

King Fahd University of Petroleum and Minerals
 College of Computer Science and Engineering
 Information and Computer Science Department

ICS 253-01: Discrete Structures I
 Summer Session 2016-2017
 Quiz#6, Thursday August 17, 2017.

Name:

ID#:

1. (5 points) How many strings are there of lowercase letters of length four or less, not counting the empty string?

$$\begin{aligned} \# \text{ strings} &= \sum_{i=1}^4 \# \text{ strings of length } i \\ &= 26 + 26^2 + 26^3 + 26^4 \end{aligned}$$

2. (5 points) Suppose that every student in a discrete mathematics class of 25 students is a freshman, a sophomore, or a junior. Show that there are at least nine freshmen, at least nine sophomores, or at least nine juniors in the class.

Assume not, i.e. at most 8 freshmen,
 8 sophomores & 8 juniors, the total
 # of students would be 24 not
 25.

3. (5 points) How many bit strings of length 10 contain at least three 1s and at least three 0s?

Let (i, j) denote a bit string of length 10 with i 0s & j 1s. Then,

$$\begin{aligned} \text{the answer} &= \#(3, 7) + \#(4, 6) + \#(5, 5) + \\ &\quad \#(6, 4) + \#(7, 3) \\ &= \binom{10}{3} + \binom{10}{4} + \binom{10}{5} + \binom{10}{6} + \\ &\quad \binom{10}{7}. \end{aligned}$$

4. (5 points) What is the coefficient of x^9 in $(2-x)^{19}$?

$$\begin{aligned} \text{Since } (2-x)^{19} &= \sum_{j=0}^{19} \binom{19}{j} 2^j (-x)^{19-j} \\ \text{the coefficient of } x^9 &\text{ will come from} \\ j=10, \text{ which is } &= \binom{19}{10} 2^{10} (-1)^{19-10} \\ &= -2^{10} \binom{19}{10} \\ &= -2^{10} \binom{19}{9} \end{aligned}$$