QUEEN MARY, UNIVERSITY OF LONDON

MAS 108 Probability I

Mathematical notation Autumn 2005

Numbers

Notation	Meaning	Example
$\mathbb{N}$	Natural numbers	$1,2,3,\ldots$ (some people include 0)
$\mathbb{Z}$	Integers	$\ldots,-2,-1,0,1,2,\ldots$
$\mathbb{R}$	Real numbers	$\frac{1}{2},\sqrt{2},\pi,\ldots$
$\lvert x\rvert$	modulus	$\lvert 2\rvert = 2, \lvert -3\rvert = 3$
a/b or $\frac{a}{b}$	a over b	$12/3 = 4$, $2/4 = 0.5$
$a \mid b$	a divides b	$4 \mid 12$
${}^mC_n$ or $\binom{m}{n}$	m choose n	${}^5C_2 = 10$
$n!$	n factorial	$5! = 120$
$\sum_{i=a}^{b} x_i$	$x_a + x_{a+1} + \cdots + x_b$	$\sum_{i=1}^{3} i^2 = 1^2 + 2^2 + 3^2 = 14$

Sets

Notation	Meaning	Example
$\{\ldots\}$	a set	$\{1,2,3\}$ NOTE: $\{1,2\} = \{2,1\}$
$x \in A$	x is an element of the set A	$2 \in \{1,2,3\}$
$\{x : \ldots\}$ or $\{x \mid \ldots\}$	the set of all x such that ...	$\{x : x^2 = 4\} = \{-2,2\}$
$\lvert A\rvert$	cardinality of A (number of elements in A)	$\lvert\{1,2,3\}\rvert = 3$
$A \cup B$	A union B (set of elements in either A or B)	$\{1,2,3\} \cup \{2,4\} = \{1,2,3,4\}$
$A \cap B$	A intersection B (set of elements in both A and B)	$\{1,2,3\} \cap \{2,4\} = \{2\}$
$A \setminus B$	set difference (set of elements in A but not B)	$\{1,2,3\} \setminus \{2,4\} = \{1,3\}$
$A \subseteq B$	A is a subset of B (or equal)	$\{1,3\} \subseteq \{1,2,3\}$
A'	complement of A	everything not in A
$\emptyset$	empty set (no elements)	$\{1,2\} \cap \{3,4\} = \emptyset$
(x,y)	ordered pair	NOTE: $(1,2) \neq (2,1)$
$A \times B$	Cartesian product (set of all ordered pairs)	$\{1,2\} \times \{1,3\} = \{(1,1),(2,1),(1,3),(2,3)\}$

The Greek alphabet

When mathematicians run out of symbols, they often turn to the Greek alphabet for more. You don't need to learn this; keep it for reference. Apologies to Greek students: you may not recognise this, but it is the Greek alphabet that mathematicians use!

Name	Capital	Lowercase
alpha	A	α
beta	B	β
gamma	Γ	γ
delta	Δ	δ
epsilon	E	ε
zeta	Z	ζ
eta	H	η
theta	Θ	θ
iota	I	ι
kappa	K	κ
lambda	Λ	λ
mu	M	μ
nu	N	ν
xi	Ξ	ξ
omicron	O	o
pi	Π	π
rho	P	ρ
sigma	Σ	σ
tau	T	τ
upsilon	Υ	υ
phi	Φ	ϕ
chi	X	χ
psi	Ψ	ψ
omega	Ω	ω

Probability and random variables

In the table, A and B are events, X and Y are random variables. Notation for specific random variables is given on the information sheets "Discrete random variables" and "Continuous random variables".

Notation	Meaning
$P(A)$	probability of A
$P(A \mid B)$	conditional probability of A given B
$X = Y$	the values of X and Y are equal
$X \sim Y$	X and Y have the same distribution (that is, same p.m.f. or same p.d.f.)
$E(X)$	expected value of X
$\mathrm{Var}(X)$	variance of X
$\mathrm{Cov}(X,Y)$	covariance of X and Y
$\mathrm{corr}(X,Y)$	correlation coefficient of X and Y