Discrete Structures. CSCI-150. Summer 2014.

Homework 3. Due Thr. June 12, 2014.

Problem 1 (Graded)

You have to schedule classes for a school. There are 5 time slots every day. To simplify the task, we don't care about the class rooms: We can assume that the rooms are indistinguishable, and there is always sufficiently many rooms to accomodate any number of classes if they happen to be in the same time slot.

Consider the following situations:

(a) There are two professors, call them A and B. Each of them teaches one class. Count the number of ways to schedule a single day of classes.

(b) The same two professors A and B, but it turns out that they hate each other, and don't want to teach in the same time slot. Again, count the number of ways to schedule their classes.

(c) The same A and B who hate each other, and also professor C, who is in good relationships with everyone and also teaches 1 class.

(d) The same A, B, and C, but C teaches 4 class.

(e) The same A, B, and C. Each of the professors teaches exactly one class every day. In how many ways the classes can be scheduled for a 5-day workweek?

Explain your solutions. Answers by themselves are useless and don't prove anything.

Problem 2 (Graded)

First, count the total number of bitstrings of length 10.

Then, find how many bit strings of length 10 either begin with four 0s or end with two 0s.

Problem 3 (Graded)

How many bit strings contain exactly eight 0s and ten 1s if

(a) every 0 is immediately followed by a 1?

(b) every 0 is either immediately followed by a 1, or this 0 is the last symbol in the string?

Problem 4

How many permutations of the letters ABCDEFGH contain

(a) the string AB

(b) the string FGH

(c) the strings AB and FGH

(d) the string AB or the string FGH

Problem 5 (Graded)

Ellen draws 5 cards from a standard deck of 52 cards.

(a) In how many ways can her selection result in a hand with no clubs?

(b) A hand with at least one club?

Problem 6

Consider the following game: Each of the two players is tossing a coin five times. To win, a player has to get more "heads" than the opponent.

(a) How many game scenarios are possible?

(b) How many games result in a tie? (The answer is between 249 and 261).

You can think of a game scenario as two strings of five symbols each:

$$x_1x_2x_3x_4x_5 \text{ and } y_1y_2y_3y_4y_5,$$

where xs are the results of the first player, and ys are the results of the second player.