

# Questions

Q1. A startup company has 5 founders. The company wants to choose a board of two officers, the CEO and CTO. Assuming that these officers are chosen at random, what is the probability that the officers are Satyajit as CEO and Dileep as the CTO (assume that there is only one Satyajit and one Dileep among the 5 founders).

Now, write a general program to compute the above probability for N founders for M board positions (assume that there is only one unique name for each board position among the N founders). Please accept N and M from the user.

Q2. A game uses 32 unique cards. These cards come four suits (diamonds, hearts, clubs, and spades). Cards are numbered 1 to 8 in each suit. A hand is a collection of 8 cards, which could be sorted however the player chooses (so order of holding cards in the hand does not matter). What is the probability of getting all four of the 1s in a hand?

Now, write a general program to compute the above probability for N unique cards, which come from four suits (diamonds, hearts, clubs, and spades). Please assume a hand is a collection of D cards, where D can be any number from 6 to 8. Please accept N and D from the user.

Q3. Imagine two unbiased six-sided dice are thrown once and the total score is observed. Use a 1000-run simulation in a program to find the estimated probability that the total score is odd or greater than 8? Run the program multiple times and observe the run-to-run variations in the probability

Lab-1

$$1) \text{ Prob} = \frac{1}{5C_2 \times 2} = \frac{1}{20} (=0.05)$$

$$2) \text{ Prob of getting all 4s in 1 hand} = \frac{{}^4C_4 {}^{28}C_4}{{}^{32}C_4}$$

$$= \frac{28 \times 27 \times 26 \times 25}{32 \times 31 \times 30 \times 29}$$

$$= 0.00194$$

Exact Calculation

$$3) \text{ Prob (Score > 8 or odd)} = 1 - \frac{(1+3+5+5)}{36}$$

$$= \frac{11}{18}$$

Code is displayed and in terminal output is shown with examples as mentioned in question

The screenshot displays the Spyder Python IDE interface. The left pane shows a Python script named 'untitled25.py' with the following code:

```
Created on Sun Feb 27 19:04:49 2022

@author: Adarsh
"""
#adding factorial formula
from math import factorial as fact      #fact(a) is factorial of a
'''
Ques 1
'''
N=int(input("founders:"))               #N is number of founders
M=int(input("board positions:"))        #M is number of board positions
print("probability:", fact(N-M)/fact(N))
#formula of permutaion is used to assign M booard position to M person out of N
#and divide it by total permutaion of N persons for probability
'''
Ques 2
'''
N=int(input("unique cards:"))           #N is number of unique cards
D=int(input("cards in hand: "))         #D is number of cards in a hand
assert 6<=D<=8                         #D is from 6 to 8
#four 1s are choosen in a hand
print(fact(N-4)*fact(D)/(fact(D-4)*fact(N)))
#formula of combination is used to choose (D-4) cards from remaining (N-4)
#and divide it by total combination to choose four cards from N to get probability
'''
Ques 3
'''
import random                          #importing a module random
def dice(a):                           #defining a function dice(a)
    count=0                            #a is number of simulation
    for i in range(a):
        l=[1,2,3,4,5,6]               #all entries of dice are listed as l
        o1=random.choice(l)           #variable is made to randomly choose a entry
        o2=random.choice(l)           #this is for two dices
        s= o1 + o2                    #s is their sum
        if(s%2!=0 or s>8):             #checking whether given condions are true
            count=count+1              #if true, increase count(variable) by 1
    return count/a                    #returning probability using it's formula
print(dice(1000))                     #run the dice function for 1000simulation
```

The right pane shows the Variable Explorer with the following variables:

Nam	Type	Size	Value
D	int	1	8
M	int	1	2
N	int	1	32

The bottom pane shows the IPython Console with the following output:

```
Python 3.7.9 (tags/v3.7.9:13c94747c7, Aug 17 2020, 18:58:18) [MSC v.1900 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 7.31.1 -- An enhanced Interactive Python.

In [1]: runfile('D:/untitled25.py', wdir='D:')

founders:5

board positions:2
probability: 0.05

unique cards:32

cards in hand: 8
0.001946607341498545
0.62

In [2]:
```

1. M=5 and N=2

2. N=32 and D=8

(as mentioned)