KIRKWOOD
SCHOOL DISTRICT

Statistics

Course Description:
Statistics is the study of the collection, comparison, summarization, and organization of data from a population. It involves gathering information and deciding what it means. Students enrolled in Statistics will learn to collect, organize, compare and summarize data and create visual representations of data. Topics will include: measure of central tendency, normal distributions, probabilities, statistical error. Students will extend their study to include real-world situations. This course will be offered each semester.

Grade Level: 11th-12th Grade

Unit Scope and Sequence
> **Unit 1:** Descriptive Statistics
> **Unit 2:** Probability
> **Unit 3:** Normal Distribution
> **Unit 4:** Inference and Hypothesis Testing

Course Enduring Understandings:
- Statistics provides tools for describing variability in data and fro making informed decisions that take it into account.
- Data are gathered, displayed, summarized, examined, and interpreted to discover patterns and deviations from patterns.
- Collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population, taking variability into account.

Course Essential Questions:
- How do we represent and interpret sets of numbers graphically?
- What role does probability play in statistical calculations?
- How are samples from a population data set with a normal distribution used to draw valid conclusions about a whole population?

STATISTICS
UNIT 1: DESCRIPTIVE STATISTICS

This unit is an introduction to statistics. Students learn represent data graphically and to draw conclusions about its meaning.

Unit Essential Learning Targets

Enduring Understandings	*Essential Questions*
- Frequency distributions can be created and interpreted for data sets in a population. - Data are gathered, displayed, summarized, examined and interpreted to discover patterns and deviations from patterns.	- When and how do we use different frequency distributions to interpret data sets? - How do we summarize and interpret data from a data set?
Students must know:	*Students must be able to:*
- Histogram - Mean - Median - Mode - Frequency distribution - Weighted mean - Bar graph - Box plot - Pie chart - Dot plot	- Create graphical representations of data including dot plots, pie charts, box plots, bar graphs, and histograms. - Calculate measures of central tendency including mean, median, and mode. - Calculate a weighted mean and explain its significance.

Missouri Learning Standards

Understand statistics as a process for making inferences about population parameters based on a random sample from that population (CCSS.MATH.CONTENT.HSS.IC.A.1).
- Represent data with plots on a real number line (dot plots, histograms, and box plots) (CCSS.MATH.CONTENT.HSS.ID.A.1).
- 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 (CCSS.MATH.CONTENT.HSS.ID.A.2).

STATISTICS
UNIT 2: PROBABILITY

This unit designed to introduce students to the concept of probability and its calculations and meanings.

Unit Essential Learning Targets	
Enduring Understandings	***Essential Questions***
- In a probability model, sample data points represent outcomes, and they can be combined to describe how likely the event is to occur. - Interpreting probabilities relies on an understanding of independence and conditional probability.	- How do we differentiate between independent and conditional probability? - How do we calculate the probability of events occurring?
Students must know:	***Students must be able to:***
- Conditional probability - Expected value - Independent probability - Compound events/ events	- Use probability to evaluate outcomes of events. - Understand independence and conditional probability and use them to interpret data. - Use the rules of probability to compute probabilities of compound events.

Missouri Learning Standards
Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations (CSS.MATH.CONTENT.HSS.CP.A.5).   - Find the conditional probability of A given B as a fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model (CSS.MATH.CONTENT.HSS.CP.B.6).   - Apply the addition rule, P(A or B) = P(A) + P(B), and interpret the answer in terms of the model (CCSS.MATH.CONTENT.HSS.CP.B.7).   - Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B/A) = P(B)P(A/B), and interpret the answer in terms of the model (CCSS.MATH.CONTENT.HSS.CP.B.8).

STATISTICS
UNIT 3: NORMAL DISTRIBUTION

This unit explores the normal distribution and sampling within a population that exists within it.

Unit Essential Learning Targets	
Enduring Understandings	***Essential Questions***
Collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population.	- How do we collect a random sample from a population that is normally distributed? - How do we calculate a Z-score to explain a value's relationship to the mean?
Students must know:	***Students must be able to:***
- Normal distribution - Sampling distribution - Central Limit Theorem - Empirical Rule - Z-score	- Use a random sampling procedure to gather a sample set from a population. - Calculate a Z-score to explain how a value's relationship varies from the mean.

Missouri Learning Standards
Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each (CCSS.MATH.CONTENT.HSS.IC.B.3).   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 (CCSS.MATH.CONTENT.HSS.IC.B.4).

STATISTICS
UNIT 4: INFERENCE AND HYPOTHESIS TESTING

In this unit, students explore different hypothesis tests for populations with a normal distribution. They then make inferences about the populations.

Unit Essential Learning Targets	
Enduring Understandings	***Essential Questions***
● A statistically significant outcome is one that is unlikely to be due to chance alone. ● Collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population, taking variability into account.	● How can we use population sample sets to test hypotheses? ● How can we analyze hypothesis test data to justify conclusions about the validity of a hypothesis at a predetermined level of significance?
Students must know:	***Students must be able to:***
● Hypothesis ● 1-tailed test ● 2-tailed test ● Hypothesis testing for probability ● Statistical error	● Write and test hypotheses using one-tailed, two-tailed, and probability tests. ● Following statistical testing, justify conclusions about the validity of a hypothesis at a predetermined level of significance. ● Explain statistical error as it relates to hypothesis testing.

Missouri Learning Standards
Understand statistics as a process for making inferences about population parameters based on a random sample from that population (CCSSMATH.CONTENT.HSS.IC.A.1). ● Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant (CCSS.MATH.CONTENT.HSS.IC.B.5).