Summary of NCTM Standards Related to Probability and Statistics

Data Analysis and Probability Standard for Grades Pre-K–2
http://standards.nctm.org/document/chapter4/data.htm

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
    - pose questions and gather data about themselves and their surroundings;
    - sort and classify objects according to their attributes and organize data about the objects;
    - represent data using concrete objects, pictures, and graphs.
- Select and use appropriate statistical methods to analyze data.
    - describe parts of the data and the set of data as a whole to determine what the data show.
- Develop and evaluate inferences and predictions that are based on data.
    - discuss events related to students' experiences as likely or unlikely.

Data Analysis and Probability Standard for Grades 3–5
http://standards.nctm.org/document/chapter5/data.htm

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
    - design investigations to address a question and consider how data-collection methods affect the nature of the data set;
    - collect data using observations, surveys, and experiments;
    - represent data using tables and graphs such as line plots, bar graphs, and line graphs;
- Select and use appropriate statistical methods to analyze data.
    - describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed;
    - use measures of center, focusing on the median, and understand what each does and does not indicate about the data set;
    - compare different representations of the same data and evaluate how well each representation shows important aspects of the data.
- Develop and evaluate inferences and predictions that are based on data.
    - propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.
- Understand and apply basic concepts of probability.
    - describe events as likely or unlikely and discuss the degree of likelihood using such words as *certain, equally likely,* and *impossible;*
    - predict the probability of outcomes of simple experiments and test the predictions;
        - understand that the measure of the likelihood of an event can be represented by a number from 0 to 1.

Data Analysis and Probability Standard for Grades 6–8
http://standards.nctm.org/document/chapter6/data.htm

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
    - Formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population;
    - Select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatterplots.
- Select and use appropriate statistical methods to analyze data.
    - find, use, and interpret measures of center and spread, including mean and interquartile range;
    - discuss and understand the correspondence between data sets and their graphical representations, especially histograms, stem-and-leaf plots, box plots, and scatterplots.
- Develop and evaluate inferences and predictions that are based on data.
    - use observations about differences between two or more samples to make conjectures about the populations from which the samples were taken;
    - make conjectures about possible relationships between two characteristics of a sample on the basis of scatterplots of the data and approximate lines of fit;
    - use conjectures to formulate new questions and plan new studies to answer them.
- Understand and apply basic concepts of probability.
    - understand and use appropriate terminology to describe complementary and mutually exclusive events;
    - use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations;
    - compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models.

Data Analysis and Probability Standard for Grades 9–12
http://standards.nctm.org/document/chapter7/data.htm

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
    - understand the differences among various kinds of studies and which types of inferences can legitimately be drawn from each;
    - know the characteristics of well-designed studies, including the role of randomization in surveys and experiments;
    - understand the meaning of measurement data and categorical data, of univariate and bivariate data, and of the term variable;
    - understand histograms, parallel box plots, and scatterplots and use them to display data;

    - compute basic statistics and understand the distinction between a statistic and a parameter.
- Select and use appropriate statistical methods to analyze data.
    - for univariate measurement data, be able to display the distribution, describe its shape, and select and calculate summary statistics;
    - for bivariate measurement data, be able to display a scatterplot, describe its shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools;
    - display and discuss bivariate data where at least one variable is categorical;
    - recognize how linear transformations of univariate data affect shape, center, and spread;
    - identify trends in bivariate data and find functions that model the data or transform the data so that they can be modeled.
- Develop and evaluate inferences and predictions that are based on data.
    - use simulations to explore the variability of sample statistics from a known population and to construct sampling distributions;
    - understand how sample statistics reflect the values of population parameters and use sampling distributions as the basis for informal inference;
    - evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions;
    - understand how basic statistical techniques are used to monitor process characteristics in the workplace.
- Understand and apply basic concepts of probability.
    - understand the concepts of sample space and probability distribution and construct sample spaces and distributions in simple cases;
    - use simulations to construct empirical probability distributions;
    - compute and interpret the expected value of random variables in simple cases;
    - understand the concepts of conditional probability and independent events;
    - understand how to compute the probability of a compound event.