



Math Department Curriculum Guide

Probability and Statistics

Course Description

This course is designed for students that have completed Algebra 2. Students will study methods of data collection and analysis. They will be exposed to various visual representations of data. The concepts of probability theory and combinatorics will also be studied. The graphing calculator is a required tool in this course.

Upon completion of this course, students should be able to:

- Model sets of finite data appropriately
- Observe and analyze patterns in data
- Model data using an appropriate mathematical function
- Use probability to describe data distributions

Graphing Calculator

Hanover High School students enrolled in Algebra 1, Algebra 2, Precalculus, Calculus, or Statistics should purchase a graphing calculator, preferably a TI-84 Plus or TI-84 Color. It is important for students to gain familiarity with their own calculator in order to use it as a tool during class and for homework. Furthermore, students are expected to use calculators on standardized assessments, including MCAS, PSAT, SAT, and AP, as well as college placement exams. Many of the questions on these assessments are designed in such a way that students are expected to use a graphing calculator. Although there are graphing calculator apps that can be downloaded and used on mobile devices, keep in mind that mobile devices are not allowed on the MCAS, PSAT, SAT, and AP exams. Therefore, it is important that students have access to and learn to use an assessment-approved graphing calculator. There is a limited number of graphing calculators that can be borrowed on a first come first serve basis – please contact the office for information.

Probability & Statistics – Calculator Skills

- Perform operations with fractions and exponents
- Convert between decimals and fractions
- Enter equations in $y =$
- Manipulate the window
- Manipulate and use the table
- Graph functions
- Enter data into one-variable lists
- Utilize 1-var stats to analyze data
- Enter data into two-variable lists
- Utilize 2-var stats to analyze data



Content Standards

Number and Quantity

Quantities

- A. Reason quantitatively and use units to solve problems.

Functions

Building Functions

- A. Build a function that models a relationship between two quantities.

Linear, Quadratic, and Exponential Models

- B. Interpret expressions for functions in terms of the situation they model.

Statistics and Probability

Conditional Probability and the Rules of Probability

- A. Understand independence and conditional probability and use them to interpret data from simulations or experiments.
- B. Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Interpreting Categorical and Quantitative Data

- A. Summarize, represent, and interpret data on a single count or measurement variable. Use calculators, spreadsheets, and other technology as appropriate.
- B. Summarize, represent, and interpret data on two categorical and quantitative variables.
- C. Interpret linear models.

Making Inferences and Justifying Conclusion

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

Conditional Probability and the Rules of Probability

- A. Understand independence and conditional probability and use them to interpret data.
- B. Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Using Probability to Make Decisions

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



Subject: Probability and Statistics

Units	Content
Unit 1 - Describing Data Term 1 September	- Context of data (a.k.a. The five W's - who, what, when, where and why) - Always identify the who and what(s) - From a set of data identify range, mean, median, lower and upper quartiles - The center of data - mean vs. median. Resistance. - From a set of data identify the lower class limits, class width, class midpoints and upper class limits - Create and label frequency tables and relative frequency tables
Unit 2 - The Spread and Shape of Data Term 1 September and October	- The five number summary and boundaries for outliers - The empirical rule as an introduction to standard deviation and the normal model - Symmetric (normal) vs. skewed
Unit 3 - Displaying Qualitative Data (Categorical) Term 1 October	- Pareto graph - Pie graph - Segmented bar graph - Comparative qualitative graphs
Unit 4 - Displaying Quantitative Data (Numeric) Term 1 and Term 2 October and November	- Boxplot (with and without outliers) - Histogram - Polygon graph - Ogive - Comparative quantitative graphs - M&M's Project on data, graphs and tables
Unit 5 - The Normal Model in Detail Term 2 November through January	- Review the empirical rule with respect to the mean (what is "expected") - Calculate a standard deviation from its formula - Normalizing the data (z scores) - Finding percent of data that is less than a value, greater than a value and in between two values. - Finding the value given percentiles - Finding the values given a central percentage - Graphing values and percents on a normal model - Applying quartiles to standard deviation - Comparisons of what is supposed to happen (theoretical with standard deviation) vs. what actually happens



Units	Content
Unit 6 - Relationships Between Variables Term 3 January through March	▪ Response variables and explanatory variables ▪ Setting up and graphing scatterplots ▪ Describing Association ▪ Calculate and describing correlation (r value) ▪ Plot and calculate the best fit line ▪ Calculate and draw the line of regression ▪ Characteristics of a line of regression ▪ Calculate and analyze the coefficient of determination (r^2 value) ▪ Compare correlation with coefficient of determination ▪ Basic Introduction to inference ▪ Independent research project on two variables
Unit 7 - Basic Probability Rules Term 3 March and April	▪ Probability as a model of “what should happen” ▪ Definition of probability, disjoint events and independent events ▪ The basic addition rule of probability (the “or” rule) and using it when an event has disjoint outcomes ▪ The basic multiplication rule of probability (the “and” rule) and using it when events are independent
Unit 8 - The Rules of Probability Term 3 and Term 4 April and May	▪ Conditional probability, non-disjoint probability and dependent probability - compared to previous unit ▪ The addition rule of probability - with or without disjoint events ▪ The multiplication rule of probability - with or without independent events ▪ Conditional tables and probability ▪ Comparing theoretical probability vs actual probability
Unit 9 - The Binomial Probability Model Term 4 May	▪ Introduction to combinatorics and permutations ▪ Combining combinatorics with probability ▪ The binomial probability model (using inequalities) ▪ The dice project
FINAL EXAM	
What You Need to Know About Your Credit Score (optional, time permitting) Term 4 May	▪ How does FICO work and why is it important ▪ Strategies to immediately start a credit score in the positive direction ▪ Samples of how bad credit works ▪ Compare good credit vs. bad credit loans and long term effects