Lecture 1

MATH 2111

Mathematics for Computing

Topics

Sets and Numbers

Functions and Relations

Special Functions

Logic

Algorithms

Counting Methods

Discrete Probability and Statistics

Textbook

Discrete Algorithmic Mathematics (3rd Edition) by Maurer & Ralston.

Assessment

Online tests:	15%
In-Class tests:	15%
Mid-Semester test:	10%
Final exam:	60%

Set Theory

(Some online notes will be available later in the week.)

A set is a collection of objects.

The objects are called the elements of a set.

We write

$$x \in X$$

to mean x is an element of the set X.

We also say x is a member of X or belongs to X.

E.g.

$$X = \{a, b, c, d\}$$

So $a \in X$, $b \in X$, $c \in X$ and $d \in X$.

$$|X| = 4$$

$|X|$ — the size or cardinality of X

E.g. $Y = \{a, b\}$

$$|Y| = 2$$

E.g. $Z = \{b\}$

— a singleton

(a 1-element set)

Important example

$\emptyset = \{\}$

= the null set

= the empty set

$\emptyset$ —— this symbol is a bit like the Comp. Sci. zero (only fatter).

Infinite Sets

$\mathbb{N} = \{1, 2, 3, \ldots\}$ (often)

$\mathbb{N} = \{0, 1, 2, 3, \ldots\}$ in Mauer & Ralston

= the set of all nonnegative integers

$\mathbb{Z} = \{\ldots, -2, -1, 0, 1, 2, \ldots\}$

= the set of all integers

$\mathbb{Q}$ = the set of all <u>rational</u> numbers (quotients of integers, or "fractions")

Note that if $a/b \in \mathbb{Q}$ then $b \neq 0$.

Are integers rational?

Yes; e.g., $3 = 3/1$.

$\pi \approx 22/7$

irrational / rational

$\mathbb{R}$ = the set of all <u>real</u> nos.

Technical fact:

$\mathbb{N}$, $\mathbb{Z}$ and $\mathbb{Q}$ are "countably infinite" or "countable"

whereas

$\mathbb{R}$ is "uncountably infinite" or "uncountable".

E.g. — exempli gratia
(for example, for instance)

i.e. — id est
(that is)