Statistics

Sayreville War Memorial

High School

School 5 Credits

Full Year

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Date Curriculum Approved/ Revised:

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Statement of Purpose

We live in a world where uncertainty is ever-present. In order to avoid common errors in human judgment and decision-making, we rely on probability and statistics to assist us in making informed decisions. The concepts learned in an introductory statistics course are utilized often in myriad disciplines and form the foundation for effective research. In an increasingly global world, the need for proper decision-making is of paramount importance. Individuals must understand how to analyze and justify claims in all facets of life. Statistics provides that basis and is used in everything from public policy planning to research in the behavioral sciences. Statistics is an essential component to a well-rounded education.

Summary of the Course:

In this course, students will learn the concepts that serve as the foundation for the study of probability and statistics. Students will see how fields outside of mathematics use statistics to analyze and interpret data to make informed decisions. With the assistance of technology such as the TI83/84 graphing calculator, they will apply these concepts in myriad ways to critically analyze and synthesize information. This course mirrors that of a college level introductory statistics course.

Unit 1 – Introduction to Statistics

Content Area: **Mathematics**
Course(s):
Time Period: **1st Marking Period**
Length: **13 Days**
Status: **Not Published**

Unit 1 – Introduction to Statistics

In this unit, students will learn ways to organize and describe data sets. The goal will be to make data easier to understand by making it easier to see trends, averages and variations.

Summary of the Unit

In this unit, students will learn ways to organize and describe data sets. The goal will be to make data easier to understand by making it easier to see trends, averages and variations.

Enduring Understandings

- Analyze sample data relative to context, source, and sampling method
- Understand the difference between statistical significance and practical significance
- Define and identify a voluntary response sample and know that statistical conclusions based on data from such a sample are generally not valid
- Distinguish between a parameter and a statistic
- Distinguish between quantitative and qualitative data
- Distinguish between discrete and continuous data
- Determine whether basic statistical calculations are appropriate for a particular data set.
- Define and identify a simple random sample
- Understand the importance of sound sampling methods and the importance of good design of experiments

Essential Questions

- What are the various ways we can graphically represent frequency distributions? How do they differ? How are they similar?
- What determines whether data is qualitative or quantitative?
- What are the measures of central tendency? How are they determined? How are they similar? How do they differ?
- How can measures of variation be determined and interpreted?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
1.1 Statistical and Critical Thinking	• Analyze sample data relative to context, source, and sampling method • Understand the difference between statistical significance and practical significance • Define and identify a voluntary response sample and know that statistical conclusions based on data from such a sample are generally not valid	• Conduct a class survey and determine what conclusions can be made. Discuss valid conclusions versus invalid conclusions • Discuss the importance of misleading statistics in decision making. Have students conduct a survey and arrive at conclusions that data supports, but logic does not. Apply reasoning to political statements and	• Introduce student portfolio. Students will choose 3 broad topics that interest them. Throughout the year, students will choose one topic and narrow their research.	S-IC.A.1 S-IC.B.3

		medicinal ads.		
1.2 Types of Data	• Distinguish between a parameter and a statistic • Distinguish between quantitative and qualitative data • Distinguish between discrete and continuous data • Determine whether basic statistical calculations are appropriate for a particular data set.	• Using their topics as guides, students will create a survey based on an issue that is relevant. • Using a study, discuss the differences between qualitative and quantitative data. Can different conclusions be drawn from different types of data for the same survey? • Choosing qualitative versus quantitative	• Students will create a qualitative and a quantitative survey about one of their topics of interest and reflect on which was more helpful and why.	S-IC.A.1 S-IC.B.3
1.3 Collecting Sample Data	• Define and identify a simple random sample • Understand the importance of sound sampling methods and the importance of good design of experiments	• In groups, students will create surveys based on a certain topic. Each student in the group will use a different surveying technique (random, clustered, convenience, blocks, etc.)	• Unit 1 Assessment	S-IC.B.3 S-IC.B.4

Suggested Modifications for Special Education, ELL and Gifted Students

- Modified class work, homework, quizzes, and tests.
- Extra time when needed.
- Use of calculator.
- Provided with guided notes and study guides.
- Extra reinforcement to stay on task.
- If appropriate, native language glossary

Suggested Technological Innovations/Use

- Students will use technology (Google Forms) to obtain survey information
- Students will use Microsoft software (Excel, Power Point, Word) to organize their information
- Students and Teacher will use the Internet to research and find reliable sources
- Students will use online presentation tools such as Prezi, Canva, etc. to create infographics and visually appealing presentations
- Teacher can choose to use online assessment and presentation tools such as GoFormative, edpuzzle, YouTube, socrative, etc.

Cross Curricular/21st Century Connections

9.1: 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

9.2: 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

9.3: 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

Unit 2 – Summarizing and Graphing

Content Area: **Mathematics**
Course(s):
Time Period: **1st Marking Period**
Length: **13 Days**
Status: **Not Published**

Summarizing and Graphing

In this unit, students will learn ways to organize and describe data sets. The goal will be to make data easier to understand by making it easier to see trends, averages and variations.

Summary of the Unit

Graphs produce visual displays of data in meaningful ways. Students will decide which statistical graph best fits a given set of data. Students will synthesize various types of graphs for given data sets.

Enduring Understandings

- Define the characteristics of a Pareto chart and compare and contrast to bar graphs.
- Explain the use of the break and show examples of graphs with inconsistent scales to emphasize importance of correct scales.
- Define and create circle graphs.
- Create and define a time-series graph.
- Delineate the steps in creating a histogram while emphasizing the differences between it and a bar graph
- Define and create a stem-and-leaf plot.

Essential Questions

- What is a bar graph?
- What are the differences between a bar graph and a Pareto chart?
- Why is a correct scale important when creating graphs?
- What is a circle graph and how are they created?
- What is a time-series graph?
- What is a histogram and how is it different from a bar graph?
- How is data ordered using a stem-and-leaf plot?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
2.1 Frequency Distributions for Organizing and Summarizing Data	• Develop an ability to summarize data in the format of a frequency distribution and a relative frequency distribution • For a frequency distribution, identify vales of class width, class midpoint, class limits and class boundaries.	• Using a frequency table to convert to percentages • Students will be given the results of a survey and create an infographic to display results. Class will discuss which infographic is the most appealing and why?	• Online assessment 2-1	S-ID.A.1 S-ID.C.8 S-ID.C.9
2.2 Histograms	• Develop the ability to summarize data in the format of a frequency distribution and a relative frequency distribution • Examine a	• Using their topics as guides, students will create a survey and a histogram to display it collected data • Students will analyze each	• Students will create a survey based on their research topic and use the data to make a histogram.	S-ID.A.1 S-ID.C.8 S-ID.C.9

	histogram and identify common distributions, including a uniform distribution and a normal distribution	other's graphs for skewness or normal distributions		
2.3 Graphs that Enlighten and Graphs that Deceive	• Develop an ability to graph data using a dotplot, stemplot, time-series graph, Pareto chart, pie chart, and frequency polygon • Determine when a graph is deceptive through the use of a nonzero axis or a pictograph that uses an object of area or volume for one-dimensional data.	• In groups, students will create surveys based on a certain topic. Each student in the group will use a different data-displaying technique (dotplot, stemplot, time-series, Pareto, PieChart, and Frequency Polygon.) • Students will create misleading graphs using nonzero axis and 2D/3D pictographs for 1 dimensional data.	• Student response prompt based on deceiving pictograph graded using teacher-made rubric	S-ID.A.1 S-ID.C.8 S-ID.C.9
2.4 Scatterplots and Regression	• Develop an ability to construct a scatterplot of paired data • Analyze a scatterplot to determine whether there appears to be a correlation between two	• Students will examine scatter plots with and without correlation. • Students will algebraically calculate correlation using *r* and P-Values • Students will	• Unit 2 Assessment	S-ID.A.1 S-ID.C.8 S-ID.C.9

	variables.	use the regression equation to determine the line of best fit. • Students will use an TI-84 to plot data and calculate values		

Suggested Modifications for Special Education, ELL and Gifted Students

- Modified class work, homework, quizzes, and tests.
- Extra time when needed.
- Use of calculator.
- Provided with guided notes and study guides.
- Extra reinforcement to stay on task.
- If appropriate, native language glossary

Suggested Technological Innovations/Use

- Students will use technology (Google Forms) to obtain survey information
- Students will use Microsoft software (Excel, Power Point, Word) to organize their information
- Students and Teacher will use the Internet to research and find reliable sources
- Students will use online presentation tools such as Prezi, Canva, etc. to create infographics and visually appealing presentations
- Teacher can choose to use online assessment and presentation tools such as GoFormative, edpuzzle, YouTube, socrative, etc.

Cross Curricular/21st Century Connections

9.1: 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

9.2: 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

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apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

Unit 3 – Describing, Exploring and Comparing Data

Content Area: **Mathematics**
Course(s):
Time Period: **1st Marking Period**
Length: **10 Days**
Status: **Not Published**

Summarizing and Graphing

Measuring the spread of data is essential for comparing data sets. Students will utilize various methods of central tendency to determine the spread of data. Students will determine whether they are working with a sample or a population and utilize the appropriate formulae to measure central tendencies.

Summary of the Unit

Measuring the spread of data is essential for comparing data sets. Students will utilize various methods of central tendency to determine the spread of data. Students will determine whether they are working with a sample or a population and utilize the appropriate formulae to measure central tendencies.

Enduring Understandings

- Define mean, median, and mode.
- Define trimmed mean and explain its use when dealing with outliers.
- Define weighted average. Introduce and define the concepts of standard deviation and variance.
- Define Chebyshev's Theorem and its use in determining percentages of data within a set number of standard deviations.
- Establish the median is the 50th percentile and then use box-and-whisker plots to visualize the remaining percentiles.

Essential Questions

- How do mean, median, and mode relate to the concept of central tendency?
- In what situations would a trimmed mean be preferable to a regular mean?
- How does one find an average when values have different weights?
- What are some limiting factors when using mean, median, and mode to describe data?
- How does standard deviation relate to the spread of data?
- How does the median relate to percentiles?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
3.1 Measures of Center	• Develop the ability to measure the center of data by finding the mean, median, mode and midrange • Determine whether an outlier has a substantial effect on the mean and median	• Students will create surveys and calculate the measures of central tendency • Students will discuss what it means when a company says they have a median salary versus an average salary. What is the difference?	• Students will use their research topic to create a survey and calculate the measures of central tendency. Which is most telling? Is any of the data skewed?	S-ID.A.2
3.2 Measures of Variation	• Develop the ability to measure variation in a set of sample data by finding vales of the range, variance, and standard deviation. • Develop the ability to	• Use TI-84 to calculate the standard deviation of a set of a data • Use pre-made survey results to investigate variation in data.	• Students will analyze published study based on their topic.	S-ID.A.4

	interpret vales of the standard deviation by applying the range rule of thumb to determine whether a particular value is significantly low or high.			
3.3 Measures of Relative Standing and Boxplots	• Develop the ability to compute a z score and use the result to determine whether a given value x is significantly low or high. • Identify percentile values and quartile values from a set of data • Develop the ability to construct a boxplot from a set of data.	• Using percentiles and quartiles in the medical field • Using percentiles and quartiles in government surveys and studies • Students will use online tools to create a boxplot from a data set	• Unit 3 Assessment	S-ID.A.4

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Unit 4 – Normal Probability Distributions

Content Area: **Mathematics**
Course(s):
Time Period: **December**
Length: **23**
Status: **Not Published**

Summarizing and Graphing

The distribution of outcomes of many real life events can be approximated by the normal curve. Students will utilize the area under the Normal Curve to answer probabilistic questions. Students will apply the Central Limit Theorem to determine the likelihood of the occurrence of an event.

Summary of the Unit

The distribution of outcomes of many real life events can be approximated by the normal curve. Students will utilize the area under the Normal Curve to answer probabilistic questions. Students will apply the Central Limit Theorem to determine the likelihood of the occurrence of an event.

Enduring Understandings

- Establish conditions for the normal curve.
- Explain the connection between standard deviation and the normal curve.
- Apply the formula for calculating z-scores and applying them to the normal curve.
- Use the normal cumulative density calculator functions normalpdf and normalcdf.
- Define both parameter and statistic. Define the Central Limit Theorem.
- Establish conditions for the application of the Central Limit Theorem.

Essential Questions

- When does a normal curve exist?
- What is the Empirical Rule?
- What is a z-score?
- How does one use the area under the normal curve to calculate probabilities?
- What is the different between a parameter and a statistic?
- What is the Central Limit Theorem?
- How is the Central Limit Theorem applied to sampling distributions?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
6.1 The Standard Normal Distribution	• Describe the characteristics of a standard normal distribution • Find the probability of some range of z values in a standard normal distribution	• Students will create surveys and create a bell curve to display their data • What does an outlier do to the distribution of data? Use technology to see the difference in graphs with and without the outlier	• Students will choose 1 topic from their initial 3 topics to focus on for the remainder of the school year. Students will develop a hypothesis and specific subtopic they are focusing on.	S-MD.A.1 S-MD.A.3
6.2 Real Applications of Normal Distributions	• Develop the ability to describe a normal distribution (not necessarily a standard normal distribution). • Find the probability of some range of values in a normal distribution	• Using data to make decisions. Students will research medicines and their side effects focusing on why there are so many side effects listed.	• Students will analyze published study based on their topic.	S-MD.A.1 S-MD.A.3

	• Find x scores corresponding to regions under the curve representing a normal distribution.			
6.3 Sampling Distributions and Estimators	• Develop the ability to describe a sampling distribution of a statistic • Determine whether a statistic serves a s a good estimator of the corresponding population parameter	• Use tables to create a sample distribution. • Making inferences from biased and unbiased estimators	• Quiz 6.1-6.3	S-MD.A.1 S-MD.A.3
6.4 The Central Limit Theorem	• Describe what the central limit theorem states • Apply the central limit theorem by finding the probability that a sample mean falls within some specified range of values • Identify conditions for which it is appropriate to use a normal distribution for the sample means	• Sampling of pennies (each student brings in a penny. What are the frequency of years drawn?) What does the distribution look like? Why?	• Using their topic, find a survey that does not have normal distribution. If one is unable to be found, make a hypothesis as to why.	S-MD.A.1 S-MD.A.3
6.5 Assessing Normality	• Develop the ability to examine histograms, outliers, and normal quartile	• Students will use technology to analyze normal quantile plots	• Quiz 6.4-6.5	S-MD.A.1 S-MD.A.3

	plots to determine whether sample data appear to be from a population having a distribution that is approximately normal	in relation to their counterpart histograms. Is the data consistent?		
6.6 Normal as Approximation to Binomial	• Identify conditions for which it is appropriate to use a normal distribution as an approximation to a binomial probability distribution • Use the normal distribution for approximating probabilities for binomial distribution	• Students will use Z-scores and charts to calculate standard deviation	• Unit 4 (Chapter 6) • Assessment	S-MD.A.1 S-MD.A.3

Suggested Modifications for Special Education, ELL and Gifted Students

- Modified class work, homework, quizzes, and tests.
- Extra time when needed.
- Use of calculator.
- Provided with guided notes and study guides.
- Extra reinforcement to stay on task.
- If appropriate, native language glossary

Suggested Technological Innovations/Use

- Students will use technology (Google Forms) to obtain survey information
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- Students will use online presentation tools such as Prezi, Canva, etc. to create infographics and visually

appealing presentations

- Teacher can choose to use online assessment and presentation tools such as GoFormative, edpuzzle, YouTube, socrative, etc.

Cross Curricular/21st Century Connections

9.1: 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

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Unit 5 – Estimating Parameters and Determining Sample Sizes

Content Area: **Mathematics**
Course(s):
Time Period: **2nd Marking Period**
Length: **14**
Status: **Not Published**

Summarizing and Graphing

The larger the sample, the more accurate the data is when mapped onto a population. To determine if two data sets affect each other, Chi-Square analysis is used.

Summary of the Unit

The larger the sample, the more accurate the data is when mapped onto a population. To determine if two data sets affect each other, Chi-Square analysis is used.

Enduring Understandings

- Define a confidence interval.
- Distinguish between a point estimate and an interval estimate.
- Utilize the graphing calculator to solve for a ZInterval.
- Discuss various ways to write the solution in layman's terms.
- Apply the appropriate formula using either the z statistic or the t statistic.
- Show the difference in the formulae given a known or unknown standard deviation.
- To determine if two data sets affect each other, Chi-Square analysis is used

Essential Questions

- What is a confidence interval?
- How does one construct a confidence interval?
- How does one interpret the solution to a confidence interval?
- How does one compute a confidence interval for two population means?
- Why is it important to determine if the standard deviation is known or unknown?
- What does it mean for two data sets to be considered independent?
- Why is it important to understand hypothesis testing prior to using Chi-Square?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
6.1 The Standard Normal Distribution	• Describe the characteristics of a standard normal distribution • Find the probability of some range of z values in a standard normal distribution	• Students will create surveys and create a bell curve to display their data • What does an outlier do to the distribution of data? Use technology to see the difference in graphs with and without the outlier	• Students will choose 1 topic from their initial 3 topics to focus on for the remainder of the school year. Students will develop a hypothesis and specific subtopic they are focusing on.	S-MD.A.1 S-MD.A.3
6.2 Real Applications of Normal Distributions	• Develop the ability to describe a normal distribution (not necessarily a standard normal distribution). • Find the probability of some range of values in a normal	• Using data to make decisions. Students will research medicines and their side effects focusing on why there are so many side effects listed.	• Students will analyze published study based on their topic.	S-MD.A.1 S-MD.A.3

	distribution • Find x scores corresponding to regions under the curve representing a normal distribution.			
6.3 Sampling Distributions and Estimators	• Develop the ability to describe a sampling distribution of a statistic • Determine whether a statistic serves a s a good estimator of the corresponding population parameter	• Use tables to create a sample distribution. • Making inferences from biased and unbiased estimators	• Quiz 6.1-6.3	S-MD.A.1 S-MD.A.3
6.4 The Central Limit Theorem	• Describe what the central limit theorem states • Apply the central limit theorem by finding the probability that a sample mean falls within some specified range of values • Identify conditions for which it is appropriate to use a normal distribution for the sample means	• Sampling of pennies (each student brings in a penny. What are the frequency of years drawn?) What does the distribution look like? Why?	• Using their topic, find a survey that does not have normal distribution. If one is unable to be found, make a hypothesis as to why.	S-MD.A.1 S-MD.A.3
6.5 Assessing Normality	• Develop the ability to examine histograms, outliers, and	• Students will use technology to analyze normal	• Quiz 6.4-6.5	S-MD.A.1 S-MD.A.3

	normal quartile plots to determine whether sample data appear to be from a population having a distribution that is approximately normal	quantile plots in relation to their counterpart histograms. Is the data consistent?		
6.6 Normal as Approximation to Binomial	• Identify conditions for which it is appropriate to use a normal distribution as an approximation to a binomial probability distribution • Use the normal distribution for approximating probabilities for binomial distribution	• Students will use Z-scores and charts to calculate standard deviation	• Unit 4 (Chapter 6) • Assessment	S-MD.A.1 S-MD.A.3

Suggested Modifications for Special Education, ELL and Gifted Students

- Modified class work, homework, quizzes, and tests.
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- Use of calculator.
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Suggested Technological Innovations/Use

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- Students will use online presentation tools such as Prezi, Canva, etc. to create infographics and visually appealing presentations
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Unit 6 – Hypothesis Testing

Content Area: **Mathematics**
Course(s):
Time Period: **3rd Marking Period**
Length: **14**
Status: **Not Published**

Summarizing and Graphing

Claims must be rigorously tested against quantitative sets of standards. Students will decide whether to reject or fail to reject a claim by using hypothesis testing. Students will determine whether the data fits a mean or a proportion, and then utilize appropriate testing methods.

Summary of the Unit

Claims must be rigorously tested against quantitative sets of standards. Students will decide whether to reject or fail to reject a claim by using hypothesis testing. Students will determine whether the data fits a mean or a proportion, and then utilize appropriate testing methods.

Enduring Understandings

- Define hypothesis testing and all applicable terms.
- Define left-tailed, right-tailed, and two-tailed testing
- Define Type I and Type II errors.
- Apply hypothesis testing for dependent samples.
- Apply hypothesis testing for independent samples.
- Use the Ztest, Ttest, , 1-PropZtest2-SampZTest, and 2-PropZtest functions on the graphing calculator.

Essential Questions

- What is hypothesis testing? What are the types of hypothesis tests?
- What are the two types of errors are possible when hypothesis testing?
- How does one test for differences between dependent samples?
- How does one test for difference in means and proportions in independent samples?
- How does one apply the graphing calculator for hypothesis testing?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
8.1 Basis of hypothesis Testing	• Develop the ability to identify the null and alternative hypotheses when given some claim about a population parameter • Develop the ability to calculate a test statistic, find critical vales, calculate P-values, and state a final conclusion that addresses the original claim	• Students will create and test hypotheses • Students will create a product and test different hypotheses about marketing the product	• Prompt: How do businesses make decisions about their products and marketing?	S-MD.A.1 S-MD.A.3
8.2 Testing a Claim about a Proportion	• Develop the ability to use sample data to conduct a formal hypothesis test of a	• Students will use conduct research about their prototype and marketing	• Online mid chapter assessment	S-MD.A.1 S-MD.A.3

	claim about a population proportion.	solutions		
8.3 Testing a Claim about a Mean	• Develop the ability to conduct a formal hypothesis test of a claim made about a population mean.	• Students will collect data and compare their hypotheses to the mean of their data collection	• Student portfolio: develop a hypothesis and research based on your topic of interest.	S-MD.A.1 S-MD.A.3
8.4 Testing a Claim about a Standard Deviation	Develop the ability to conduct a formal hypothesis test of a claim made about a population standard deviation or variance	• Students will present their prototype and business methods.	• Chapter 8 Assessment	S-MD.A.1 S-MD.A.3

Suggested Modifications for Special Education, ELL and Gifted Students

- Modified class work, homework, quizzes, and tests.
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- Use of calculator.
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Suggested Technological Innovations/Use

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Unit 7 - Inferences from Two Samples

Content Area: **Mathematics**
Course(s):
Time Period: **3rd Marking Period**
Length: **14**
Status: **Not Published**

Summarizing and Graphing

Claims must be rigorously tested against quantitative sets of standards. Students will decide whether to reject or fail to reject a claim by using hypothesis testing. Students will determine whether the two-sample data fits a mean or a proportion, and then utilize appropriate testing methods.

Summary of the Unit

Claims must be rigorously tested against quantitative sets of standards. Students will decide whether to reject or fail to reject a claim by using hypothesis testing. Students will determine whether the data fits a mean or a proportion, and then utilize appropriate testing methods.

Enduring Understandings

-
    - Apply hypothesis testing for independent variables
    - Apply hypothesis testing for dependent variables
    - Determine if sample means are significantly different

Essential Questions

- How can we determine if sample percentages are significantly different?
- Why might it be necessary to determine if there is a difference between two data sets?
- What does it mean for two data sets to be considered independent?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
9.1 Two Proportions	• Conduct a formal hypothesis test of a claim made about two population proportions • Construct a confidence interval estimate of the difference between two population proportions	• Students will create a test hypothesis between two samples of the population.	• Prompt: What makes a statistical difference between data? How can this data be used to misconstrue statistics in advertising?	S-ID.B.5
9.2 Two Means: Independent Samples	• Distinguish between a situation involving two independent samples and a situation involving two samples that are not independent • Construct a confidence interval estimate of the difference between two population proportions	• Students will look at data between heights of women and men. Students will look at data between heights of husband and wife. Using this data, students will draw a conclusion about independent vs. dependent.	• Student Portfolio: What are two samples that could be independently related based on your topic?	S-ID.B.5 S-ID.B.6

9.3 Two Dependent Samples (Matched Pairs)	• Identify sample data consisting of matched pairs • Conduct a formal hypothesis test of a claim made about two means from independent populations • Construct a confidence interval estimate of the difference between two population means	• Students will collect data and compare their hypotheses to the mean of their data collection • Students will use the differences from the matched pairs of sample data	• Student Portfolio: What are two samples that could be dependently related based on your topic?	S-ID.B.5 S-ID.B.6
9.4 Two Variances or Standard Deviations	• Develop the ability to conduct a formal hypothesis test of a claim made about two population standard deviations or variances	• Students will use the F-Test to interpret data • Student will use TI-84 to calculate scores	• Chapter 9 Assessment	S-ID.B.5 S-ID.B.6

MA.S-ID.B.5	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
MA.S-ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Suggested Modifications for Special Education, ELL and Gifted Students

- Modified class work, homework, quizzes, and tests.
- Extra time when needed.
- Use of calculator.
- Provided with guided notes and study guides.
- Extra reinforcement to stay on task.

- If appropriate, native language glossary

Suggested Technological Innovations/Use

- Students will use technology (Google Forms) to obtain survey information
- Students will use Microsoft software (Excel, Power Point, Word) to organize their information
- Students and Teacher will use the Internet to research and find reliable sources
- Students will use online presentation tools such as Prezi, Canva, etc. to create infographics and visually appealing presentations
- Teacher can choose to use online assessment and presentation tools such as GoFormative, edpuzzle, YouTube, socrative, etc.

Cross Curricular/21st Century Connections

9.1: 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

9.2: 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

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Unit 8 - Probability

Content Area: **Mathematics**
Course(s):
Time Period: **4th Marking Period**
Length: **27**
Status: **Not Published**

Summary of the Unit

The important methods of hypothesis testing commonly use P-values, which are probability values expressed as numbers between 0 and 1, inclusive. Smaller probability values, such as .01, correspond to events that are very unlikely. Large probability values, such as .99, correspond to events that are very likely.

Enduring Understandings

- Distinguish between types of probability
- Calculate the probability of two events occurring in sequence
- Calculate probability that at lease one of two events will occur
- Count the number of ways an event can occur

Essential Questions

- How is probability used in everyday life?
- How does the study of probability integrate itself into the study of statistics?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects
- Student-tested events

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
9.1 Two Proportions	• Conduct a formal hypothesis test of a claim made about two population proportions • Construct a confidence interval estimate of the difference between two population proportions	• Students will create a test hypothesis between two samples of the population.	• Prompt: What makes a statistical difference between data? How can this data be used to misconstrue statistics in advertising?	S-ID.B.5
9.2 Two Means: Independent Samples	• Distinguish between a situation involving two independent samples and a situation involving two samples that are not independent • Construct a confidence interval estimate of the difference between two population proportions	• Students will look at data between heights of women and men. Students will look at data between heights of husband and wife. Using this data, students will draw a conclusion about independent vs. dependent.	• Student Portfolio: What are two samples that could be independently related based on your topic?	S-ID.B.5 S-ID.B.6
9.3 Two Dependent Samples (Matched Pairs)	• Identify sample data consisting of matched pairs • Conduct a formal hypothesis test of a claim made about	• Students will collect data and compare their hypotheses to the mean of their data collection • Students will	• Student Portfolio: What are two samples that could be dependently related based on your topic?	S-ID.B.5 S-ID.B.6

	two means from independent populations • Construct a confidence interval estimate of the difference between two population means	use the differences from the matched pairs of sample data		
9.4 Two Variances or Standard Deviations	• Develop the ability to conduct a formal hypothesis test of a claim made about two population standard deviations or variances	• Students will use the F-Test to interpret data • Student will use TI-84 to calculate scores	• Chapter 9 Assessment	S-ID.B.5 S-ID.B.6

MA.S-CP.B	Use the rules of probability to compute probabilities of compound events in a uniform probability model
MA.S-CP.B.6	Find the conditional probability of □ given □ as the fraction of □'s outcomes that also belong to □, and interpret the answer in terms of the model.
MA.S-CP.B.9	Use permutations and combinations to compute probabilities of compound events and solve problems.
MA.S-MD	Using Probability to Make Decisions
MA.S-MD.A.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.
MA.S-CP.A.1	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
MA.S-CP.A.2	Understand that two events □ and □ are independent if the probability of □ and □ occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
MA.S-CP.A.3	Understand the conditional probability of □ given □ as □(□ □□□ □)/□(□), and interpret independence of □ and □ as saying that the conditional probability of □ given □ is the same as the probability of □, and the conditional probability of □ given □ is the same as the probability of □.

Suggested Modifications for Special Education, ELL and Gifted Students

- Modified class work, homework, quizzes, and tests.
- Extra time when needed.
- Use of calculator.
- Provided with guided notes and study guides.
- Extra reinforcement to stay on task.
- If appropriate, native language glossary

Suggested Technological Innovations/Use

- Students will use technology (Google Forms) to obtain survey information
- Students will use Microsoft software (Excel, Power Point, Word) to organize their information
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Cross Curricular/21st Century Connections

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Unit 9 - Ethics in Statistics/Statistics in the Real World

Content Area: **Mathematics**
Course(s):
Time Period: **4th Marking Period**
Length: **25**
Status: **Not Published**

Summary of the Unit

While statistical methods give us tremendous power to better understand the world in which we live, this power also provides opportunities to uses in ways that are fundamentally unethical. It is important to consider some ethical issues in statistics related to data collection, analysis and reporting

Enduring Understandings

- Apply statistics to a variety of applications, professions, college majors, and events in the real world

Essential Questions

- How do statistics affect our everyday lives?
- When reading statistics or watching/listening to advertisements, how can you justify the validity of statements and claims?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects
- Student-tested events

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
15.1 Ethics in Statistics	• Discuss ethics in data collection, analysis, ethics and reporting • Develop methods to enforce ethics while conducting research	• Discussion points - Using prisoners - Using animals - Infecting subjects with disease/medicine - Sample bias - Payments for studies - Medical ghostwriting	• Research assignment: students will select a study and examine any unethical instances that may have taken place.	S-ID.A.4 S-IC.A.1 S-IC.B.3 S-IC.B.4 S-MD.A
Statistics in Sports	• Discuss how statistics are crucial in sports	• How can statistics be skewed in sports? • What statistics are most relevant for each sport? • Finding statistics that seem unbelievable, but can be substantiated.	• Prompt: Chose a sport topic of your interest. Summarize your findings, being sure to include relevant statistics, ethics, questionable statistics and any questions you would like to further explore.	
Statistics in Medicine	• Discuss how statistics are crucial in medicine	• How can statistics be skewed in medicine s? • What statistics are most relevant? • Side effects of medicine: how are these results obtained • How can statistics be used in controversial	• Prompt: Chose a medical topic of your interest. Summarize your findings, being sure to include relevant statistics, ethics, questionable statistics and any questions you would like to further explore.	S-ID.A.4 S-IC.A.1 S-IC.B.3 S-IC.B.4 S-MD.A

		ways?		
Statistics in Business	• Discuss how statistics are crucial in business	• How can statistics be skewed in business? • How are statistics used to drive business decisions? • How do businesses use statistics to advertise? - How can you determine the validity of an advertisement?	• Prompt: Chose a company of interest. Research facts about their operations. Summarize your findings, being sure to include relevant statistics, ethics, questionable statistics and any questions you would like to further explore.	S-ID.A.4 S-IC.A.1 S-IC.B.3 S-IC.B.4 S-MD.A
Statistics in Politics	• Discuss how statistics are crucial in politics	• How can statistics be skewed in politics? • How do statistics change for each of the main political parties? • Using statistics in debates and fact checking accurate statements made by politicians	• Prompt: The election is tomorrow. Using statistical data, who are you voting for and why? Summarize your findings, being sure to include relevant statistics, ethics, questionable statistics and any questions you would like to further explore.	S-ID.A.4 S-IC.A.1 S-IC.B.3 S-IC.B.4 S-MD.A

MA.S-IC	Making Inferences and Justifying Conclusions
MA.S-MD	Using Probability to Make Decisions
MA.S-MD.A	Calculate expected values and use them to solve problems
MA.S-IC.B.3	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
MA.S-IC.B.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.S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
MA.S-ID.A.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.S-ID.B	Summarize, represent, and interpret data on two categorical and quantitative variables

Suggested Modifications for Special Education, ELL and Gifted Students

- Modified class work, homework, quizzes, and tests.
- Extra time when needed.
- Use of calculator.
- Provided with guided notes and study guides.
- Extra reinforcement to stay on task.
- If appropriate, native language glossary

Suggested Technological Innovations/Use

- Students will use technology (Google Forms) to obtain survey information
- Students will use Microsoft software (Excel, Power Point, Word) to organize their information
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Unit 10 - Independent Project

Content Area: **Mathematics**
Course(s):
Time Period: **4th Marking Period**
Length: **18**
Status: **Not Published**

Summary of the Unit

In this culminating unit, students will create a project utilizing many of the topics covered in the course. Students will utilize technology, such as spreadsheets, graphing calculators, and graphing software to analyze data and create their own project, which will be graded with a rubric.

Enduring Understandings

- Technology is integral to the study of statistics
- Proper experimental design is necessary to ensure non-biased results

Essential Questions

- What types of technology are used for statistical analysis?
- In what ways can technology be useful when designing your own experiment?
- What considerations should be made when designing an experiment?
- What does it mean for results to be considered biased?

Summative Assessment and/or Summative Criteria

- Quizzes
- Student-led research projects
- Student-tested events

Resources

Elementary Statistics, Triola, M., 2018, Pearson.

Unit Plan

Topic/Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
Independent Topic Selection	• Determine an area and question that will be used to conduct experiment	• Brainstorm 3 potential topics to explore. Students will work with each other to peer-review	• Google Classroom tracking sheet with comments	S-ID.A.4 S-IC.A.1 S-IC.B.3 S-IC.B.4 S-MD.A
Independent Topic Hypothesis	• Develop a hypothesis to selected topic	• Determine a hypothesis that you are testing.	• Peer review – do you think this hypothesis can be justified? What issues may the researcher stumble across? What are your suggestions for how to implement the experimental design?	S-ID.A.4 S-IC.A.1 S-IC.B.3 S-IC.B.4 S-MD.A
Independent Topic Testing	• Reinforce steps to proper experimental design	• How does one ensure proper experimental design?	• Using online survey techniques	S-ID.A.4 S-IC.A.1 S-IC.B.3 S-IC.B.4 S-MD.A
Independent Topic Conclusions	• Discuss hidden biases • Use Excel, Google Docs, etc. to create graphs from data/	• How can you use spreadsheets to create meaningful displays of data? • What conclusions can be drawn from your	• Research Paper (Final Exam Grade) – What conclusions were able to be made? How did you use data to represent the results? What questions were still left unanswered? Was your hypothesis	S-ID.A.4 S-IC.A.1 S-IC.B.3 S-IC.B.4 S-MD.A

		project	validated?	

MA.S-IC	Making Inferences and Justifying Conclusions
MA.S-MD	Using Probability to Make Decisions
MA.S-MD.A	Calculate expected values and use them to solve problems
MA.S-IC.B.3	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
MA.S-IC.B.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.S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
MA.S-ID.A.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.S-ID.B	Summarize, represent, and interpret data on two categorical and quantitative variables

Suggested Modifications for Special Education, ELL and Gifted Students

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