could reasonably be considered to be the cause of the other; defend and justify selection of variables.	8.The correlation coefficient of a given data set is 0.97. List three specific things this tells you about the data. Have students enter data into graphing technology, calculate the regression equation and interpret what the correlation coefficient is telling about the data. 9.Collect height, shoe-size, and wrist circumference data for each student. Determine the best way to display the data. Answer the following questions. Is there a correlation between any two of the three indicators? Is there a correlation between all three indicators? What patterns and trends are apparent in the data? What inferences can be made from the data? (SMP 3,4,5,6)

Subject Area: AP Statistics (Grade 11-12)

CCSS Conceptual Category: Statistics and Probability

CCSS Domain: Making Inferences and Justifying Conclusions (S-IC)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Understand and evaluate random processes underlying statistical experiments	1. understand statistics as a process for making inferences about population parameters based on a random sample from that population.	MA 3 1.4, 1.8, 3.6	Strategic Thinking	1. Define populations, population parameter, random sample, and inference. Explain why randomization is used to draw a sample that represents a population well. Recognize that statistics involves drawing conclusions about a population based on the results obtained from a random sample of the population.	1. From a class containing 12 girls and 10 boys, three students are to be selected to serve on a school advisory panel. Here are four different methods of making the selection. I. Select the first three names on the class roll. II. Select the first three students who volunteer. III. Place the names of the 22 students in a hat, mix them thoroughly, and select three names from the mix. IV. Select the first three students who show up for class tomorrow. Which is the best sampling method, among these four, if you want the school panel to represent a fair and representative view of the opinions of your class? Explain the weaknesses of the three you did not select as the best. (SMP 1,2,3,4,5,6,7,8)

Subject Area: AP Statistics (Grade 11-12)

CCSS Conceptual Category: Statistics and Probability

CCSS Domain: Making Inferences and Justifying Conclusions (S-IC)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Understand and evaluate random processes underlying statistical experiments	2. decide if a specified model is consistent with results from a given data-generating process. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?	MA 3 1.4, 1.8, 3.6	Strategic Thinking	2.The law of large numbers states that as the sample size increases, the experimental probability will approach the theoretical probability. Comparison of data from repetitions of the same experiment is part of the model building verification process.	2. Have multiple groups flip coins. One group flips a coin 5 times, one group flips a coin 20 times, and one group flips a coin 100 times. Which group's results will most likely approach the theoretical probability? Have the groups compare answers and discuss the outcomes. (SMP 1,2,3,4,5,6,7,8)

Subject Area: AP Statistics (Grade 11-12)

CCSS Conceptual Category: Statistics and Probability

CCSS Domain: Making Inferences and Justifying Conclusions (S-IC)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Make inferences and justify conclusions from sample surveys, experiments, and observational studies	3. recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	MA 3 1.4, 1.6,1.8, 3.6	Extended Thinking	3. Design or evaluate sample surveys, experiments and observational studies with randomization. Discuss the importance of randomization in these processes.	3.Students are given a term project that would be a study of the strictness of the parents or guardians of students in the school. Their goal is to estimate the proportion of students in the school who think of their parents or guardians as “strict”. They do not have time to interview all 1000 students in the school, so they plan to obtain data from a sample of students. The students design and carry out the survey. (SMP 1,2,3,4,5,6,7,8)

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CCSS Domain: Making Inferences and Justifying Conclusions (S-IC)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Make inferences and justify conclusions from sample surveys, experiments, and observational studies	4. use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.	MA 3 1.4, 1.6,1.8, 3.6	Extended Thinking	4. Given the mean and the standard deviation of a sample, students will choose an appropriate margin of error for the sample mean or proportion and create a confidence interval using the correct formulas.	4.Is normal body temperature the same for men and women? Medical researchers interested in this question collected data from a large number of men and women. Random samples from that data are recorded in a table given to the students. a. Use a 95% confidence interval to estimate the mean body temperature of men and then of women. b. Find the margin of error for the men and for the women. c. Which margin of error is larger? Why is it larger? (SMP 1,2,3,4,5,6,7,8)

Subject Area: AP Statistics (Grade 11-12)

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CCSS Domain: Making Inferences and Justifying Conclusions (S-IC)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Make inferences and justify conclusions from sample surveys, experiments, and observational studies	5. use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	MA 3 1.4, 1.6,1.8, 3.6	Extended Thinking	5. Conduct a simulation for two treatment groups using the sample results as the parameters for the distributions. Calculate the difference of means for each simulation and represent those differences in a histogram. Use the results of the simulation to create a confidence interval for the difference of means.	5. Using a completely randomized design, 20 students counted the number of times they blinked their eyes and the number of breaths they took in one minute. The data is shown a given table.Compute the mean and standard deviation for both the numberof breaths and number of blinks. Using the results, create a 99% confidence interval to estimate the number of times a student blinks and breathes in a minute. (SMP 1,2,3,4,5,6,7,8)

Subject Area: AP Statistics (Grade 11-12)					
CCSS Conceptual Category: Statistics and Probability					
CCSS Domain: Making Inferences and Justifying Conclusions (S-IC)					
Show-Me Standards					
CCSS Cluster	**Common Core Standard (D)=District Standard**	**Show Me Standards**	**DOK**	**Instructional Strategies Student Activities/Resources**	**Assessment**
	The students will:				
Make inferences and justify conclusions from sample surveys, experiments, and observational studies	6. evaluate reports based on data.	MA 3 1.4, 1.6,1.8, 3.6	Extended Thinking	6. Read summaries of a data-based report addressing the sampling techniques used, inferences made, and any flaws or biases. Discuss the conclusions.	6. A reporter used the two data sets below to calculate the mean housing price in Kansas as $629,000. Why is this calculation not representative of the typical housing price in Kansas? o Wichita area {1.2 million, 242,000, 265,500, 140,000, 281,000, 265,000, 211,000} o Overland Park homes {5 million, 154,000, 250,000, 250,000, 200,000, 160,000, 190,000} (SMP 1,2,3,4,5,6,7,8)

Subject Area: AP Statistics (Grade 11-12)					
CCSS Conceptual Category: Statistics and Probability					
CCSS Domain: Conditional Probability and the Rules of Probability (S-CP)					
Show-Me Standards					
CCSS Cluster	**Common Core Standard (D)=District Standard**	**Show Me Standards**	**DOK**	**Instructional Strategies Student Activities/Resources**	**Assessment**
	The students will:				
Use the rules of probability to compute probabilities of compound events in a uniform probability model	6. find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. 7. apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model.	MA 3 1.4, 1.8	Skill/Concept	6. Students will calculate conditional probabilities using the definition after discussing the definiton. For example: A teacher gave her class two quizzes. 30% of the class passed both quizzes and 60% of the class passed the first quiz. What percent of those who passed the first quiz also passed the second quiz? 7. Interpret the probability of unions and intersections based on the context of a given problem.	6. A local restaurant asked 1000 people, “Did you cook dinner last night?” The results of this survey are shown in a table. Determine what the probability is of a person chosen at random from the 1000 surveyed who a. cooked dinner last night. b. was a male and did not cook dinner. c. was a male. d. was a female and cooked dinner last night. 7. In a math class of 32 students,18 are boys and 14 are girls. On a unit test, 5 boys and 7 girls made an A grade. If a student is chosen at random from the class, what is the probability of choosing a girl or an A student? (SMP 1,4,5,6,7)

Subject Area: AP Statistics (Grade 11-12)

CCSS Conceptual Category: Statistics and Probability

CCSS Domain: Conditional Probability and the Rules of Probability (S-CP)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Use the rules of probability to compute probabilities of compound events in a uniform probability model	8. (+) apply the general Multiplication Rule in a uniform probability mode, P(A and B) = P(A)P(BIA) = P(B)P(AIB), and interpret the answer in terms of the model. 9. (+) use permutations and combinations to compute probabilities of compound events and solve problems.	MA 3 1.4, 1.8	Skill/Concept	8.Students will apply the formula for conditional probability to find the probability of a given event in a real world problem. 9. Students will apply the formulas for permutations and combinations to real world problems to compute the probabilities of compound events.	8. If a coulple plans to have 10 children, what is the probability that there will be at least one girl? If the couple eventually has 10 children and they are all boys, what can the couple conclude? 9. A batch of pills consists of 7 that are good and 3 that are defective. They contain the wrong amount of drug. a. How many different permutations are possible when all 10 pills are randomly selected (without replacement)? b. If 3 pills are randomly selected without replacement, find the probability that all three of the defective pills are selected. (SMP 1,4,5,6,7)

Subject Area: AP Statistics (Grade 11-12)

CCSS Conceptual Category: Statistics and Probability

CCSS Domain: Using Probability to Make Decisions (S-MD)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Calculate expected values and use them to solve problems	1. (+) define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. 2. (+) calculate the expected value of a random variable; interpret it as the mean of the probability distribution.	MA 1,3 1.4, 1.6, 1.8	Strategic Thinking	1. Students will define x as the number rolled on a 6 sided die. They will then construct a table and a probability histogram representing a probability distribution. 2. Use the formula $E=\Sigma[x \cdot P(x)]$ to find the expected value of a discrete random variable. Then, discuss why the mean of the discrete random variable is the same as the expected value.	1. Let the random variable x represent the number of girls in a family of four children. Construct a table and a histogram describing the probability distribution, then find the mean and standard deviation. Is it unusual for a family of four children to consist of four girls? 2. When you give a casino $5 for a bet on the "pass line" in a casino game of dice, there is a 251/495 probability that you will lose $5 and there is a 244/495 probability that you will make a net gain of $5. What is your expected value? Interpret it as the mean to fine how much you would lose for each dollar bet. (SMP 1,4,5,6,8)

Subject Area: AP Statistics (Grade 11-12)

CCSS Conceptual Category: Statistics and Probability

CCSS Domain: Using Probability to Make Decisions (S-MD)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Calculate expected values and use them to solve problems	3. (+) develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. 4. (+) develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.	MA 1,3 1.4, 1.6, 1.8	Strategic Thinking	3. Students will find the theoretical probability for the number of times heads appears while flipping a coin 20 times. Then, find the expected value for the number of times heads would be flipped in 500 trails. 4. Students will discuss the Empirical rule for data sets that have a distribution that is approximately bell-shaped. The rule tells us that 68% of the values fall within 1 standard devieation from the mean, 95% are 2 standard deviation from the mean, and 99.7% are 3 standard deviations form the mean. Then expected values can be found.	3. Find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes. 4. Find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households? (SMP 1,4,5,6,8)

Subject Area: AP Statistics (Grade 11-12)

CCSS Conceptual Category: Statistics and Probability

CCSS Domain: Using Probability to Make Decisions (S-MD)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Use probability to evaluate outcomes of decisions	5. (+) weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. a. find the expected payoff for a game of chance.	MA 1,3 1.4, 1.6, 1.8	Extended Thinking	5a. Students will dicuss how to find the expected winnings form a state lottery ticket, a game at a fastfood restaurant, or a casino game. They will use the correct formulas while doing practice problems.	5a. If you bet $5 on the number 13 in roulette, your probability of winning is1/38 and the payoff odds are given by the casino as 35:1. a. Find the actual odds against the outcome of 13. b. How much net profit would you make if you win by betting on 13? c. If the casino were operating just for the fun of it, and the payoff odds were changed to match the actual odds against 13, how much would you win if the outcome were13? (SMP 1,3,4,5,8)

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CCSS Domain: Using Probability to Make Decisions (S-MD)

Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Use probability to evaluate outcomes of decisions	5. (+) weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. b. evaluate and compare strategies on the basis of expected values.	MA 1,3 1.4, 1.6, 1.8	Extended Thinking	5b. Students will be given data on different insurance policies and then compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.	5b.The CNA Insurance Company charges a 21-year-old male a premim of $250 for a one-year $100,000 life insurance policy. The male has a .9985 probability of living for a year. a. What are the values of the two different outcomes if he lives or dies? b. What is the expected value for a 21-year-old male who buys the insurance? c. What would be the cost of the insurance policy if the company just breaks even instead of making a profit? (SMP 1,3,4,5,8)

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Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Use probability to evaluate outcomes of decisions	6. (+) use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).	MA 1,3 1.4, 1.6, 1.8	Extended Thinking	6. Given information about betting $5 on a roulette game in a Las Vegas casino, find the expected value if you bet on the number 7. If you bet that the oucome is an odd number, what is the expected value? Which of the options is best, bet on 7, bet on an odd number, or don't bet? Why?	6.Reader's Digest ran a sweepstakes in which prizes were listed along with the chances of winning. Given that information, find the expected value of the amount won for one entry. Then find the expected value if the cost of entering this sweepstakes is the cost of a postage stamp. Is it worth entering this contest? (SMP 1,3,4,5,8)

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Show-Me Standards

CCSS Cluster	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Use probability to evaluate outcomes of decisions	7. (+) analyze decisions and strategies using probability concepts (e.g.,product testing, medical testing, pulling a hockey goalie at the end of a game).	MA 1,3 1.4, 1.6, 1.8	Extended Thinking	7. Students will discuss how probability is used to analyze decisions and strategies. For example, in product testing, medical testing, or pulling a hockey goalie at the end of a game. Then students will work problems were probability is used to decisions.	7. In a clinical trial of Lipitor, a common drug used to lower cholesterol, 863 patients were given a treatment of tablets. 19 of those patients experienced flu symptoms. The probability of flu symptoms for a person not receiving any treatment is .019. Find the mean and standard deviation for the numbers of people in groups of 863 that can expect to have flu symptoms. Is it unusual to find that among 863 people there 19 who have flu symptoms? Do flu symptoms appear to be an adverse reaction that should be of concern to those who use Lipitor? (SMP 1,3,4,5,8)

Subject Area: AP Statistics (Grade 11-12)

Advanced Placement Topic: Hypothesis Testing

Show-Me Standards

	Common Core Standard (D)=District Standard	Show Me Standards	DOK	Instructional Strategies Student Activities/Resources	Assessment
	The students will:				
Testing a Claim About a Proportion, Mean, or Variation	use sample data to estimate a population parameter and test a hypothesis or claim about a population parameter.	MA 1,3 1.4, 1.7, 1.8 3.4, 3.5, 3.6	Extended Thinking	Students will be given a claim about a population parameter. They will write the null hypothesis and the alternative hypothesis. Next, use the correct formula to calculate the test statistic and then find the critical value or values. Then decide whether to reject the null hypothesis or fail to reject. Finally, restate this decison in simple nontechnical tems and address the original claim.	In recent years, some professional baseball players complained that umpires were calling more strikes than the average rate of 61.0% called the previous years. At one point in the seaon, umpire Dan Morrison called strikes in 2231 of 3581 pitches. Use a 0.05 significance level to test the claim that his strike rate is greater than 61.0%. SMP(1,3,4,5,6)