MATH 233 Midterm Exam Fall 2017

REMARKS: *Duration is 2 hours. Each question is worth 20 points. Write neatly so that you can get partial points. State your reasoning, thinking: Do not just write a number as the answer. No calculators.*

1. Suppose a department contains 10 men and 15 women. How many ways are there to form a committee with six members if

a) There should be more women than men?

b) There should be same number of men and women?

(Do not forget to state the problem as a combination/permutation problem.)

2. Give a formula for the coefficient of x^k in the expansion of $(x + 1/x)^{100}$, where k is an integer. Remember the Binomial Theorem:

$$(x+y)^n = \sum_{j=0}^{n} \binom{n}{j} x^{n-j} y^j$$

3. There are 10 questions on discrete mathematics final exam. How many ways are there to assign scores to the problem if the sum of the scores is 100 and

a) Each question can have any points from 0 to 100 (Yes, it is stupid to assign 0 points to a question, but assume that this can be the case).

b) Each question is at least 5 points.

4. How many ways are there to put five temporary employees into four identical offices if

a) An office can take at most two employees.

b) An office can host take any number of employees.

5. We are interested in finding the likelihood of having a poker hand contains a full house, that is to say 3 of one kind and 2 of another. Remember that a deck of 52 cards contains 13 kinds (A,2,3,…, Q,K) and 4 suites (spade, club, diamond, heart) for each kind.

a) What is the experiment?

b) What is the sample space?

c) What is the size of the sample space?

d) What is the event (of having a full house)?

e) What is the size of the event?

f) What is the probability of having a hand containing full house?