## MATH -112 Exercise set 1

**1.** In how many ways can the letters in VISITING be arranged? How many arrangements have all three I's together?

**2.** In how many ways can letters WONDERING be arranged with exactly two consecutive vowels?

**3.** Find a number of different paths for a rook (a rook is a chess piece that can move horizontally and vertically on a chessboard) to move from the southwest corner to northeast corner by moving eastward and northward only.

4. In how many ways can two squares be selected from  $8 \times 8$  chessboard so that they are not in the same row or column?

5. In how many ways can four squares, not all in the same row or column, be selected from  $8 \times 8$  chessboard to form a rectangle?

**6.** In a class of 100 students, 40 were boys. (a) In how many ways can 10 person committee be formed? (b) Repeart part (a) if there must be equal number of boys and girls. (c) Repeart part (a) if there must be either 6 boys and 4 girls or 4 boys and 6 girls.

7. How many ways are there to place 12 marbles of the same size in five distinct jars if (a) the marbles are all black; (b) each marble is of a different color?

8. In how many ways can 2n people be divided into n pairs?

**9.** In how many ways we can select n objets from a collection of size 2n that consists of n distinct and n identical objects?

**10.** In how many ways can 22 different books be given to 5 students so that 2 of them will have 5 books each and other 3 will have 4 books each?

**11.** If we write all natural numbers form 1 to 1 million, how many times would we write digit 9?

12. In how many ways can we distribute 15 books among Peter, Linda and Sam so that Peter and Linda together receive twice as much books as Sam?

**13.** In how many ways can Beth place 24 different books on four shelves so that there is at least one book on each shelf?

**14.** Find the coefficient of  $x^2y^2z^2w^2$  in the expansion of (a)  $(x+y+z+w+1)^{10}$ ; (b)  $(2x-y+3z+w-2)^{12}$ ; (c) (b)  $(v+x-3y-2z+5w+3)^{12}$ .

15. How many distinct terms in the expansion arise in the expansion of  $(3v + 5u - x + z)^{45}$ ?

16. In how many ways can the 11 identical horses on a carousel be painted so that three are brown, three are white, and five are black.

17. Determine the number of integer solutions of  $x_1 + x_2 + x_3 + x_4 = 32$  where

a)  $x_1$ ,  $x_2$ ,  $x_3 > 5$  and  $x_4 \ge 8$ ; b)  $x_1$ ,  $x_2 > -3$ ,  $x_3 > 0$  and  $x_4 \ge 6$ ; c)  $x_1$ ,  $x_2$ ,  $x_3 > 0$  and  $0 \le x_4 \le 25$ .

18. In how many ways can two numbers be selected from the integers 1...100 so that their sum is (a) an even number (b) an odd number?

**19.** Suppose n different games are to be distributed among n children. In how many ways it can be done so that exactly one child gets no game?

**20.** In how many ways can two integers from  $1, 2, \ldots n - 1$  be choosen so that their sum is large than n?