**Assignment Number 8**

NEGATIVE BINOMIAL, GEOMETRIC and HYPER-GEOMETRIC DISTRIBUTION

Register Number: 1740256

**Date:** 12/2/2018

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**Question 1**

**Aim** – The probability is 0.75 that an applicant for driver’s licence will pass the test for a given trial. What is the probability that an applicant will finally pass the test on the 4th trial?

**Procedure-**

1. Let X be the random variable denoting the number of times there is failure for the person before he passes the test.
2. In the excel sheet – select any cell.
3. Type the formulae for Negative Binomial distribution i.e =NEGBINOM.dist(f,s,p,c)

Where f denotes the number of failures

S denotes the number of successes

P denotes the probability of success

C denotes the cumulative value which can be true or false

* NOTE – c is generally taken to be false as we need the value at a particular point
* In case of geometric distribution, we replace s by 1 as geometric distribution is a special case of negative binomial distribution.

**Calculations –**



**Conclusions –**

The probability that an applicant will finally pass the test on the 4th trial is **0.011719**.

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**Question 2**

**Aim** – While taping a T.V cereal, there is a probability of 0.3 that an actor will get his lines correct on any tape. What is the probability that he gets his lines correct for the 1st time on the 6th tape?

**Procedure-**

1. Let X be the random variable denoting the number of times there is failure for the person before he passes the test.
2. In the excel sheet – select any cell.
3. Type the formulae for Negative Binomial distribution i.e =NEGBINOM.dist(f,s,p,c)

Where f denotes the number of failures

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* NOTE – c is generally taken to be false as we need the value at a particular point
* In case of geometric distribution, we replace s by 1 as geometric distribution is a special case of negative binomial distribution.

**Calculations –**



**Conclusions –**

The probability that the actor gets his lines correct for the 1st time on the 6th tape is **0.0504021**.

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**Question 3**

**Aim** – The probability that a target is destroyed in any 1 shot is 0.5. What is the probability that it will get destroyed in the 6th attempt?

**Procedure-**

1. Let X be the random variable denoting the number of times there is failure for the person before he passes the test.
2. In the excel sheet – select any cell.
3. Type the formulae for Negative Binomial distribution i.e =NEGBINOM.dist(f,s,p,c)

Where f denotes the number of failures

S denotes the number of successes

P denotes the probability of success

C denotes the cumulative value which can be true or false

* NOTE – c is generally taken to be false as we need the value at a particular point
* In case of geometric distribution, we replace s by 1 as geometric distribution is a special case of negative binomial distribution.

**Calculations-**



**Conclusions -**

The probability that the target that will get destroyed in the 6th attempt is **0.015625**.

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**Question 4**

**Aim** – If the probability is 0.4 that a child exposed to a contagious disease will catch it. What is the probability that the 10th child exposed to the disease will be the 3rd to catch the disease?

**Procedure-**

1. Let X be the random variable denoting the number of times there is failure for the person before he passes the test.
2. In the excel sheet – select any cell.
3. Type the formulae for Negative Binomial distribution i.e =NEGBINOM.dist(f,s,p,c)

Where f denotes the number of failures

S denotes the number of successes

P denotes the probability of success

C denotes the cumulative value which can be true or false

* NOTE – c is generally taken to be false as we need the value at a particular point
* In case of geometric distribution, we replace s by 1 as geometric distribution is a special case of negative binomial distribution.

**Calculations-**



**Conclusions-**

The probability that the 10th child exposed to the disease will be the 3rd to catch the disease is **0.064497**

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**Question 5**

**Aim** – If the probability is 0.75 that a person will believe a rumour about a certain politician, then find the probability that the 8th person to hear the rumour will be the 5th to believe it?

**Procedure-**

1. Let X be the random variable denoting the number of times there is failure for the person before he passes the test.
2. In the excel sheet – select any cell.
3. Type the formulae for Negative Binomial distribution i.e =NEGBINOM.dist(f,s,p,c)

Where f denotes the number of failures

S denotes the number of successes

P denotes the probability of success

C denotes the cumulative value which can be true or false

* NOTE – c is generally taken to be false as we need the value at a particular point
* In case of geometric distribution, we replace s by 1 as geometric distribution is a special case of negative binomial distribution.

**Calculations –**



**Conclusions –**

The probability that the 8th person to hear the rumour will be the 5th to believe it is **0.129776**.

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**Question 6**

**Aim** – A scientist needs 3 diseased rabbits for an experiment. He has 20 rabbits available and inoculates them one at time with a serum, quitting if he gets 3 positive reactions. If the probability is 0.25 that a rabbit can contract the disease from the serum. What is the probability that the scientist is able to get 3 diseased rabbits from 20?

**Procedure-**

1. Let X be the random variable denoting the number of times there is failure for the person before he passes the test.
2. In the excel sheet – select any cell.
3. Type the formulae for Negative Binomial distribution i.e =NEGBINOM.dist(f,s,p,c)

Where f denotes the number of failures

S denotes the number of successes

P denotes the probability of success

C denotes the cumulative value which can be true or false

* NOTE – c is generally taken to be false as we need the value at a particular point
* In case of geometric distribution, we replace s by 1 as geometric distribution is a special case of negative binomial distribution.

**Calculations –**



**Conclusions-**

The probability that the scientist is able to get 3 diseased rabbits from 20 rabbits available is **0.020084**.

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**Question 7**

**Aim** – A boy is throwing stones at a target. What is the probability that his 10th throw is his 5th hit if the probability of hitting the target at any time is 0.5?

**Procedure-**

1. Let X be the random variable denoting the number of times there is failure for the person before he passes the test.
2. In the excel sheet – select any cell.
3. Type the formulae for Negative Binomial distribution i.e =NEGBINOM.dist(f,s,p,c)

Where f denotes the number of failures

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P denotes the probability of success

C denotes the cumulative value which can be true or false

* NOTE – c is generally taken to be false as we need the value at a particular point
* In case of geometric distribution, we replace s by 1 as geometric distribution is a special case of negative binomial distribution.

**Calculations-**



**Conclusions-**

The probability that his 10th throw is his 5th hit if the probability of hitting the target at any time is 0.5 = **0.123047.**

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**Question 8**

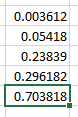
**Aim** -A taxi cab company has 12 ambassadors and 8 fiats. 5 of these taxis cabs. 5 of these taxi cabs are in the shop for repair. What is the probability that –

1. 3 of them are ambassadors.
2. At least 3 of them are ambassadors.
3. All of them are of the same type.

**Procedure -**

1. Using Excel, we can use the function =HYPGEOM.dist to solve it.
2. =HYPGEOM.dist(X=which you want,n=working with,M=1 group of the population,N=population)
3. The individual values can be stored in different cells so that they can be re-used.
4. Finally, =HYPGEOM.dist is called with the appropriate values.

**Calculations -**

**Conclusions -**

The probability that

1. 3 of them are ambassadors. = **0.397317**
2. At least 3 of them are ambassadors. = **0.703818**
3. All of them are of the same type. = **0.054696**

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**Question 9**

**Aim** -As a part of air pollution survey – an inspector decided to examine the exhaust of 6 of the companies 24 trucks. If 4 of the company’s trucks emit excessive amount of pollutants, what is the probability that –

1. None of them will emit excessive amount of pollutants
2. At least 2 will emit excessive amount of pollutants

**Procedure -**

1. Using Excel, we can use the function =HYPGEOM.dist to solve it.
2. =HYPGEOM.dist(X,n,M=1 group of the population,N=population)
3. The individual values can be stored in different cells so that they can be re-used.
4. Finally, =HYPGEOM.dist is called with the appropriate values.

**Calculations –**

**Conclusions –**

1. None of them will emit excessive amount of pollutants = **0.287973**
2. At least 2 will emit excessive amount of pollutants = **0.25127**

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