

COT 3100 Fall 2024 Homework #5
Please Consult WebCourses for the due date/time

Unless otherwise specified, please leave answers in factorials, combinations, powers, etc.

- 1) This question considers permutations of “HEWLETTPACKARD”.
 - a) How many permutations are there total?
 - b) How many permutations contain the substring “LETTER”?
 - c) How many permutations start and end with vowels?
 - d) How many permutations do NOT have consecutive vowels in them?
 - e) How many permutations contain the vowels in order (A before Es, before I, before O)?
- 2) A class contains 22 girls and 18 boys. For all parts of this question, each boy and girl are distinguishable from one another. Treat each student as distinguishable from each other student. Answer the following questions:
 - a) In how many ways can a committee of one boy and one girl be chosen?
 - b) In how many ways can a committee of five students be chosen?
 - c) In how many ways can a committee of four girls and three boys be chosen?
 - d) In how many ways can a committee of six students be chosen such that all the students on the committee are the same sex?
 - e) In how many ways can the girls and boys form a line where no two boys are standing next to one another?
- 3) How many solutions does the equation $a + b + c + d + e = 50$ have, where a, b, c, d and e are each non-negative integers, under the following restrictions?
 - a) No other restrictions
 - b) $d \geq 8$
 - c) $b \leq 15$
 - d) $b \leq 15$ and $c \leq 10$
 - e) $d \geq 8$ and $b \leq 15$ and $c \leq 10$

4) How many solutions does the equation $a + b + c + d + e + f + g + h \leq 50$ have if each variable must be an integer greater than or equal to -1.

5) Suppose that one person in 1,000 people has a rare genetic disease. There is an excellent test for the disease; 98% of the people with the disease test positive and only 3% of the people who don't have it test positive. What is the probability that someone who tests positive has the disease? What is the probability that someone who tests negative does not have the disease?

6) A bag of candy has 20 Hershey bars and 30 Krackel bars. Jacob randomly selects 3 candy bars without replacement from the bag. What is the probability he gets at least 1 bar of both types?

7) Stephanie rolls three standard six-sided dice. What is the probability that the product of the three numbers she rolled is not a multiple of 8? (Please answer as a fraction in lowest terms.)

8) Malik rolls two six-sided dice, but the labels on the dice have been changed. One die has the following six labels: 1, 1, 3, 3, 5, 6. The other die has the following six labels: 2, 2, 4, 4, 5, 5. He then rolls both dice.

(a) What is the probability that the sum of the top faces of the dice he rolled sum to an even number?

(b) Given that he rolled an even sum, what is the probability he rolled a sum of 8?