Forward School

Program Code: J620-002-4:2020

Program Name: FRONT-END SOFTWARE DEVELOPMENT

Title : Binomial Distribution Exercise

Name: Chong Mun Chen

IC Number: 960327-07-5097

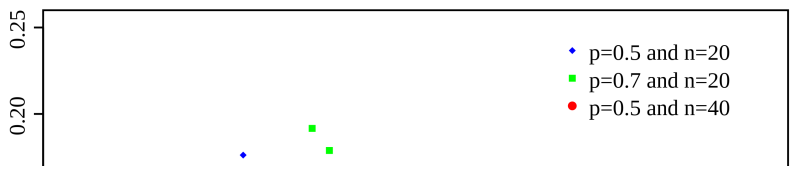
Date : 12/7/2023

Introduction : Practising more on binomial distribution exercises.

Conclusion : More familiar than before in finding the probability from binomial distribution models.

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.



Question 1

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

In [1]:
```
from scipy.stats import binom

q = 0.25
n = 51
p = 0.5

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

Out[1]: 23.0

Question 2

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

In [2]:
```
from scipy.stats import binom

k = 26
n = 51
p = 0.5

binom.cdf(k, n, p)
```

Out[2]: 0.6101160347234629

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 [3]:
```
#find the probability of 10 successes during 12 trials where the probability o
#success on each trial is 0.6

from scipy.stats import binom

k = 10
n = 12
p = 0.6

binom.pmf(k, n, p)
```

Out[3]:
```
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 [5]:
```
#find the probability of 7 successes during 20 trials where the probability of
#success on each trial is 0.5

from scipy.stats import binom

k = 7
n = 20
p = 0.5

binom.pmf(k, n, p)
```

Out[5]:
```
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 [6]:
```
#find the probability of 4 or fewer successes during 10 trials where the
#probability of success on each trial is 0.3


from scipy.stats import binom

k = 4
n = 10
p = 0.3

binom.cdf(k, n, p)
```

Out[6]:
```
0.8497316674000001
```

Question 6

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

In [7]:
```
#find the probability of more than 2 successes during 5 trials where the
#probability of success on each trial is 0.5

from scipy.stats import binom

k = 2
n = 5
p = 0.5

1 - binom.cdf(k, n, p)
```

Out[7]: 0.5

Question 7

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

In [8]:
```
from scipy.stats import binom

q = 0.1
n = 10
p = 0.4

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

Out[8]: 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 [9]:
```
from scipy.stats import binom

q = 0.8
n = 30
p = 0.25

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

Out[9]: 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 [10]:
```
from scipy.stats import binom

k = 5
n = 20
p = 0.05

binom.pmf(k, n, p)
```

Out[10]:
```
0.002244646010124003
```

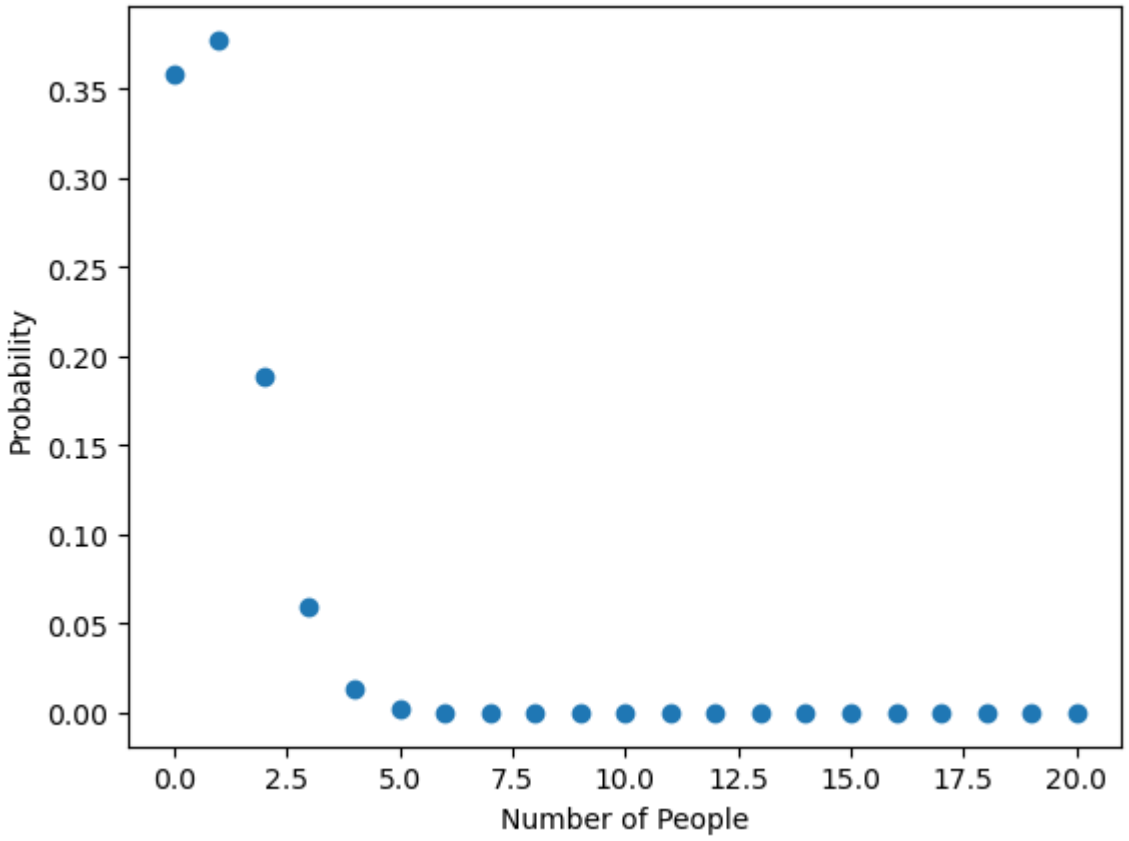
Question 10

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 [11]:
```
import matplotlib.pyplot as plt
import numpy as np

x = np.arange(0,21)
y = binom.pmf(np.arange(0,21), n, p)

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 [18]:
```
import matplotlib.pyplot as plt
from numpy import random

plt.hist(random.binomial(20, 0.75, 1000), bins = 10, color = "red", edgecolor
plt.show()
```