1. Each locker in an airport is labeled with an uppercase letter followed by three digits. How many different labels for lockers are there?

2. How many different license plates can be made if each license plate consists of three letters followed by three digits or four letters followed by two digits?

3. How many four letter "words" are there that contain the letter A (repetition allowed)?

4. Nine people (Ann, Ben, Cal, Dot, Ed, Fran, Gail, Hal and Ida) are in a room. Five of them stand in a row for a picture. In how many ways can this be done if
(a) Ben is to be in the picture?
(b) Both Ed and Gail are in the picture?
(c) Neither Ed nor Fran are in the picture?
(d) Dot is on the left end and Ed is on the right end?
(e) Hal or Ida (but not both) are in the picture?
(f) Ed and Gail are in the picture, standing next to each other?
(g) Ann and Ben are in the picture, but not standing next to each other?

5. Five men and six women are to be arranged in a line. In how many ways if:
(a) the men must be together and the women must be together.
(b) the men and the women must alternate.
(c) A man must be first and a woman must be last.
(d) A man must be first or a woman last.

6. (a) How many bit strings of length 10 are there?
(b) How many bit strings of length 10 begin with 1101?
(c) How many have exactly six 0s?
(d) How many have an equal number of 0s and 1s?
(e) How many have more 1s than 0s?
(f) How many begin with 10 or end with 000?
(g) How many have a 1 in the 4th position?

7. A club 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?

8. Each user has a password 6 character long where each character is an uppercase letter, a lowercase letter, or a digit. Each password must contain at least one digit. How long will it take to check every possible password if each check takes one unit of time?

9. Consider the set \( S = \{1, 2, 3, \ldots, 10\} \). Find the number of subsets that contain
(a) the number 5
(b) neither 5 nor 6.
(c) both 5 and 6.
(d) no odd numbers.
(e) exactly three elements.
(f) exactly three elements, one of which is 3.
(g) exactly five elements, all of them even.
(h) exactly three elements, all of them even.
(i) exactly five elements, two of which are 3 and 4.
(j) exactly five elements, including 3 or 4 but not both.
(k) exactly five elements, but neither 3 nor 4.
(l) exactly five elements, the sum of which is even.
(m) exactly four elements, the sum of which is odd.

10. You have 50 of each of the following kinds of jellybeans: red, orange, green, yellow. The jelly beans of each color are identical.
(a) In how many ways can you put all the jellybeans in a row?
(b) How many handfuls of 12 are possible?

11. There are 805 lockers in the athletic center and 4026 students who need lockers. Therefore, some students must share lockers. What is the largest number of students who must necessarily share a locker?

12. How many students must be in a class to guarantee that at least five were born on the same day of the week?

13. A professor gives a multiple choice quiz that has ten questions, each with four possible responses, a,b,c,d. What is the minimum number of students that must be in the professor's class in order to guarantee that at least three answer sheets must be identical? (assume that no answers are left blank).

14. (a) How many functions are there from a set with three elements to a set with eight elements?
(b) How many one-to-one functions are there from a set with three elements to a set with eight elements?
(c) How many onto functions are there from a set with three elements to a set with eight elements?

15. From a group of 5 men and 6 women a committee of 4 must be chosen.
(a) How many different committees are possible if:
(b) the committee must contain at least one woman.
(c) the committee must contain at least one woman and one man.

16. A test has 15 multiple choice questions, each with 4 possible answers A, B, C and D. How many different answer sheets are possible if:
(a) All questions are answered?
(b) Questions can be left blank?
(c) exactly two questions were left blank?
(d) There are 5 As, 3 Bs, 4 Cs, 2Ds and one blank answer.

17. From a group of 8 women and 9 men, a committee consisting of 3 men and 3 women is to be formed.
(a) How many different committees are possible if:
(b) Two of the men refuse to serve together?
(c) Two of the women refuse to serve together?
(d) One man and one woman refuse to serve together?
(e) the committee must have a woman as a chair and a man as a secretary?

18. How many different ways are there to choose five doughnuts if there are eight varieties (and only the type of each doughnut matters)?

19. (a) How many ways are there to chose 12 cookies if there are five varieties of cookies?
(b) How many ways are there to choose 12 cookies if there are five varieties, including chocolate chip, and at least four chocolate chip must be chosen?

20. (a) How many different strings can be made using all the letters in the word NONSENSE?
(b) How many of these strings start or end with the letter O?

21. (a) Find the number of solutions to \( x + y + z = 32 \) where \( x, y \) and \( z \) are nonnegative integers.
(b) Answer part (a), but assume that \( x \geq 7 \) and \( y \geq 15 \).
22. Assume that you have 50 pennies and three jars, labeled A, B, and C. In how many ways can you put the pennies in the jars, (a) assuming that the pennies are distinguishable? 
(b) assuming that the pennies are identical? 
(c) assuming that the pennies are identical and each jar must have at least two pennies put into it?

23. What is the number of possible poker hands 
(a) that contain exactly 3 hearts. 
(b) that contain at least 2 clubs. 
(c) that are a straight flush (same suit and in sequence).

24: Let A be the set of possible poker hands that contain cards of the same suit. Let B be the set of possible poker hands that contain the jack of spades. Let C be the set of possible poker hands that contains the ace of spades. Find:
(a) \(|A| = \)
(b) \(|A \cap B| = \)
(c) \(|A \cup B| = \)
(d) \(|A \cap B \cap C| = \)
(e) \(|A \cup B \cup C| = \)