Theory of Probability

Blaise Pascal together with Fermat created the mathematical theory of probabilities. This theory would have wide implications for a wide variety of areas of studies. It is especially important for subject areas that require the quantitative analysis of large sets of data. These include areas such as mathematics, statistics, finance, insurance, science and philosophy etc. The list goes on and on. The ramifications of this theory can be found everywhere. One author stated that with the discovery of the theory of probability, Pascal had solved the problem of "bringing the superficial lawlessness of pure chance under the domination of law, order and regularity".[i] Man could use the theory of probability to explain rationally things and events that had before been attributed to magic and mysticism.

The theory of probability looks at patterns that occur in random events. Some important terms include:

Experiment: situation involving chance or probability that leads to results. This could involve rolling a dice, flipping a coin or spinning a spinner.

Outcome: the possible results of a single trial of an experiment. The possible outcomes of flipping a coin is heads or tails, of rolling a dice is 1,2,3,4,5,6.

Event: One or more outcomes of an experiment. This means focusing on one or more of the outcome. An event for flipping a coin could be a head, for flipping a coin twice, two heads.

Probability: the measure of how likely an event is. The probability of throwing a head is ½ or 50%.

To figure out what the probability is of an event is first determine how many way that the event could occur and then divide that number by total number of possible outcomes.

$$\textbf{Probability of event} = \frac{\textbf{Number of ways the event can occur}}{\textbf{Total number of possible outcomes}}$$

The total number of possible outcomes for flipping a coin or rolling a dice increases exponentially with the number of times the coin is flipped or die rolled. The total possible outcomes for flipping a coin once is two, twice is four and so on. The equation that shows this relationship is 2^n where *n* is the number of flips. The same is true for rolling a dice. The total possible outcomes for rolling a die once is six, twice is thirty six and so on. The equation that shows this relationship is 6^n where *n* is the number of rolls.

Blaise Pascal made extensive use of Pascal's Triangle to solve probability questions. He discovered that Pascal's Triangle could be used to show how many different combinations of heads and tails are possible depending on the number of throws. (This further explained in the resource included on this site entitled Pascal's Triangle.)

[i] E.T. Bell, *Men of Mathematics: The Lives and Achievements of the Great Mathematicians from Zeno to Poincare*, (Toronto: Simon & Schuster, 1937), p.86.