Probability

The Theory of Chance, its Historical Context, and its Applications in the Modern World

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Syllabus

I PREAMBLE

- **a)** The flowering of a mathematical science
- **b)** The background needed
- **c)** Table d'hôte: the topics of the course
- **d)** A word on how to study mathematics

1. Prelude to a theory of chance

1.1. Chance around us

1.2. The amazing aspects of fluctuations and the hot hand phenomenon

- **a)** The tosses of a coin
- **b)** Unexpected phenomena in success runs
- **c)** The hot hand phenomenon and a principled basis for a statistical test
- **d)** Summary of Tableau 1

2. Combinatorial elements

2.1. *The science of counting*

- **a)** *The setting: sampling from finite sets*
- **b)** *Sampling with replacement, powers*
- **c)** *Sampling without replacement, falling factorials, permutations*
- **d)** *Subpopulations, binomial coefficients*
- **e)** *Test your understanding*
- **f)** *Summary of Tableau 2, Part 1*

2.2. *Basic properties of binomial coefficients*

- **a)** *Alternative forms for the falling factorial*
- **b)** *Equivalent expressions for binomial coefficients*
- **c)** *Pascal's triangle*
- **d)** *The binomial theorem*
- **e)** *Test your understanding*
- **f)** *Summary of Tableau 2, Part 2*