

CS 275 Sections 001 and 002 Exam 2 March 1, 2007

You may use the class notes from the course web site, your own notes, and the textbook only for references during the exam. You have approximately 70-75 minutes.

Write your name and the page number on each piece of paper you use. If you use the back, label that, too. If you split a problem's solution, please note this fact. Show your work. There are 9 problems on two sides/pages.

No electronic devices are to be used. Turn off your cell phone now. Answering one means you are done with your exam on the spot.

1. For all $n \times m$ matrices A and B , prove that $A+B = B+A$.
2. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 1 \\ 1.5 & -0.5 \end{bmatrix}$.
 - a. What is the product of A and B ?
 - b. A and B are _____ of each other.
3. Define $H_n = \sum_{k=1}^n k^{-1}$.
 - a. Define H_n recursively.
 - b. Use some form of induction to prove that $\sum_{k=1}^n H_k = (n+1)H_n - n$.
 - c. What type of induction did you use in (b)?
4. A certain car manufacturer builds four models, twelve colors, three engine sizes, and two transmission types.
 - a. How many distinct types of cars can be manufactured?
 - b. If one of the available colors is maroon, how many different types of maroon cars can be manufactured?
5. You are given the letters t, c, a, g, b, l, e, x .
 - a. How many permutations are there for the eight letters?
 - b. How many permutations in part (a) begin with the letter c ?
 - c. How many permutations in part (a) begin with the letter t and end with the letter x ?
6. Evaluate the Binomial coefficients:
 - a. $C(10,10)$
 - b. $C(10,3)$
 - c. $C(10,7)$
 - d. $C(121,2)$

7. Given $(x+y)^5$. What are the coefficients of
- x^2y^3
 - xy^4
8. You are given 3 dice. Die one is fair and the other two are crooked (Die two rolls to 4 twice as often as the other numbers and die three rolls to 2 three times as often as the other numbers).
- Construct a random variable for *each* of the three dice.
 - Assign the correct probabilities for *each* random variable's possible values.
9. Every time I do a major security software update on one of my laptops there seems to be a 0.05 probability that the update will cause so many problems that the laptop is unusable after the required reboot.
- What distribution should I use to model the probability that I will have a problem with a major security update?
 - Justify your choice in (a).
 - Write a formula for the probability that I will have a problem on the k^{th} update.
 - Estimate k for when I will have at least a 50% chance of a problem update based on (c).

How not to do problem 7 (this example is *not* from any of my students nor a previous class):

