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Binomial Distribution

Q.1 If X is Binomial Distribution $B(n,p)$ where $n=50$ $p=0.35$

Write R-program to evaluate and print (i) $P(X=15)$ (ii) $P(X \leq 26)$ (iii) $P(X \geq 17)$

Code

```
a=dbinom(15,50,0.35)
b=pbinom(26,50,0.35)
c=1-pbinom(17,50,0.35)
cat("P(X=15)=",a)
cat("P(X≤26)=",b)
cat("P(X≥17)=",c)
cat("name & roll no","Akshat Yadav & 16010122221")
```

Output:-

$P(X=15)=a=0.09232743$

$P(X \leq 26)=b=0.9954573$

$P(X \geq 17)=c=0.494028$

The screenshot displays the RStudio environment with the following components:

- Source Editor:** Contains R code for calculating binomial probabilities and printing results.
- Environment:** Shows the values of variables created in the script.
- Console:** Displays the output of the R commands, including the calculated probabilities and the printed text.

Source Editor Code:

```
1 a=dbinom(15,50,0.35)
2 b=pbinom(26,50,0.35)
3 c=1-pbinom(17,50,0.35)
4 cat("P(X=15)=",a)
5 cat("P(X≤26)=",b)
6 cat("P(X≥17)=",c)
7 cat("name & roll no","Akshat Yadav & 16010122221")
8
9
```

Environment Values:

Variable	Value
a	0.0923274329594517
b	0.9954573336781
c	0.494027984664287
k	27.7258872223978
k1	67.8660076906206
k2	72.6243185035937
n	35
pa	0.025

Console Output:

```
R 4.3.2 ~ -/
> a=dbinom(15,50,0.35)
> b=pbinom(26,50,0.35)
> c=1-pbinom(17,50,0.35)
> cat("P(X=15)=",a)
P(X=15)= 0.09232743> cat("P(X≤26)=",b)
P(X≤26)= 0.9954573> cat("P(X≥17)=",c)
P(X≥17)= 0.494028> cat("name & roll no","Akshat Yadav & 16010122221")
name & roll no Akshat Yadav & 16010122221
> |
```

Q.2 If X is Poisson Distribution with mean 35

Write R-program to evaluate and print (i) $P(X=0)$ (ii) $P(X \leq 12)$ (iii)
 $P(22 \leq X \leq 35)$

CODE

```
m=35
```

```
a=dpois(0,m)
```

```
b=ppois(12,m)
```

```
c=ppois(35,m)-ppois(22,m)
```

```
cat("P(X=0)=",a)
```

```
cat("P(X≤12)=",b)
```

```
cat("P(22≤X≤35)=",c)
```

```
cat("name & roll no","Akshat Yadav & 16010122221")
```

Output

The screenshot displays the RStudio interface with the following components:

- Source Editor:** Contains R code for generating random values and printing them.
- Environment:** Shows the current environment with variables `a`, `b`, `c`, `k`, `k1`, `k2`, `m`, and `pa`.
- Console:** Shows the output of the R code execution.

R Code (Source Editor):

```
1 m=35
2 a=dpois(0,m)
3 b=ppois(12,m)
4 c=ppois(35,m)-ppois(22,m)
5 cat("P(X=0)=",a)
6 cat("P(X<12)=",b)
7 cat("P(22<X<35)=",c)
8 cat("name & roll no","Akshat Yadav & 16010122221")
9
10
```

Environment (Global Environment):

Variable	Value
a	6.30511676014699e-16
b	6.63457798153552e-06
c	0.531979497637796
k	27.7258872223978
k1	67.8660076906206
k2	72.6243185035937
m	35
pa	0.025

Console Output:

```
>
> m=35
> a=dpois(0,m)
> b=ppois(12,m)
> c=ppois(35,m)-ppois(22,m)
> cat("P(X=0)=",a)
P(X=0)= 6.305117e-16> cat("P(X<12)=",b)
P(X<12)= 6.634578e-06> cat("P(22<X<35)=",c)
P(22<X<35)= 0.5319795> cat("name & roll no","Akshat Yadav & 16010122221")
name & roll no Akshat Yadav & 16010122221
>
```

Q.3 If X is Uniform Distribution over the range (1,15). Write R-program to evaluate and print (i) $P(X < 9.6)$ (ii) $P(X > 5.2)$ (iii) $P(11.2 < X < 14.5)$

Code:

```
a=punif(9.6,1,15)
b=1-punif(5.2,1,15)
c=punif(14.5,1,15)-punif(11.2,1,15)
cat("P(X<9.6)=",a)
cat("P(X>5.2)=",b)
cat("P(11.2<X<14.5)=",c)
cat("name , roll no Q no.", "Akshat Yadav & 16010122221 , Q3")
```

OUTPUT

The screenshot displays the RStudio environment with the following components:

- Source Editor:** Contains R code for generating random variables and categorical labels based on probability thresholds.
- Environment:** Shows the global environment with variables 'a', 'b', 'c', 'k', 'k1', 'k2', 'm', and 'pa' and their corresponding values.
- Console:** Shows the execution of the code, including the output of the `cat` function and the values of the random variables.

Source Editor Code:

```
1 a=punif(9.6,1,15)
2 b=1-punif(5.2,1,15)
3 c=punif(14.5,1,15)-punif(11.2,1,15)
4 cat("P(X<9.6)=",a)
5 cat("P(X>5.2)=",b)
6 cat("P(11.2<X<14.5)=",c)
7 cat("name , roll no Q no. ", "Akshat Yadav & 16010122221 , Q3")
8
9
```

Environment Values:

Variable	Value
a	0.614285714285714
b	0.7
c	0.235714285714286
k	27.7258872223978
k1	67.8660076906206
k2	72.6243185035937
m	35
pa	0.025

Console Output:

```
>
> a=punif(9.6,1,15)
> b=1-punif(5.2,1,15)
> c=punif(14.5,1,15)-punif(11.2,1,15)
> cat("P(X<9.6)=",a)
P(X<9.6)= 0.6142857> cat("P(X>5.2)=",b)
P(X>5.2)= 0.7> cat("P(11.2<X<14.5)=",c)
P(11.2<X<14.5)= 0.2357143> cat("name , roll no Q no. ", "Akshat Yadav & 16010122221 , Q3")
name , roll no Q no. Akshat Yadav & 16010122221 , Q3
>
```

Q.4 If X is Exponential Distribution with mean 40.

Write R-program to evaluate and print

(i) $P(X < 25)$ (ii) $P(X > 30)$ (iii) $P(15 < X < 65)$.

Find value of k such that $P(X < k) = 0.5$

CODE:

```
pa=1/40
```

```
a=pexp(25, pa)
```

```
b=1-pexp(30, pa)
```

```
c=pexp(65, pa)-pexp(15, pa)
```

```
k=qexp(.5, pa)
```

```
cat("P(X<25)=",a)
```

```
cat("P(X>30)=",b)
```

```
cat("P(15<X<65).=",c)
```

```
cat("The value of k is ",k)
```

```
cat("name , roll no Q no. ","Akshat Yadav & 16010122221 , Q4")
```

OUTPUT:

The screenshot displays the RStudio interface with the following components:

- Source Editor:** Contains R code for generating random variables and calculating probabilities.
- Environment:** Shows the values of variables created in the script.
- Console:** Displays the output of the R commands.

R Code (Source Editor):

```
1 pa=1/40
2 a=pexp(25, pa)
3 b=1-pexp(30, pa)
4 c=pexp(65, pa)-pexp(15, pa)
5 k=qexp(.5, pa)
6 cat("P(X<25)=",a)
7 cat("P(X>30)=",b)
8 cat("P(15<X<65).=",c)
9 cat("The value of k is ",k)
10 cat("name , roll no Q no. ", "Akshat Yadav & 16010122221 , Q4")
11
```

Environment (Global Environment):

Variable	Value
a	0.46473857148101
b	0.472366552741015
c	0.490377603586778
k	27.7258872223978
k1	67.8660076906206
k2	72.6243185035937
m	35
pa	0.025

Console Output:

```
> pa=1/40
> a=pexp(25, pa)
> b=1-pexp(30, pa)
> c=pexp(65, pa)-pexp(15, pa)
> k=qexp(.5, pa)
> cat("P(X<25)=",a)
P(X<25)= 0.4647386> cat("P(X>30)=",b)
P(X>30)= 0.4723666> cat("P(15<X<65).=",c)
P(15<X<65).= 0.4903776> cat("The value of k is ",k)
The value of k is 27.72589> cat("name , roll no Q no. ", "Akshat Yadav & 16010122221 , Q4")
name , roll no Q no. Akshat Yadav & 16010122221 , Q4
>
```

Q.5 If X is Normal Distribution with mean 60 and standard deviation 15.

Write R-program to evaluate and print (i) $P(X < 88)$ (ii) $P(X > 35)$ (iii) $P(70 < X < 95)$.

Find value of k_1 such that $P(X < k_1) = 0.7$. Also find k_2 such that $P(X > k_2) = 0.84$

CODE:

```
a=pnorm(88,60,15)

b=1-pnorm(35,60,15)

c=pnorm(95,60,15)-pnorm(70,60,15)

k1=qnorm(.7,60,15)

k2=qnorm(.84,60,15)

cat("P(X<88) =",a)

cat("P(X>35) =",b)

cat("P(70<X<95)=",c)

cat("value of k1 such that P(X<k1) = 0.7 is ",k1)

cat("value of k2 such that P(X>k2) = 0.84 is",k2)

cat("name , roll no Q no.", "Akshat Yadav & 16010122221 , Q5")
```

OUTPUT:

The screenshot shows the RStudio interface with the following components:

- Source Editor:** Contains the R code from the 'CODE' section.
- Environment Pane:** Displays the values of the variables created in the code.

Variable	Value
a	0.969025924293259
b	0.952209647727185
c	0.242677208918278
k	27.7258872223978
k1	67.8660076906206
k2	74.9168682481463
m	35
pa	0.025
- Console:** Shows the output of the code execution, including the values of a, b, c, k1, k2, and the final cat statement output.