1	10	
2	10	
3	20	
4	10	
5	10	
6	10	
Total	70	

CS 336H
Examination 1

Name _____

1. The important issue is the logic you used to arrive at your answer.
2. Use extra paper to determine your solutions then neatly transcribe them onto these sheets.
3. Do not submit the scratch sheets. However, all of the logic necessary to obtain the solution should be on these sheets.
4. Comment on all logical flaws and omissions and enclose the comments in boxes

1. [10] How many arrangements of the numbers 31415926535 begin with 3 or end with 5 (or both)?

2. [10] A class of 40 students is to illustrate all functions from $\{a,b,c\}$ into $\{1,2,...,8\}$. Prove that at least one student must illustrate at least nine one-to-one functions.

3. a. [10] Using a combinatorial argument, prove that for $n \geq 1$ and $k \geq 1$:

$$n^k - n^{k-1} = (n-1)n^{k-1}$$

b. [10] Using a combinatorial argument, prove that for $m \geq n \geq p \geq 0$:

$$\binom{m}{n}\binom{n}{p} = \binom{m}{p}\binom{m-p}{n-p}$$

4. [10] For $n \geq 2,$ how many arrays of length $2n-1$ using one a, one b, and $2n-3$ $c's$ have the a in one of first n positions and the b in one of last n positions? (Obviously only one could occupy position n.)

5. [10] How many numbers between 0 and 999,999 have (decimal) digits adding to 8?

6. a. [5] Two distinct, unordered numbers are selected from $\{1,...,30\}$ and all such selections are equally likely. What is the probability that (at least) one of the numbers is odd?

b. [5] What is the probability that both numbers are prime given that (at least) one of them is odd?