



Probability and Statistics for Elementary and Middle School Teachers

**A Staff Development Training
Program To Implement the 2001
Virginia Standards of Learning**

**Revised
December 2004**

**Division of Instruction
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Introduction

The revised *Probability and Statistics for Elementary and Middle School Teachers* is a staff development training program designed to assist teachers in implementing the 2001 Virginia Standards of Learning for mathematics. This staff development program provides a sample of meaningful and engaging activities correlated to the probability and statistics strand of the grades K-5 and grades 6–8 mathematics Standards of Learning.

The purpose of the staff development program is to enhance teachers' content knowledge and their use of instructional strategies for teaching the probability and statistics Standards of Learning. Teachers will receive intensive training on ways to (1) gather data, and (2) represent, analyze, and interpret data to guide instruction and classroom assessment. Through explorations, problem solving, and hands-on experiences, teachers will engage in discussions and strategies that address:

- formulating questions and conducting investigations;
- gathering data and using tools from simple tallying methods to the development of good surveys and methods of observation;
- representing data in a variety of tables, charts, graphs and plots (including line plots, stem and-leaf plots, and box-and-whisker plots);
- developing strategies for analyzing and interpreting data, making inferences, observing trends, drawing conclusions, and making predictions; and
- assessing students data analysis skills and knowledge.

Through these activities, it is anticipated that teachers will develop new techniques that are sure to enhance student achievement in their classroom.

Designed to be presented by teacher trainers, this staff development program includes directions for the trainer, as well as the black line masters for handouts. In some instances, related student activities are included. Trainers should adapt the materials to best fit the needs of their audience; adding materials that may be more appropriate for their audience and eliminating materials that have been used in previous training sessions. Trainers are encouraged to use graphing utilities and other technology, as appropriate. **All materials in this document may be duplicated and distributed as desired for use in Virginia.**

The training program is organized into five three-hour modules that may be offered by school divisions for teacher licensure renewal points or for a one-credit graduate course, when university credit can be arranged.



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GLOSSARY

<i>Average</i>	See <i>mean</i> .
<i>Axes</i>	See <i>x-axis</i> and <i>y-axis</i> .
<i>Bar graph</i>	A graph that uses parallel horizontal or vertical bars to represent counts for several categories. One bar is used for each category, with the length of the bar representing the count for that category.
<i>Box-and-whisker plot</i>	A graph showing how a set of data clusters around the middle (median) and shows the distribution of data in each quartile.
<i>Circle graph</i>	A circular graph that shows the relationship of the parts to the whole.
<i>Coordinates</i>	An ordered pair of numbers used to locate a point in a plane.
<i>Coordinate system (coordinate plane)</i>	A two-dimensional system of intersecting horizontal and vertical number lines, used to locate points.
<i>Fundamental (Basic) Counting Principle</i>	A computational procedure used to determine the number of possible arrangements of several objects. It is the product of the number of ways each object can be chosen individually (e.g., the possible arrangements of four shirts, two pants, and three shoes is $4 \times 2 \times 3$ or 24).
<i>Event</i>	An outcome or set of outcomes of an experiment or situation, e.g., rolling a 3 or higher is one possible event produced by a dice roll.
<i>Experiment</i>	In probability, any activity involving chance, such as a dice roll.
<i>Experimental probability</i>	A probability based on the statistical results of an experiment.
<i>Fair games</i>	Games where all players have the same odds of winning.
<i>Histogram</i>	A type of bar graph where the categories are equal ranges of numbers.
<i>Independent events</i>	The event in which the outcome of one event does not affect the probability of the subsequent event.
<i>Line graph</i>	A graph that uses a line to show how data changes over time.
<i>Line plot</i>	A plot, using stacked x 's, showing the distribution of values in a data set.



<i>Mean</i>	The sum of the values in a data set divided by the number of values. Also known as the average.
<i>Median</i>	The middle value in a data set when the values are arranged in order.
<i>Mode</i>	The value(s) that occur most often in a data set.
<i>Negative relationship</i>	Two data sets have a negative relationship when the data values in one set increase as the values in the other decrease.
<i>Odds</i>	The ratio of a number of ways an event can happen to the number of ways it cannot.
<i>Outcome</i>	One way an experiment or situation could turn out.
<i>Outlier</i>	A value widely separated from the others in a data set. Any value that lies more than 1.5 IQR units below the lower quartile or 1.5 IQR units above the upper quartile.
<i>Positive relationship</i>	Two data sets have a positive relationship when their data values increase or decrease together.
<i>Probability</i>	The likelihood of an event occurring.
<i>Quadrants</i>	The four regions determined by the axes of a coordinate plane.
<i>Range (in statistics)</i>	The difference between the least and greatest numbers in a data set.
<i>Rate</i>	A ratio showing how quantities with different units are related. Example: $\frac{72 \text{ dollars}}{8 \text{ hours}}$
<i>Sample Space</i>	All the possible outcomes of an experiment.
<i>Scale (graphical)</i>	A system of marks in a given order and at specific intervals.
<i>Scatterplot</i>	A graph showing paired data values as points.
<i>Simulation</i>	A model of a real world situation.
<i>Stem-and-leaf plot</i>	A table showing the distribution of values in a data set by splitting each value into a “stem” and a “leaf”.
<i>Theoretical probability</i>	The ratio of the number of ways an event can happen to the total number of possible outcomes.



Tree diagram

A branching diagram showing all possible outcomes for a given experiment.

Trend

A clear direction in a line graph suggesting how the data will behave in the future.

x-axis

The horizontal number line in a coordinate plane.

x-coordinate

The first number in an ordered pair.

y-axis

The vertical number line in a coordinate plane.

y-coordinate

The second number in an ordered pair.