

Discrete Structures and Theory (Spring 2023)

Discussion

Date: 20/04/2023

Exercise 1:

A drawer contains a dozen brown socks and a dozen black socks, all unmatched. A man takes socks out at random in the dark.

- a) How many socks must he take out to be sure that he has at least two socks of the same color?
- b) How many socks must he take out to be sure that he has at least two black socks?

Exercise 2:

Assuming that no one has more than 1,000,000 hairs on the head of any person and that the population of New York City was 8,008,278 in 2010, show there had to be at least nine people in New York City in 2010 with the same number of hairs on their heads.

Exercise 3:

Let  $S = \{1, 2, 3, 4, 5\}$ .

- a) List all the 3-permutations of  $S$ .
- b) List all the 3-combinations of  $S$ .

Exercise 4:

Find the value of each of these quantities.

- a)  $P(6, 3)$
- b)  $P(6, 5)$
- c)  $P(8, 1)$
- d)  $P(8, 8)$
- e)  $C(5, 1)$
- f)  $C(8, 4)$
- g)  $C(8, 8)$
- h)  $C(8, 0)$

Exercise 5:

In how many different orders can five runners finish a race if no ties are allowed?

Exercise 6:

Suppose you have 30 books (15 novels, 10 history books, and 5 math books). Assume that all 30 books are different.

- a) In how many ways can you put the 30 books in a row on a shelf?
- b) In how many ways can you get a bunch of four books to give to a friend?
- c) In how many ways can you get a bunch of three history books and seven novels to give to a friend?
- d) In how many ways can you put the 30 books in a row on a shelf if the novels are on the left, the math books are in the middle, and the history books are on the right?

Exercise 7:

A class consists of 20 sophomores and 15 freshmen. The club needs to choose four different members to be president, vice president, secretary, and treasurer.

(a) In how many ways is this possible?

(b) In how many ways is this possible if sophomores will be chosen as president and treasurer and freshmen as vice president and secretary?

Exercise 8:

Make up a word problem in good English whose answer is  $C(15, 4) \times C(7, 3)$

Exercise 9:

How many subsets with more than two elements does a set with 100 elements have?