Forward School

Program Code: J620-002-4:2020

Program Name: FRONT-END SOFTWARE DEVELOPMENT

Title : Binomial Distribution Exercise

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Introduction :

Conclusion :

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.

In [22]:
```
from scipy.stats import binom
import math
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 [38]:
```
# (a,b,c)
# a = number of needed success
# b = number of tries
# c = chance of success
a = 0.25
b = 51
c = 0.5
binom.ppf(a,b,c)
```

Out[38]: 23.0

Question 2

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

In [41]:
```
a = 0.25
b = 51
c = 0.5
sum(binom.pmf(np.arange(1,27),b,c))
```

Out[41]: 0.6101160347234623

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 [54]:
```
#find the probability of 10 successes during 12 trials where the probability o
#success on each trial is 0.6
a = 10
b = 12
c = 0.6
binom.pmf(a,b,c)
```

Out[54]: 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 [43]:
```
#find the probability of 7 successes during 20 trials where the probability of
#success on each trial is 0.5
a = 7
b = 20
c = 0.5
binom.pmf(a,b,c)
```

Out[43]: 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 [44]:
```
#find the probability of 4 or fewer successes during 10 trials where the
#probability of success on each trial is 0.3
a = 4
b = 10
c = 0.3
sum(binom.pmf(np.arange(0,a+1),b,c))
```

Out[44]: 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 [48]:
```
#find the probability of more than 2 successes during 5 trials where the
#probability of success on each trial is 0.5
a = 2
b = 5
c = 0.5
sum(binom.pmf(np.arange(a+1,6),b,c))
```

Out[48]: 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 [49]:
```
binom.ppf(0.1,10,0.4)
```

Out[49]:
```
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 [50]:
```
binom.ppf(0.8,30,0.25)
```

Out[50]:
```
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.

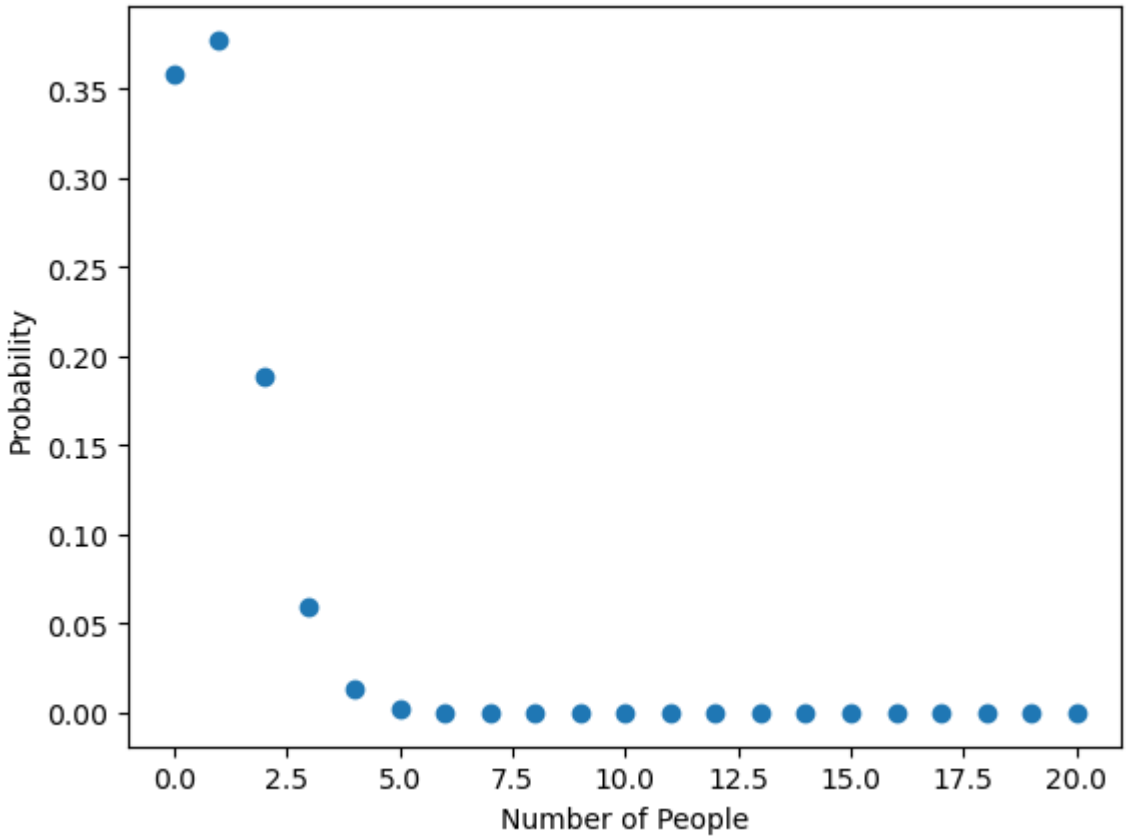
In [53]:
```
binom.pmf(5,20,0.05)
```

Out[53]:
```
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 [56]:
```
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 [ ]:
```
binom.pmf( )
```

In [6]:
```
import numpy as np
import matplotlib.pyplot as plt
from numpy import random
plt.hist(random.binomial(20,0.75,1000),bins =10,edgecolor="black")
```

Out[6]:
```
(array([  4.,  10.,  18.,  53., 118., 378., 191., 136.,  71.,  21.]),
 array([ 8. ,  9.2, 10.4, 11.6, 12.8, 14. , 15.2, 16.4, 17.6, 18.8, 20. ]),
 <BarContainer object of 10 artists>)
```