Exam 2
What you need to know

CMSC 203

- *This review sheet will outline the basics of what you should know for the exam to do well. Familiarity with these topics is a **minimum** for performing well, but questions may appear on the exam that are not on this list. Be sure to review all the material we have covered in class.*
- *Most questions will be **medium** to **long** answers, where you will be expected to show your work.*
- *To practice, verify you can successfully complete the homework problems and odd numbered problems in the book without assistance.*

1 Algorithms and Complexity

- Prove $f(x)$ is or is not $O(g(x))$ using a **proof by existence**
- Use **simplifying assumptions** in asymptotic analysis to find big-O
- Analyze the **asymptotic runtime** of a procedure
- **Compare and rank** procedures and runtime of functions using big-O
- **Develop** an algorithm to solve a problem, and give the runtime

2 Induction and Recursion

- Prove statements using **mathematical induction** and **strong induction**
- Develop a **recursive algorithm** to solve a problem, and prove it is correct
- Everything listed under *Induction and Recursion*

3 Counting

- How to appropriately use the **product rule**, **sum rule**, **subtraction rule**, and **division rule** for a real-world problem
- Using the **Pigeonhole Principle** to find the number minimum number of items that must be in at least one box (solving for both N and k)
- Solve real-world **permutation** and **combination** problems without repetition
- Determine the **binomial expansion** of some $(x+y)^n$, and finding the arbitrary **coefficient** for some binomial problem using mathematics and Pascal's Triangle
- Solve real-world problems using **permutations and combinations with repetition**
- Count possibilities for distributing **distinguishable objects into distinguishable boxes** and **indistinguishable objects into distinguishable boxes**