

# Forward School

**## Program Code: J620-002-4:2020**

**## Program Name: FRONT-END SOFTWARE DEVELOPMENT**

**## Title : Binomial Distribution Exercise**

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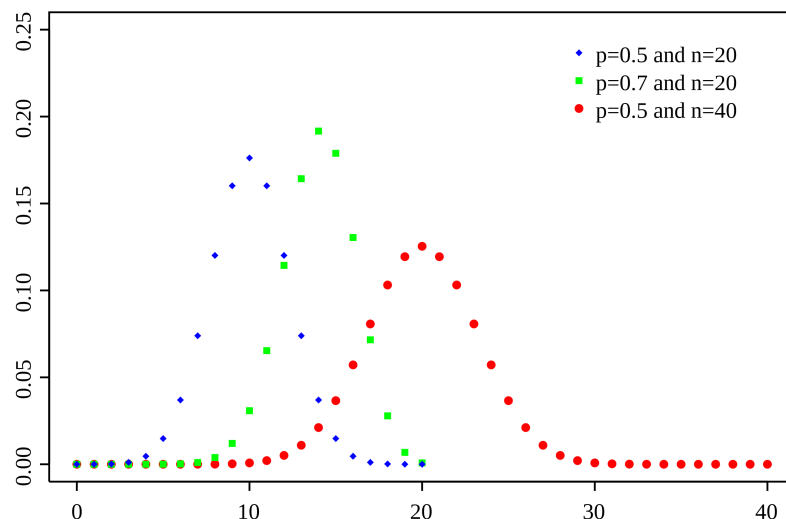
**#### Date : 14/7/2023**

**#### Introduction : Learning about binomial distribution.**

**#### Conclusion : Managed to complete tasks based on binomial distributions.**

## Binomial Distribution

The binomial distribution model deals with finding the probability of success of an event which has only two possible outcomes in a series of experiments. For example, tossing of a coin always gives a head or a tail. The probability of finding exactly 3 heads in tossing a coin repeatedly for 10 times is estimated during the binomial distribution.



We will use the scipy package to create the binomial distribution.

In [2]:

```
from scipy.stats import binom
import numpy as np
```

## Question 1

How many heads will have a probability of 0.25 will come out when a coin is tossed for 51 times.

In [34]:

```
# sum(binom.pmf(np.arange(0,5), 12, 0.2))
n = 51
p = 0.5
x = 0.25

binom.ppf(x, n, p)
```

Out[34]:

23.0

## Question 2

Probability of getting 26 or less heads from a 51 tosses of a coin.

In [28]:

```
sum(binom.pmf(np.arange(0, 27), 51, 0.5))
```

Out[28]:

0.6101160347234628

## Question 3

Bob makes 60% of his free-throw attempts. If he shoots 12 free throws, what is the probability that he makes exactly 10?

In [29]:

```
#find the probability of 10 successes during 12 trials where the probability of
#success on each trial is 0.6
binom.pmf(10, 12, 0.6)
```

Out[29]:

0.063852281856

## Question 4

Sasha flips a fair coin 20 times. What is the probability that the coin lands on heads exactly 7 times?

In [30]:

```
#find the probability of 7 successes during 20 trials where the probability of  
#success on each trial is 0.5  
binom.pmf(7, 20, 0.5)
```

Out[30]:

```
0.07392883300781249
```

## Question 5

Suppose Tyler scores a strike on 30% of his attempts when he bowls. If he bowls 10 times, what is the probability that he scores 4 or fewer strikes?

In [35]:

```
#find the probability of 4 or fewer successes during 10 trials where the  
#probability of success on each trial is 0.3  
sum(binom.pmf(np.arange(0, 5), 10, 0.3))
```

Out[35]:

```
0.8497316673999996
```

## Question 6

Ando flips a fair coin 5 times. What is the probability that the coin lands on heads more than 2 times?

In [39]:

```
#find the probability of more than 2 successes during 5 trials where the  
#probability of success on each trial is 0.5  
sum(binom.pmf(np.arange(3,6), 5, 0.5))
```

Out[39]:

```
0.49999999999999983
```

## Question 7

Find the 10th quantile of a binomial distribution with 10 trials and probability of success on each trial = 0.4

In [40]:

```
binom.ppf(0.1, 10, 0.4)
```

Out[40]:

```
2.0
```

## Question 8

Find the 80th quantile of a binomial distribution with 30 trials and probability of success on each trial = 0.25

In [41]:

```
binom.ppf(0.8, 30, 0.25)
```

Out[41]:

9.0

## Question 9

There are 20 people randomly selected and nationally 5% of the population is afraid of being home alone at night. Now we want to know what the probability is that exactly 5 of these 20 are afraid of being home alone at night.

In [43]:

```
binom.pmf(5, 20, 0.05)
```

Out[43]:

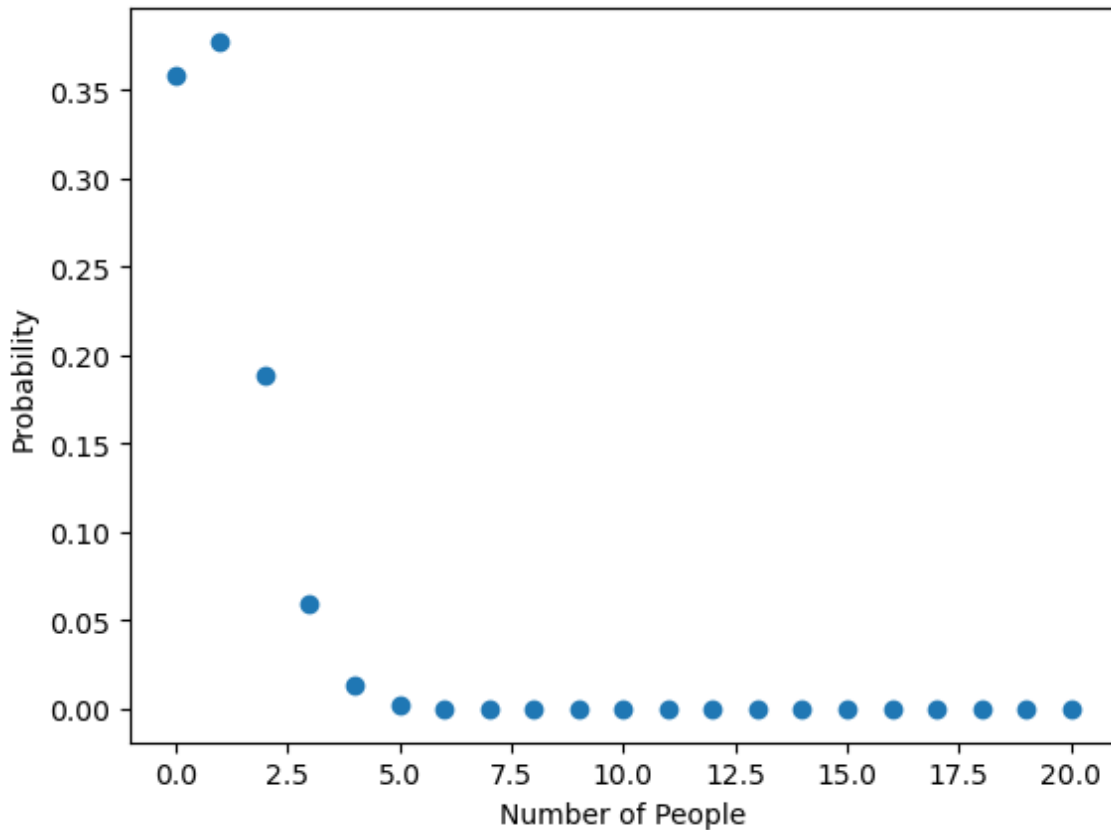
0.002244646010124003

## Question 10

Continuing from Question 9, we can also find the probability that someone will be afraid in each possible outcome, from 0 through 20. Plot a scatter plot to visualize the most likely outcomes in this scenario are that 1, 0.

In [49]:

```
import matplotlib.pyplot as plt
import numpy as np
x= np.arange(0,21)
y = binom.pmf(np.arange(0,21), 20, 0.05)
plt.scatter(x,y)
plt.xlabel('Number of People')
plt.ylabel('Probability')
plt.show()
```



## Question 11

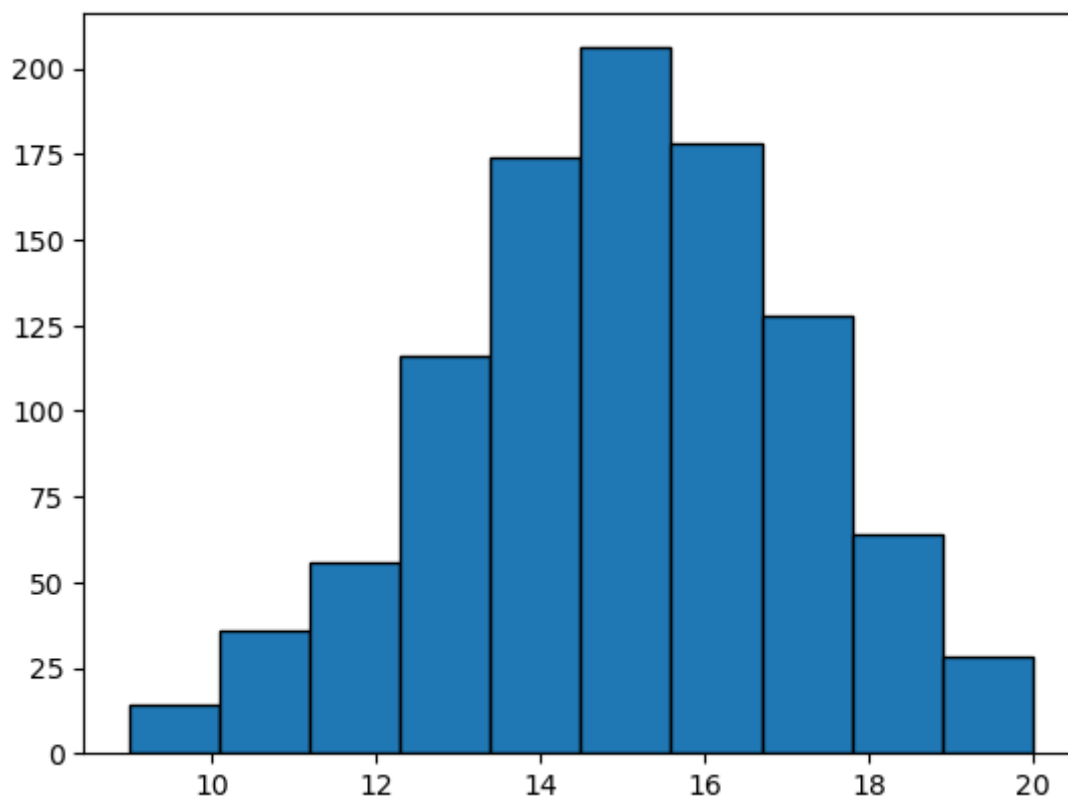
We have a fictional drug that has a 75% success rate, it's been tried out on groups of 20 people 1000 times and we want a binomial distribution of the number of success in each trial. Generate a random binomial distribution of 1000 trials for 20 people and plot the histogram.

In [6]:

```
import random
import matplotlib.pyplot as plt
from numpy import random
plt.hist(random.binomial(20, 0.75, 1000), bins = 10, edgecolor='black')
```

Out[6]:

```
(array([ 14.,  36.,  56., 116., 174., 206., 178., 128.,  64.,  28.]),
 array([ 9. , 10.1, 11.2, 12.3, 13.4, 14.5, 15.6, 16.7, 17.8, 18.9, 20.
]),
 <BarContainer object of 10 artists>)
```



In [ ]: