## CPSC 229, Fall 2007 — Second Test Info

*The second test of the term will be given in class on Monday, October 22. It will cover Chapter 1, Section 8; Chapter 2, Sections 1, 2, 3, 4, and 6; and Chapter 3, Section 1. You will* ***not*** *be asked to do any Proofs by Induction on the test. However, you* ***should*** *be able to explain how mathematical induction works and why it is valid.*

*Because of the large amount of notation that has been introduced since the first test, a copy of the following table of notations will be provided with the test*:

| | | | |
|---|---|---|---|
| $\mathbb{N}$ | $\{0, 1, 2, 3, \dots\}$ | $\mathbb{Z}$ | {. . . ,-2,-1,0,1,2,3,. . . } |
| $\mathbb{R}$ | the real numbers | $\mathbb{Q}$ | the rational numbers |
| $a \in A$ | $a$ is an element of $A$ | $a \notin A$ | $a$ is not an element of $A$ |
| $\{a, b, c\}$ | set of $a$, $b$, and $c$ | $\{x \mid P(x)\}$ | set of $x$ such that $P(x)$ |
| $A \subseteq B$ | subset | $\{x \in A \mid P(x)\}$ | set of $x$ in $A$ such that $P(x)$ |
| $A \subsetneq B$ | proper subset | $A \not\subseteq B$ | not a subset of |
| $A \cup B$ | union | $A \cap B$ | intersection |
| $A \setminus B$ | set difference | $\overline{A}$ | complement |
| $\emptyset$ or { } | empty set | $\mathcal{P}(A)$ | power set |
| $\forall x \in A, P(x)$ | $\forall x\,(x \in A \to P(x))$ | $\exists x \in A, P(x)$ | $\exists x\,(x \in A \wedge P(x))$ |
| $\lvert A \rvert$ | cardinality of $A$ | $(a, b)$ | ordered pair |
| $A \times B$ | cross product | $f\colon A \to B$ | function from $A$ to $B$ |
| $A^B$ | all functions from $A$ to $B$ | `0xFA97` | sample hexadecimal number |
| $x$ `&` $y$ | bitwise *and* operator | $x$ `\|` $y$ | bitwise *or* operator |
| `~` x | bitwise *not* operator | $x$ `<<` $n$ | left shift operator |
| $x$ `>>` $n$ | right shift operator | $\Sigma$ | typical symbol for an alphabet |
| $xy$ | concatenation of strings | $\varepsilon$ | empty string |
| $LM$ | concatenation of languages | $L^2$ | $LL$ |
| $L^k$ | $LL \cdots L$ ($k$ times) | $L^*$ | all concatenations of strings in $L$ |
| $x^R$ | reverse of a string | $L^R$ | reverse of a language |

**Here are some terms and ideas that you should be familiar with for the test:**

Principle of Mathematical Induction
base Case
inductive Case
set
element (or member) of a set
set notation
the empty set
equality of sets

subset
proper subset
set operations: union, intersection, set difference, complement
universal set
power set
disjoint sets
there is no set of all sets (Russell's Paradox)
DeMorgan's laws for sets
representing sets as binary numbers
bitwise logical operations in Java
shift operations in Java
hexadecimal numbers in Java
ordered pair
function from a set $A$ to a set $B$
cross product (also known as Cartesian product)
one-to-one function
onto function
bijective function (also known as one-to-one correspondence)
cardinality of a finite set
finite set
counting rules for finite sets (Theorem 2.8)
infinite set
cardinalities of infinite sets
countably infinite sets
proofs that various sets are countably infinite
uncountable set
proof that $\mathbb{R}$ is uncountable
diagonal argument
proof that there is no bijection from $X$ to $\mathcal{P}(X)$, for any set $X$
there is no largest infinite cardinality
alphabet
symbol
string
concatenation of strings
length of a string
reverse of a string
empty string
language
number of strings over an alphabet $\Sigma$
number of languages over an alphabet $\Sigma$
operations on languages: union, intersection, concatenation, complement, reverse
Kleene closure, $L^*$, of a language
Kleene star operator