1. You have 10 tulips and 10 roses. In how many ways can you plant flowers in your 4 flower gardens if:
    a. There are no any restriction
    b. First flower garden has at least 1 tulip and 2 roses.
    c. Each flower garden has at least one flower

2. There are 10 cat images, machine learning algorithm can differentiate exactly 7 of them. Testing process consist of a random selection of 5 of 10 cat images. What is the probability that algorithm will differentiate correctly:
    a. all 5 images
    b. at least 4 of 5

3. An urn contains one red and one black ball. Each time, a ball is drawn independently at random from the urn, and then returned to the urn along with another ball of the same color. For example, if the first ball drawn is red, the urn will subsequently contain two red balls and one black ball.
    a. What is the probability of observing 3 red and 2 black balls?
    b. What is the probability of observing 7 red and 9 black balls?

4. A repeated appearance of the same symbol in a sequence is called a "run". For example the sequence 0111001 contains four runs: 0, 111, 00, and 1; the sequence 00010 contains three runs: 000, 1, and 0; and the sequence 111 contains a single run -- the sequence itself.
    a. Find the expected number of runs in the random sequence X_1X_2 where X_1 and X_2 are independent $B_{2/3}$ (Bernoulli with parameter 2/3) random variables. For example, if $X_1=1$ and $X_2=0$, the sequence is 10 and has 2 runs.
    b. Find the expected number of runs in the random sequence $X_1X_2X_3X_4X_5$, where all X_i's are independent $B_{2/3}$ random variables.

5. There are 5 traffic signals between your home and work. Each is red with probability 0.35, independently of all others. Find:
    a. the probability of encountering no red lights,
    b. the probability of encountering only red lights,
    c. the expected number of red lights you will encounter.

6. Let X ~N (0; 1) and Y~N (2;2) independently. Find the constant C such that:
    a. P (X + 2Y<=C)= P (7X - 4Y=>10)

7. To find the average SAT verbal score in a class, six students are sampled and their scores are 560, 610, 500, 470, 660, and 640. Assuming that students' SAT verbal scores follow normal distribution, what is the upper limit for the confidence interval of the distribution mean with confidence level 90%?

8. Please explain me what eigenvalues and eigenvectors are, assume that I am zero in math. Then find eigenvalues and eigenvectors:

Given the matrix

$$A = \begin{bmatrix} -1 & 2 & 2 \\ 2 & 2 & -1 \\ 2 & -1 & 2 \end{bmatrix}$$

9. What is hypothesis testing, explain for non-mathematician person.

10. You have a neural network with three fully connected layers, each containing 800 nodes. Approximately how many total edges does this graph have?
11. What is the unit vector in the same direction as (3,2,2,2,2)