

*The second exam will be given in class on Wednesday, March 11. If you have an unavoidable conflict with the date of an exam, please see me as soon as possible (before the exam date!) to discuss options for rescheduling. Last minute rescheduling/extensions will not be accommodated for something known about in advance.*

*The exam covers material from the first two chapters of the text — sections 1.6–1.8 and 2.1–2.4. Sections 1.9 and 2.5–2.8 will not be on the exam.*

*The exam is closed book. References for the rules of boolean algebra for sets, the hexadecimal-binary conversion table, and the number-related definitions from section 1.6 will be provided — you should be familiar with what they mean and how to use them but you don't need to memorize them.*

*Many of the questions on the exam will be similar to problems on the homeworks. In particular, you can expect some short proofs (more informal mathematical proofs rather than formal proofs). There may be a proof by induction, but with sums or other number properties like we've been working with, not involving code (recursion or loop invariants). In addition, the exam may include some short answer questions that ask you to define, discuss, or explain a term or other concept.*

Terms and ideas that you should be familiar with:

- mathematical proof
- direct proof
- existence proof
- proof by contradiction
- proof by mathematical induction
- the number terminology definitions from section 1.6 (pages 52–53) — you do not need to have the definitions themselves memorized, but you should be familiar with what they mean and how to utilize them
- summation notation, for example:  $\sum_{k=1}^n a_k$
- sets
- set notations:  $\{a, b, c\}$ ,  $\{1, 2, 3, \dots\}$ ,  $\{x \mid P(x)\}$ ,  $\{x \in A \mid P(x)\}$
- the empty set,  $\emptyset$  or  $\{\}$
- equality of sets:  $A = B$  if and only if they contain the same elements
- element of a set:  $a \in A$
- subset:  $A \subseteq B$
- $A = B$  if and only if both  $A \subseteq B$  and  $B \subseteq A$
- union, intersection, and set difference:  $A \cup B$ ,  $A \cap B$ ,  $A \setminus B$
- definition of set operations in terms of logical operators
- power set of a set:  $\mathcal{P}(A)$  power set is)
- universal set
- complement of a set (in a universal set):  $\bar{A}$

- DeMorgan's laws for sets — you do not need to have the laws themselves memorized, but you should be familiar with what they mean and how to utilize them
- bitwise operations in Java:  $\&$ ,  $|$ ,  $\sim$
- correspondence between  $n$ -bit binary numbers and subsets of  $\{n-1, n-2, \dots, 1, 0\}$
- $\&$ ,  $|$ ,  $\sim$  as set operations (intersection, union, complement)
- the shift operators  $\ll$ ,  $\gg$ , and  $\ggg$
- hexadecimal numbers, and converting to and from binary — you do not need to memorize the binary equivalents for each hexadecimal digit but you should understand what hexadecimal numbers are and being able to convert given a table
- ordered pair:  $(a, b)$
- cross product of sets:  $A \times B$
- function  $f : A \rightarrow B$
- the domain, range, and image of a function
- one-to-one function
- onto function
- bijective function
- $B^A$ , the set of all functions from the set  $A$  to the set  $B$