

# Discrete Structures. CSCI-150. Spring 2014.

## Homework 3.

Due Fri. Feb 21, 2014.

### Problem 1

A *palindrome* is a string whose reversal is identical to the string.

- (a) How many bit strings of length 4 are palindromes?
- (b) How many bit strings of length 5 are palindromes?
- (c) How many bit strings of length 6 are palindromes?
- (d) How many bit strings of length  $n$  are palindromes?

(You can provide two formulas: One when  $n$  is even, and another when it's odd).

Always provide sufficiently complete arguments for the answers. Answers by themselves are useless and don't prove anything.

### Problem 2

How many bit strings of length 10 either begin with three 0s or end with two 0s?

Answer: 352.

### Problem 3

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 4

How many bit strings contain exactly eight 0s and ten 1s if every 0 is either immediately followed by a 1, or this 0 is the last symbol in the string?

**Problem 5**

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  $x$ s are the results of the first player, and  $y$ s are the results of the second player.