

# CMSC 671 Pretest

August 31, 2010 Due: Sep. 7, 2010
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*You may use written reference materials. You may not work on or discuss the pretest with anyone else. This pretest will be graded for your information (and mine), but will not count towards your final course grade. The primary intent is for you to identify prerequisite material that you are expected to know for CMSC 671. If you have trouble with this pretest, you may want to put in some time now reviewing basic concepts.*

## 1 Logic (10 pts)

Represent the following sentences in first-order logical notation. Use the following predicates:

- $\text{likes}(x, y)$  –  $x$  likes  $y$
- $\text{student}(x)$  –  $x$  is a student
- $\text{grade}(x, y)$  –  $x$  receives grade  $y$
- $\text{person}(x)$  –  $x$  is a person
- $\text{fool}(x, y, t)$  –  $x$  fools  $y$  at time  $t$

1. Everybody likes Raymond.
2. At least one student will get an A.
3. At least two students will get a B.
4. You can fool some of the people all of the time.
5. You can fool all of the people some of the time.

## 2 Combinatorics, Proofs and Mathematical Induction (20 pts)

For an alphabet with  $N$  symbols, how many words are there of length  $k$  or less? (Hint: Your answer should use summation notation.) Prove your answer using mathematical induction.

## 3 Algorithm Design and Programming Principles (20 pts)

Write a function in pseudocode that accepts two arguments: an alphabet `alph` (represented as an array of  $N$  symbols), the length of the alphabet array `N`, and a word length `len` (represented as a positive integer). The function should print a list of all of the words of length `len` that use the symbols in the alphabet, in alphabetical order.

## 4 Algorithmic Complexity (10 pts)

What is the “big-O” complexity of the function in Section 3, in terms of  $N$  and  $k$ ? Justify your answer.

## 5 Probability and Statistics (20 pts)

1. Suppose that you are given three unbiased six-sided dice. What is the probability of rolling a 10 (i.e., that the total of the three dice is equal to ten)? Show your work.
2. Now suppose that one of the dice is biased, so that it shows a 1 half of the time, and a 2 half of the time. (It never rolls a 3, 4, 5, or 6.) What is the probability of rolling a 10? Show your work.

Additional Information (submit on a separate page with your name)

Tell me a little bit about yourself, what do you do? what is your motivation for taking this course? (meet the requirements, haven't thought about it, to know what AI is about, to learn about some specific topic in AI, etc), do you have any previous experience or exposure to AI, AI tools, AI software?

Have you used Lisp? If yes how much? (very basic, basic, intermediate, proficient)

Have you used Python? If yes how much? (very basic, basic, intermediate, proficient)

Have you used Java? If yes how much? (very basic, basic, intermediate, proficient)

Have you used or heard of NetLogo before? where?

Any additional comments, expectations, and/or concerns you might have.