# Statistics: Year at a Glance

## First Semester

| **Unit**  | **Representing Data** **45 days** | **Probability** **18 days** |
| --- | --- | --- |
| **TEKS**  |  2C, 2D, **2E,** 3A**, 3B**, 3D, **4A**, **4B, 4C**, 4D, **4E**, 4F, 5A, **5C,** 5D  |  5A, 5B, 4F  |
| **Stage One Snapshot**  | * Identifying and comparing categorical and numerical variables.
* Describing and comparing categorical and numerical data and distributions.
* Choosing and creating the appropriate graphical display based on data type.
* Identify and choose correct symbol for parameters and statistics
* Identify and choose the correct measure of center (mean or median) given a data set.
* Describe the relationship between the mean and median based on the shape of the distribution.
* Choose the appropriate measure of variability (IQR, Range, Standard Deviation) based on the shape of the distribution.
* Calculate the five-number summary.
* Create a boxplot based on the five-number summary
* Identify the outliers in a data set using the 1.5IQR method.
* Describe a boxplot using C.U.S.S. and use comparative language to compare multiple boxplots.
* Compare boxplots to other graphical displays.
* Transform and combine the mean and standard deviation of data distributions.
* Describe the attributes of a normal distribution.
* Calculate and interpret z-scores.
* Calculate probabilities on a normal distribution using the Empirical Rule.
 | * Calculate the numbers of ways different events can happen using the appropriate method (Combinations, Permutations or Fundamental Counting Principle)
* Calculate probabilities using the appropriate probability model. (e.g disjoint events, complementary events, union, independence rule, addition rule, etc)
* Calculate conditional probabilities including the use of two way tables, hypothetical 1000 tables and the conditional probability equation.

  |

## Second Semester

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Design** **1st Semester – 8 days (with project)** **2nd Semester – 7 days**  | **Distributions** **19 days**  |
| **TEKS**  |  2A, 2B, 2F, **3C, 2E, 3B, 4B**  |  (All TEKS in this unit have been previously introduced) **2E, 3B, 4B, 4C**, 5A, **5C**  |
| **Stage One Snapshot**  | * Compare and contrast observational studies and experiments.
* Identify and describe the four principles of design.

(Randomization, Control, Replication and Comparison) * Identify and compare the advantages and disadvantages of three types of experimental design.
* Identify and compare the advantages and disadvantages of four types of sampling design.
* Identify the different sources of bias in sampling methods.

  | * Calculate probabilities using a discrete probability table.
* Calculate the mean and standard deviation of discrete probability distributions.
* Determine if a game is fair.
* Calculate probabilities of binomial distributions using technology.
* Calculate the mean and standard deviation of a binomial distribution.
* Construct and calculate probabilities of uniform distributions.
* Calculate the mean and standard deviation of uniform distributions.
* Calculate probabilities of normal distributions using technology. (normalcdf)
* Calculate and interpret z-scores including comparison of z-scores to make decisions based on relative standing.

  |

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Inferences** **46 days**  | **Linear Regression****8 days** |
| **TEKS**  | 6A, 6B, 6C, 6D, **6E, 6F, 6G, 6H, 6I**, 6J 2C, 2D**, 2E**, 2G, **3B, 3C,** 3D, **4A, 4B, 4C,** 5D  |  **7A**, 7B, 7C, 7D, 7E, 7F Spiraled: **2E, 3B, 4B, 4C**  |
| **Stage One Snapshot**  | * Describe the attributes of the sampling distribution of a sample proportion and a sample mean.
* Construct the confidence interval of a proportion and mean using the equation and technology.
* Identify the conditions that need to present in order to conduct inference procedures for both proportions and means.
* Interpret the resulting confidence interval of a proportion and mean in context of the data.
* Construct and interpret the confidence interval to compare two proportions or two means using technology.
* Write hypotheses in context in order to test hypotheses about a population for a single proportion, a single mean. Comparing two proportions or comparing two means.
* Calculate the p-value to test a hypothesis based on sample data using technology for both a proportion and a mean.
* Interpret the p-value to make a decision with regards to your hypothesis statements in context of the problem.
* Describe the types of errors and their consequences.
* Describe the relationship between a confidence interval and the results of a corresponding hypotheses test in context of the problem for both one and two sample mean and proportion inference procedures.
 | * Describe the types of correlation for two variables. ( linear, nonlinear, positive, negative, no correlation) • Use technology to calculate the correlation coefficient (r)
* Construct regression models using technology.
* Calculate the LSRL using technology.
* Use the LSRL to make predictions on your data.
* Interpret the values of slope, y-intercept and the correlation coefficient in context of the problem.
* Calculate and interpret residuals.
* Compare and contrast typical values, influential points and outliers.
 |

# Texas Essential Knowledge and Skills

1. **Mathematical process standards.** The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:
	1. apply mathematics to problems arising in everyday life, society, and the workplace;
	2. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
	3. select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems; (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
	4. create and use representations to organize, record, and communicate mathematical ideas;
	5. analyze mathematical relationships to connect and communicate mathematical ideas; and
	6. display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.
2. **Statistical process sampling and experimentation**. The student applies mathematical processes to apply understandings about statistical studies, surveys, and experiments to design and conduct a study and use graphical, numerical, and analytical techniques to communicate the results of the study. The student is expected to: (A) compare and contrast the benefits of different sampling techniques, including random sampling and convenience sampling methods;
	1. distinguish among observational studies, surveys, and experiments;
	2. analyze generalizations made from observational studies, surveys, and experiments;
	3. distinguish between sample statistics and population parameters;
	4. formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions;
	5. communicate methods used, analyses conducted, and conclusions drawn for a data-analysis project through the use of one or more of the following: a written report, a visual display, an oral report, or a multi-media presentation; and
	6. critically analyze published findings for appropriateness of study design implemented, sampling methods used, or the statistics applied.
3. **Variability**. The student applies the mathematical process standards when describing and modeling variability. The student is expected to:
	1. distinguish between mathematical models and statistical models;
	2. construct a statistical model to describe variability around the structure of a mathematical model for a given situation;
	3. distinguish among different sources of variability, including measurement, natural, induced, and sampling variability; and
	4. describe and model variability using population and sampling distributions.
4. **Categorical and quantitative data**. The student applies the mathematical process standards to represent and analyze both categorical and quantitative data. The student is expected to:
	1. distinguish between categorical and quantitative data;
	2. represent and summarize data and justify the representation;
	3. analyze the distribution characteristics of quantitative data, including determining the possible existence and impact of outliers;
	4. compare and contrast different graphical or visual representations given the same data set;
	5. compare and contrast meaningful information derived from summary statistics given a data set; and
	6. analyze categorical data, including determining marginal and conditional distributions, using two-way tables.
5. **Probability and random variables**. The student applies the mathematical process standards to connect probability and statistics. The student is expected to:
	1. determine probabilities, including the use of a two-way table;
	2. describe the relationship between theoretical and empirical probabilities using the Law of Large Numbers; **(C)** construct a distribution based on a technology-generated simulation or collected samples for a discrete random variable; and

(D) compare statistical measures such as sample mean and standard deviation from a technology-simulated sampling distribution to the theoretical sampling distribution.

1. **Inference**. The student applies the mathematical process standards to make inferences and justify conclusions from statistical studies. The student is expected to:
	1. explain how a sample statistic and a confidence level are used in the construction of a confidence interval; (B) explain how changes in the sample size, confidence level, and standard deviation affect the margin of error of a confidence interval;
	2. calculate a confidence interval for the mean of a normally distributed population with a known standard deviation;
	3. calculate a confidence interval for a population proportion;
	4. interpret confidence intervals for a population parameter, including confidence intervals from media or statistical reports;
	5. explain how a sample statistic provides evidence against a claim about a population parameter when using a hypothesis test;
	6. construct null and alternative hypothesis statements about a population parameter;
	7. explain the meaning of the p-value in relation to the significance level in providing evidence to reject or fail to reject the null hypothesis in the context of the situation;
	8. interpret the results of a hypothesis test using technology-generated results such as large sample tests for proportion, mean, difference between two proportions, and difference between two independent means; and (J) describe the potential impact of Type I and Type II Errors.
2. **Bivariate data**. The student applies the mathematical process standards to analyze relationships among bivariate quantitative data. The student is expected to:
	1. analyze scatterplots for patterns, linearity, outliers, and influential points;
	2. transform a linear parent function to determine a line of best fit;
	3. compare different linear models for the same set of data to determine best fit, including discussions about error;
	4. compare different methods for determining best fit, including median-median and absolute value;
	5. describe the relationship between influential points and lines of best fit using dynamic graphing technology; and
	6. identify and interpret the reasonableness of attributes of lines of best fit within the context, including slope and y-intercept.