Section:

## Computer Science 243 Spring 2025 Homework 9

## Due: beginning of class, Wednesday, 4/9/25

Answer the following questions and show your work. Your final submission must be completely your own work.

- 1. [5 points] Answer the following. Show all work to receive full credit.
  - a. [3 points] In a particular state, a driver's license identifier consists of either 2 uppercase letters followed by 3 digits [0-9], or 3 uppercase letters followed by 2 digits. Furthermore, no driver's license identifier can start with a 'X'. How many different driver's license identifiers are possible?
  - b. [2 points] How many strings of four lowercase English letters with at least one vowel can be created if (i) letters can be repeated, and (ii) if no letter can be repeated?
- 2. [10 points] How many bit strings of length 8
  - a. end in 01?
  - b. begin with 10 or end with 0?
  - c. contain exactly 3 0's?
  - d. contain exactly 2 0's or exactly 2 1's?
  - e. are palindromes?
- 3. [9 points] Suppose that a password for a computer system must have at least 5, but no more than 7, characters, where each character in the password is a lowercase English letter, an uppercase English letter, a digit, or one of three special characters #, \$, or -.
  - a. How many different passwords are possible for this system?
  - b. How many different passwords are possible if the password is required to contain exactly one of the special characters?
  - c. Using your answer in (a), how long would it take a hacker (in minutes) to try every possible password, assuming that it takes 1 ns to check a single password?
- 4. [6 points] Thirteen people on a softball team show up for a game.
  - a. How many ways are there to choose 9 players to take the field?
  - b. How many ways are there to assign the 9 positions by selecting players from the 13 people who show up?
  - c. Of the 13 people who show up, three are under 21. How many ways are there to choose 9 players to take the field if at least one of these players must be under 21?

Name:

Points: 50

- 5. [6 points] Answer the following. Show all work to receive full credit.
  - a. At least how many students must be present in class to guarantee that there are 30 either younger than 21 years old, or greater than or equal to 21 years old?
  - b. What is the minimum number of students, each of whom comes from one of the 50 U.S. states, who must be enrolled in a university to guarantee that there are at least 20 that come from the same state?
  - c. How many ordered pairs of integers (a,b) are needed to guarantee that there are two ordered pairs  $(a_1,b_1)$  and  $(a_2,b_2)$  such that  $a_1 \pmod{4} = a_2 \pmod{4}$  and  $b_1 \pmod{4} = b_2 \pmod{4}$ ?
- 6. [4 points] Answer the following:
  - a. Find the expansion of  $(3x + y)^4$ . You may use Pascal's triangle, but take care to handle the coefficient of *x*.
  - b. What is the coefficient of  $x^4y^8$  in the expansion of  $(2x + y)^{12}$ ?
- 7. [6 points] A bakery sells 6 different kinds of donuts: glazed, chocolate, cinnamon, custard, strawberry, and blueberry. Assuming order of selection does not matter, how many ways are there to select
  - a. eight donuts?
  - b. a dozen donuts with at least two glazed and at least one blueberry?
  - c. ten donuts with no more than two chocolate?
- 8. [4 points] Answer the following:
  - a. How many different strings can be made using all of letters of MISSISSIPPI?
  - b. How many ways are there to distribute a deck of 52 cards to 4 players, with all players receiving 12 cards each?