

Probability, Math 60, Spring 2006

- **Instructor:** Marius Ionescu, office 402 Bradley Hall.
- **Textbook:** Introduction to Probability (second revised edition) by Charles M. Grinstead and J. Laurie Snell
- **WebPage:** <http://www.math.dartmouth.edu/~m60s06>

Short History

- Probability theory began in seventeenth century France.
- Two great French mathematicians, Blaise Pascal and Pierre de Fermat, corresponded over two problems from games of chance.
- Many of the early problems of probability might well have been suggested by gamblers' experiences.

Simple experiments; Simulations

- The naturalist Buffon tossed a coin 4040 times, resulting in 2048 heads and 1992 tails.
- The English biologist W. F. R. Weldon recorded 26,306 throws of 12 dice.
- The Swiss scientist Rudolf Wolf recorded 100,000 throws of a single die without a computer.

- We will be introducing some probabilistic concepts via experiment.
- You will need to simulate probabilistic phenomena to do this.
- I recommend using maple.
 - **Maple for Mac OS X:**
`http://www.dartmouth.edu/comp/resources/downloads/mac/academic/maple-osx.html`
 - **Maple for Windows:**
`http://www.dartmouth.edu/comp/resources/downloads/win/academic/maple.html`

Probability

- We shall first consider chance experiments with a finite number of possible outcomes $\omega_1, \omega_2, \dots, \omega_n$:
 - rolling a die
 - tossing a coin
- A random variable is an expression whose value is the outcome of a particular experiment.
- We shall assign probabilities to the possible outcomes of this experiment.

Examples

- Random Numbers
- Coin Tossing

Dice Rolling

- The famous letters between Pascal and Fermat were instigated by a request for help from a French nobleman and gambler, Chevalier de Méré
- de Méré had been betting that, in four rolls of a die, at least one six would turn up.
- He changed the game to bet that, in 24 rolls of two dice, a pair of sixes would turn up.

Heads or Tails

- Peter and Paul play a game called *heads or tails*.
- A fair coin is tossed a sequence of times.
- Each time a head comes up Peter wins 1 penny from Paul, and each time a tail comes up Peter loses 1 penny to Paul.
- What is the probability that he will win j pennies?