Data Science Masters :Assignment 15

Problem Statement 1:
A test is conducted which is consisting of 20 MCQs (multiple choices questions) with every MCQ having its four options out of which only one is correct. Determine the probability that a person undertaking that test has answered exactly 5 questions wrong.

Solution
Total Ques = 20
Here the probability of success = probability of giving a right answer = S = 1/4
Hence, the probability of failure = probability of giving a wrong answer = 1 - s = 1 - 1/4 = 3/4

Using Binomial Distribution:

$$P[X=r] = {}^{N}C_{r} * (P)^r (Q)^{(N-r)}$$

So, P (exactly 5 out of 20 answers incorrect) = $${}^{20}C_{5} * (3/4)^5 * (1/4)^{15}$$

$$= \frac{20!}{(15!(20-15)!)} \times (0.25)^{15} \times (0.75)^{5}$$

$$= 0.0000034265$$

Thus the required probability is 0.0000034 approximately.

In [28]:
```
#Using scipy function to cross verify the solution #1...
from scipy.stats import binom
n = 20
p = 0.75
binomial = binom.pmf(5,n,p)
print(binomial)
```

```
3.4264958230778435e-06
```

Problem Statement 2:
A die marked A to E is rolled 50 times. Find the probability of getting a “D” exactly 5 times.

Solution
Probability of getting D (success) = s= 1/5
Probability of not getting D (failure) = 1-s = 1-1/5 = 4/5
N = 50

Using Binomial Distribution
So, P (getting exactly "D" 5 times) = $${}^{50}C_{5} \times (1/5)^5 \times (4/5)^{45}$$

$$= \frac{50!}{(5!(50-5)!)} \times (0.2)^{5} \times (0.8)^{45}$$

$$= 0.029531204310523224$$

In [27]:
```
#Using scipy function to cross verify the solution #2.....
from scipy.stats import binom
n = 50
p = 0.2
binomial = binom.pmf(5,n,p)
print(binomial)
```

```
0.029531204310523224
```

```
Problem Statement 3:
Two balls are drawn at random in succession without replacement from an urn containing
4 red balls and 6 black balls.
Find the probabilities of all the possible outcomes.

# Solution
Total balls in an urn =  10
Probability of getting Red Ball (RB) = 4/10
Probability of getting Black Ball (BB) = 6/10

Possible outcomes

P(RR) = 4/10 * 3/9 = 0.4 * 0.333333 = 0.13333

P(RB) = 4/10 * 6/9 = 0.4 * 0.666666 = 0.26666

P(BR) = 6/10 * 4/9 = 0.6 * 0.444444 = 0.26666

P(BB) = 6/10 * 5/9 = 0.6 * 0.555555 = 0.33333
```