High School Statistics and Probability

The Mathematics Curriculum Framework represents the commitment of the Hinsdale School District to the Common Core State Standards and the ideas of Grant Wiggins and Jay McTighe in their principles of *Understanding by Design.* The Mathematics Curriculum Revision Committee (2015-16) believes that this document provides the necessary framework for teachers to develop mathematical units and lessons based on best practices in curriculum, instruction and assessment.

The Common Core State Standards for Mathematics requires that students develop a conceptual understanding of key concepts, procedural skills and fluency and the ability to use their knowledge to solve real world problems. Teachers are expected to develop lessons that meet these requirements by using a variety of instructional techniques and resources to meet individual student needs.

More information about the Common Core State Standards can be found at:

www.corestandards.org

High School - Statistics and Probability

Standard S-ID: Interpreting Categorical & Quantitative Data

Summarize, represent, and interpret data on a single count or measurement variable.
Summarize, represent, and interpret data on two categorical and quantitative variables.
Interpret linear models.

21st Century Learning Expectations

Hinsdale students will take responsibility for their own learning.
Hinsdale students will demonstrate responsibility for their actions and choices.
Hinsdale students will be able to solve problems.

Enduring Understandings:

Mathematics can be used to solve real world problems and can be used to communicate solutions.
Relationships between quantities can be shown symbolically, numerically, graphically and verbally.

Learning Competencies	Essential Questions
Students will be able to • construct dot plots, histograms and box plots for data on a real number line. • use the appropriate measure of center and spread to describe a distribution. • interpret differences in different data sets in context and accounting for outliers. • apply the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages while recognizing there are data sets for which such a procedure is not appropriate. • construct a two way frequency table and interpret data in context. • represent data on two quantitative variables on a scatter plot, and describe how the variables are related. • explain the meaning of the slope and y-intercept in context. • apply technology to compute and interpret the correlation coefficient of a linear fit. • explain the difference between correlation and causation.	• In what ways can equations of lines be graphed and used to solve problems? • How are the graphs of linear equations used to solve real life problems? • How can data be gathered, organized and displayed to communicate and justify results in real life situations? • How can data be analyzed to make inferences or predictions based on various data collection means?

High School - Statistics and Probability

Standard S-IC: Making Inferences & Justifying Conclusions

Understand and evaluate random processes underlying statistical experiments.
Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

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Enduring Understandings:

Statistics is a process for making inferences about population based on random samples.
Variability is an important aspect of statistical analysis.
Statistics is necessary to make accurate decisions involving data.

Learning Competencies	Essential Questions
Students will be able to • explain in context the difference between values describing a population and a sample. • evaluate if a specified model is consistent with results from a given data-generating process. • recognize the purposes of and differences among sample surveys, experiments, and observational studies and explain how randomization relates to each. • estimate a population mean or proportion and develop a margin of error through the use of simulation models for random sampling using data from a sample survey. • evaluate data from a randomized experiment to compare two treatments and use simulations to decide if differences between parameters are significant. • evaluate reports based on data.	• How can statistics help us make inferences about the population of interest? • What aspects of the data collection process are important? • How can you design a statistical study?

High School - Statistics and Probability

Standard S-CP: Conditional Probability and the Rules of Probability

Understand independence and conditional probability and use them to interpret data.

Use the rules of probability to compute probabilities of compound events in a uniform probability model.

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Enduring Understandings:

There is a connection between statistical techniques and real world applications.

The quality of the question used impacts the data collected and the validity of the results.

Learning Competencies	Essential Questions
Students will be able to • describe events as subsets of a sample space using characteristics of the outcomes. • identify two events as independent or not and explain the properties of independence and conditional probabilities. • define and calculate conditional probabilities. • construct and interpret two-way frequency tables of data for two categorical variables, calculate probabilities and evaluate the independence of two variables. • recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. • calculate conditional probabilities and Interpret the probability in context. • identify two events as mutually exclusive; calculate probabilities and interpret probability in context. • compute probabilities of compound events and solve problems.	• How can probability be used to predict future events? • How can understanding probability affect our decision making?

High School - Statistics and Probability

Standard S-MD: Using Probability to Make Decisions

Calculate expected values and use them to solve problems.
Use probability to evaluate outcomes of decisions.

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Enduring Understandings:

Probability models are useful tools for making decisions and predictions.
Probability distribution of a discrete variable becomes more normal as sample size increases.

Learning Competencies	Essential Questions
Students will be able to • define a random variable, assign probabilities to its sample space, and graph the distribution of the random variable. • calculate and interpret in context the expected value of a random variable. • develop a theoretical probability distribution and find the expected value. • develop an empirical probability distribution and find the expected value. • weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. • make decisions based on expected values and use them to compare long term benefits in different situations. • analyze decisions and strategies using probability concepts.	• Can probability be used to predict future events? • How does changing sample size effect outcomes? • How can random variables be used to collect the probabilities of similar events?