COMP 170 Discrete Mathematical Tools for CS
2007 Fall Semester – Written Assignment # 1
Distributed: Sept 6, 2007 – Due: Sept 13, 2007

At the top of your solution, please write your (i) name, (ii) student ID #, (iii) email address and (iv) tutorial section.

<u>Some Notes:</u>

- Please write clearly and briefly. For all questions you should also provide a short explanation as to *how* you derived the solution. That is, if the solution is 20, you shouldn't just write down 20. You need to explain *why* it's 20.
- Please follow the guidelines on doing your own work and avoiding plagiarism given on the class home page. Don't forget to *acknowledge* individuals who assisted you, or sources where you found solutions.
- These problems are taken (some modified) from section 1.1 of the textbook.
- Please make a *copy* of your assignment before submitting it. If we can't find your paper in the submission pile, we will ask you to resubmit the copy.
- Your solutions can either be submitted at the end of your Thursday lecture section or, before 5PM, in the collection bin in front of Room 4213A.

Problem 1: Seven schools are going to send their basketball teams to a tournament at which each team must play each other team exactly once. How many games are required?

Problem 2: In how many ways can an eight-person club select a president and a secretary-treasurer from among its members?

Problem 3: In how many ways can an eight-person club select a two-person executive committee from among its members?

Problem 4: In how many ways can an eight-person club select a president and a two-person executive advisory board from among its members (assuming that the president is not on the advisory board)?

Problem 5: Using the formula for $\binom{n}{2}$ it is straightforward to show that

$$n\binom{n-1}{2} = \binom{n}{2}(n-2)$$

However, this proof simply uses blind substitution and simplification. Find a more conceptual explanation of why this formula is true. (Hint: Think in terms of officers and committees in a club.)

Problem 6: The local ice cream shop sells 15 different flavors of ice cream. How many different two-scoop cones are there? For this problem assume that *order doesn't matter*; since it all goes to the same stomach, a cone with a vanilla scoop on top of a chocolate scoop is considered the same as a cone with chocolate on top of vanilla.

Problem 7: Suppose that in the previous problem you decide that *order matters*, i.e., a cone with a vanilla scoop on top of a chocolate scoop is not the same as a cone with chocolate on top of vanilla. How many different possible two-scoop cones are there then? (In this case note that cones with two scoops of the same flavour, e.g., two scoops of vanilla, should only be counted once.)