

Index of Terms

- absorbing state, 116
- arbitrage opportunity, 230
- Bayes' formula, 97
- Bernoulli distribution, 200
- binomial distribution, 42
 - mean and variance, 42
 - median, 172
 - sums of, 191
- binomial theorem, 37
- Black-Scholes formula, 234
- Bonferroni inequalities, 65
- Brownian motion, 233
 - geometric, 234
- Cauchy distribution, 175
- central limit theorem, 212
- Chapman-Kolmogorov equation, 123
- Chebyshev's inequality, 205
- chi-squared statistic, 8
- combinations, 35
- conditional probability, 81
- confidence interval, 221
- continuous distribution, 161
 - change of variables, 174
- continuous random variable, 12
- covariance, 199
- density function, 161
- discrete random variable, 12
 - mean, 21
 - standard deviation, 23
 - sums of, 190
 - variance, 22
- discrete joint distributions, 100
 - conditional distributions, 104
 - marginal distributions, 101
- distribution functions, 166
 - properties of, 170
- doubly stochastic, 135
- European call option, 229
- event, 2
 - independent, 9, 11
 - pairwise disjoint, 3
 - pairwise independent, 11
- expected value, 17
 - linearity of, 18, 196
- experiment, 1
- exponential distribution, 162
 - distribution function, 167
 - expected value, 165
 - lack of memory property, 168
 - mapped to uniform, 175
 - median, 172
 - sums of, 195
- factorial, 33
- gamma distribution, 195
- geometric distribution, 13, 20
 - mean and variance, 24
 - sums of, 192
- hedging strategy, 233
- histogram correction, 213
- hypergeometric distribution, 201
- hypothesis testing, 220
- identity matrix, 132
- inclusion-exclusion formula, 64
- independent
 - continuous random variables, 182
 - discrete random variables, 102

- independent (*cont.*)
 - events, 9
 - identically distributed, 224
- integration by parts formula, 165
- joint density function, 177
 - conditional densities, 184
 - marginal densities, 182
- joint distribution function, 180
- law of large numbers, 206
- law of total probability, 89
- Markov chain, 114
 - aperiodic, 133
 - convergence theorem, 134
 - fundamental matrix, 145
 - irreducible, 133
 - period of a state, 133
 - two-stage, 119
- maximum likelihood, 61
- mean, 17
- median, 171
- moments, 22
- multinomial distribution, 46
- multiplication rule
 - combinatorial, 32
 - for probabilities, 83
- normal distribution, 208
 - sums of, 211
 - tail probabilities, 218
- outcome, 1
- pairwise independent, 11
- partition, 89, 97
- permutation, 34
- Pascal's triangle, 36
- Poisson distribution, 47
 - approximation to the binomial, 49, 52
 - mean and variance, 48
 - normal approximation, 217
 - sums of, 192
- power laws, 163
 - distribution function, 168
 - expected value, 166
 - median, 172
- probability, 2
 - frequency interpretation of, 3
 - monotonicity of, 5
 - prior, 99
- random variable, 12
- sample mean, 204
- sample size selection, 221
- sample space, 1
- standard deviation, 23
- stationary distribution, 125
- Stirling's formula, 33
- sums of random variables
 - distribution, 190, 193
 - mean, 196
 - variance, 200
- transition probability, 115
 - multi-step, 120
- two-stage experiments, 81
- uniform distribution, 162
 - distribution function, 167
 - expected value, 164
 - median, 172
 - on a ball, 178
 - sums of, 193
- variance, 22
- z-score, 216

Index of Examples

- Alliteration in Shakespeare, 51
- Astragali, 15
- Bad luck in Bloomington, 67
- Balls in boxes, 197, 203
- Baseball versus flipping coins, 219
- Benford's law, 16
- Birthday problem, 8, 14, 51
- Births in Ithaca, 53
- Blackjack, 68
- Bridge, 40, 44, 59
- Buffon's needle, 178, 221
- Capture-recapture experiments, 61
- China's one-child policy, 20
- Cognitive dissonance, 85
- Coupon collector's problem, 202
- Craps, 90, 93
- Deal or No Deal, 19
- Death by horse kick, 50
- Disputed elections, 60
- Ehrenfest chain, 116, 129, 132
- English letter frequencies, 15
- Exit polls, 94
- Fair division of a bet, 18
- Gambler's ruin, 114, 138
- Growth of a risky investment, 206
- Hemophilia, 96
- Hot-hand in basketball, 120, 128
- How not to water your lawn, 175
- Ipolito versus Power, 213
- Joe DiMaggio's streak, 66
- Keno, 58
- Literary Digest poll, 222
- Lottery double winners, 54
- Mammogram posterior probabilities, 95
- Monopoly, 136
- Monty Hall problem, 84
- NCAA tournament, 93
- New York state lottery, 56
- New York Yankees salaries, 25
- NFL regular season records, 215
- O.J. Simpson trial, 99
- Optimal investment, 207
- Paternity probabilities, 98
- Pick 4 coincidence, 54
- Poker, 38
- Quality control, 61
- Roulette, 17, 139, 216
- Sally Clark, 55
- Scrabble, 15, 20, 24
- Scratch-off triple winner, 55
- Shark attacks, 50
- Simpson's paradox, 105
- Tennis, 46, 143, 146
- V-2 rocket hits, 50
- Waiting for coin patterns, 147
- Wayne Gretsky, 53
- Weldon's dice data, 220
- World Series, 6, 35
- Wright-Fisher model, 115, 139