Statistics

Unit 1: Survey Says

Texas Essential Knowledge and Skills (TEKS)

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

S.1A apply mathematics to problems arising in everyday life, society, and the workplace;

S.1B 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;

S.1C 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;

S.1D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

S.1E create and use representations to organize, record, and communicate mathematical ideas;

S.1F analyze mathematical relationships to connect and communicate mathematical ideas; and

S.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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:

S.2A compare and contrast the benefits of different sampling techniques, including random sampling and convenience sampling methods;

S.2B distinguish among observational studies, surveys, and experiments;

S.2C analyze generalizations made from observational studies, surveys, and experiments;

S.2E formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions;

S.2F 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

S.2G critically analyze published findings for appropriateness of study design implemented, sampling methods used, or the statistics applied.

The student applies the mathematical process standards when describing and modeling variability. The student is expected to:

S.3C distinguish among different sources of variability, including measurement, natural, induced, and sampling variability;

Unit Big Ideas/Learning Targets

- I can distinguish between data collection methods and determine if a statistical question is valid in order to make decisions.
- I can identify sources of bias in a sample, evaluate its impact on collected data, and explain how to avoid bias when collecting data.
- I can distinguish among different sources of variability to analyze and communicate information about

collected data.

- I can compare and contrast the benefits of different sampling techniques.
- I can critically analyze published findings for appropriateness of study design implemented, sampling methods used, or the statistics applied.
- I can formulate a statistical question, select an appropriate data collection method, gather and analyze the data, and draw reasonable conclusions.

Statistics

Unit 2: Do You See What I See?

Texas Essential Knowledge and Skills (TEKS)

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

S.1A apply mathematics to problems arising in everyday life, society, and the workplace;

S.1B 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;

S.1C 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;

S.1D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

S.1E create and use representations to organize, record, and communicate mathematical ideas;

S.1F analyze mathematical relationships to connect and communicate mathematical ideas; and

S.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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:

S.2C analyze generalizations made from observational studies, surveys, and experiments;

S.2D distinguish between sample statistics and population parameters;

S.2E formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions;

S.2F 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

S.2G critically analyze published findings for appropriateness of study design implemented, sampling methods used, or the statistics applied.

The student applies the mathematical process standards to represent and analyze both categorical and quantitative data. The student is expected to:

S.4A distinguish between categorical and quantitative data;

S.4B represent and summarize data and justify the representation;

S.4C analyze the distribution characteristics of quantitative data, including determining the possible existence and impact of outliers;

S.4D compare and contrast different graphical or visual representations given the same data set;

S.4E compare and contrast meaningful information derived from summary statistics given a data set; and

S.4F analyze categorical data, including determining marginal and conditional distributions, using two-way tables.

Unit Big Ideas/Learning Targets

- I can distinguish between categorical and quantitative data.
- I can represent, analyze, and draw conclusions about categorical data.
- I can represent, analyze, and draw conclusions about quantitative data.
- I can summarize distributions of quantitative variables numerically.

Statistics

Unit 3: Seeing Double

Texas Essential Knowledge and Skills (TEKS)

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

S.1A apply mathematics to problems arising in everyday life, society, and the workplace;

S.1B 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;

S.1C 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;

S.1D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

S.1E create and use representations to organize, record, and communicate mathematical ideas;

S.1F analyze mathematical relationships to connect and communicate mathematical ideas; and

S.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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:

S.2E formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions;

S.2F 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.

The student applies the mathematical process standards when describing and modeling variability. The student is expected to:

S.3A distinguish between mathematical models and statistical models;

S.3B construct a statistical model to describe variability around the structure of a mathematical model for a given situation;

S.3D describe and model variability using population and sampling distributions.

The student applies the mathematical process standards to represent and analyze both categorical and quantitative data. The student is expected to:

S.4B represent and summarize data and justify the representation.

The student applies the mathematical process standards to analyze relationships among bivariate quantitative data. The student is expected to:

S.7A analyze scatterplots for patterns, linearity, outliers, and influential points;

S.7B transform a linear parent function to determine a line of best fit;

S.7C compare different linear models for the same set of data to determine best fit, including discussions about error;

S.7D compare different methods for determining best fit, including median-median and absolute value;
S.7E describe the relationship between influential points and lines of best fit using dynamic graphing technology; and
S.7F identify and interpret the reasonableness of attributes of lines of best fit within the context, including slope and y-intercept.

Unit Big Ideas/Learning Targets

- I can represent and analyze data using scatterplots. I can describe the strength of a relationship by analyzing overall patterns displayed in a scatterplot using precise mathematical language.
- I can estimate and interpret the correlation between two variables from a scatterplot. I can distinguish correlation from causation.
- I can calculate using technology and apply the properties of correlation between two variables from a scatterplot. I can describe how outliers influence the correlation using precise mathematical language.
- I can calculate and interpret a residual. I can interpret the slope and y-intercept and make predictions using regression lines.
- I can calculate the equation of the least squares regression line using technology and summary statistics. I can describe how outliers affect the regression line by comparing different methods for determining best fit.

Statistics

Unit 4: What Are the Chances?

Texas Essential Knowledge and Skills (TEKS)

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

S.1A apply mathematics to problems arising in everyday life, society, and the workplace;

S.1B 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;

S.1C 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;

S.1D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

S.1E create and use representations to organize, record, and communicate mathematical ideas;

S.1F analyze mathematical relationships to connect and communicate mathematical ideas; and

S.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

The student applies the mathematical process standards to connect probability and statistics. The student is expected to:

S.5A determine probabilities, including the use of a two-way table;

S.5B describe the relationship between theoretical and empirical probabilities using the Law of Large Numbers;

Unit Big Ideas/Learning Targets

- I can use a simulation to create a probability model from data and use it to make predictions. I can justify my solutions and the reasonableness of my answer using precise mathematical language.
- I can use a two way table to determine probabilities. I can explain my reasoning using logical arguments and determine reasonableness of solutions.
- I can make sense of and solve probability problems in a variety of situations. I can justify my solutions and explain my reasoning using logical arguments.

Statistics

Unit 5: Above the Norm

Texas Essential Knowledge and Skills (TEKS)

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

S.1A apply mathematics to problems arising in everyday life, society, and the workplace;

S.1B 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;

S.1C 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;

S.1D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

S.1E create and use representations to organize, record, and communicate mathematical ideas;

S.1F analyze mathematical relationships to connect and communicate mathematical ideas; and

S.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

The student applies the mathematical process standards to connect probability and statistics. The student is expected to:

S.5A determine probabilities, including the use of a two-way table;

S.5B describe the relationship between theoretical and empirical probabilities using the Law of Large Numbers;

S.5C construct a distribution based on a technology-generated simulation or collected samples for a discrete random variable.

Unit Big Ideas/Learning Targets

- I can calculate probabilities involving a discrete random variable from a probability distribution and justify my reasoning with mathematical ideas.
- I can make a histogram to display the probability distribution of a discrete random variable, and calculate and interpret its shape, center and spread. I can use representations to communicate mathematical reasoning and their implications.
- I can represent a situation with continuous random variables as a normal probability distribution and identify its key features.
- I can use a normal distribution to calculate probabilities.

Statistics

Unit 6: Building Confidence

Texas Essential Knowledge and Skills (TEKS)

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

S.1A apply mathematics to problems arising in everyday life, society, and the workplace;

S.1B 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;

S.1C 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;

S.1D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

S.1E create and use representations to organize, record, and communicate mathematical ideas;

S.1F analyze mathematical relationships to connect and communicate mathematical ideas; and

S.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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:

S.2D distinguish between sample statistics and population parameters;

S.2E formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions; and

S.2F 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.

The student applies the mathematical process standards when describing and modeling variability. The student is expected to:

S.3D describe and model variability using population and sampling distributions.

The student applies the mathematical process standards to connect probability and statistics. The student is expected to:

S.5D compare statistical measures such as sample mean and standard deviation from a technology-simulated sampling distribution to the theoretical sampling distribution.

The student applies the mathematical process standards to make inferences and justify conclusions from statistical studies. The student is expected to:

S.6A explain how a sample statistic and a confidence level are used in the construction of a confidence interval;

S.6B explain how changes in the sample size, confidence level, and standard deviation affect the margin of error of a confidence interval;

S.6C calculate a confidence interval for the mean of a normally distributed population with a known standard deviation;

S.6D calculate a confidence interval for a population proportion; and
S.6E interpret confidence intervals for a population parameter, including confidence intervals from media or statistical reports.

Unit Big Ideas/Learning Targets

- I can compare statistical measures from a technology-simulated sampling distribution to the theoretical sampling distribution. I can justify my solutions and explain my reasoning using logical arguments.
- I can describe the key characteristics of a sampling distribution for the sample proportion. I can explain my reasoning using logical arguments.
- I can describe the key characteristics of a sampling distribution for the sample mean. I can explain my reasoning using logical arguments.
- I can explain how confidence intervals are constructed and utilized to describe real world situations.
- I can calculate and interpret a confidence interval for a population proportion in real world contexts.
- I can calculate and interpret a confidence interval for a population mean in real world contexts.

Statistics

Unit 7: Hypothetically Speaking

Texas Essential Knowledge and Skills (TEKS)

The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

S.1A apply mathematics to problems arising in everyday life, society, and the workplace;

S.1B 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;

S.1C 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;

S.1D communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

S.1E create and use representations to organize, record, and communicate mathematical ideas;

S.1F analyze mathematical relationships to connect and communicate mathematical ideas; and

S.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

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:

S.2D distinguish between sample statistics and population parameters;

S.2E formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions;

S.2F 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

The student applies the mathematical process standards to make inferences and justify conclusions from statistical studies. The student is expected to:

S.6F explain how a sample statistic provides evidence against a claim about a population parameter when using a hypothesis test;

S.6G construct null and alternative hypothesis statements about a population parameter;

S.6H 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;

S.6I 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;

S.6J describe the potential impact of Type I and Type II Errors.

Unit Big Ideas/Learning Targets

- I can state the appropriate null and alternative hypotheses for a significance test about a population parameter and communicate conclusions.
- I can test a claim about a proportion using technology and communicate conclusions.
- I can test a claim about a mean using technology and communicate conclusions.

- I can determine if the results of a study are statistically significant and communicate conclusions using a significance level.
- I can interpret a Type I error and a Type II error in context.
- I can test a claim about a difference between two proportions using technology and communicate conclusions.
- I can test a claim about a difference between two means using technology and communicate conclusions.