MAT5007 – Applied Statistical Methods

Embedded Lab – R Statistical Software

FALL SEMESTER – 20222023
L25+L26 SLOT

E-RECORD
Experiment No.: 2

Submitted By

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MCA– I Year
SITE

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1. For a random variable X with a binomial (20,1/2) distribution, find the following probabilities.

   (i) Find Pr(X<8)
   (ii) Find Pr(X>12)
   (iii) Find Pr(8 >= X >= 1)

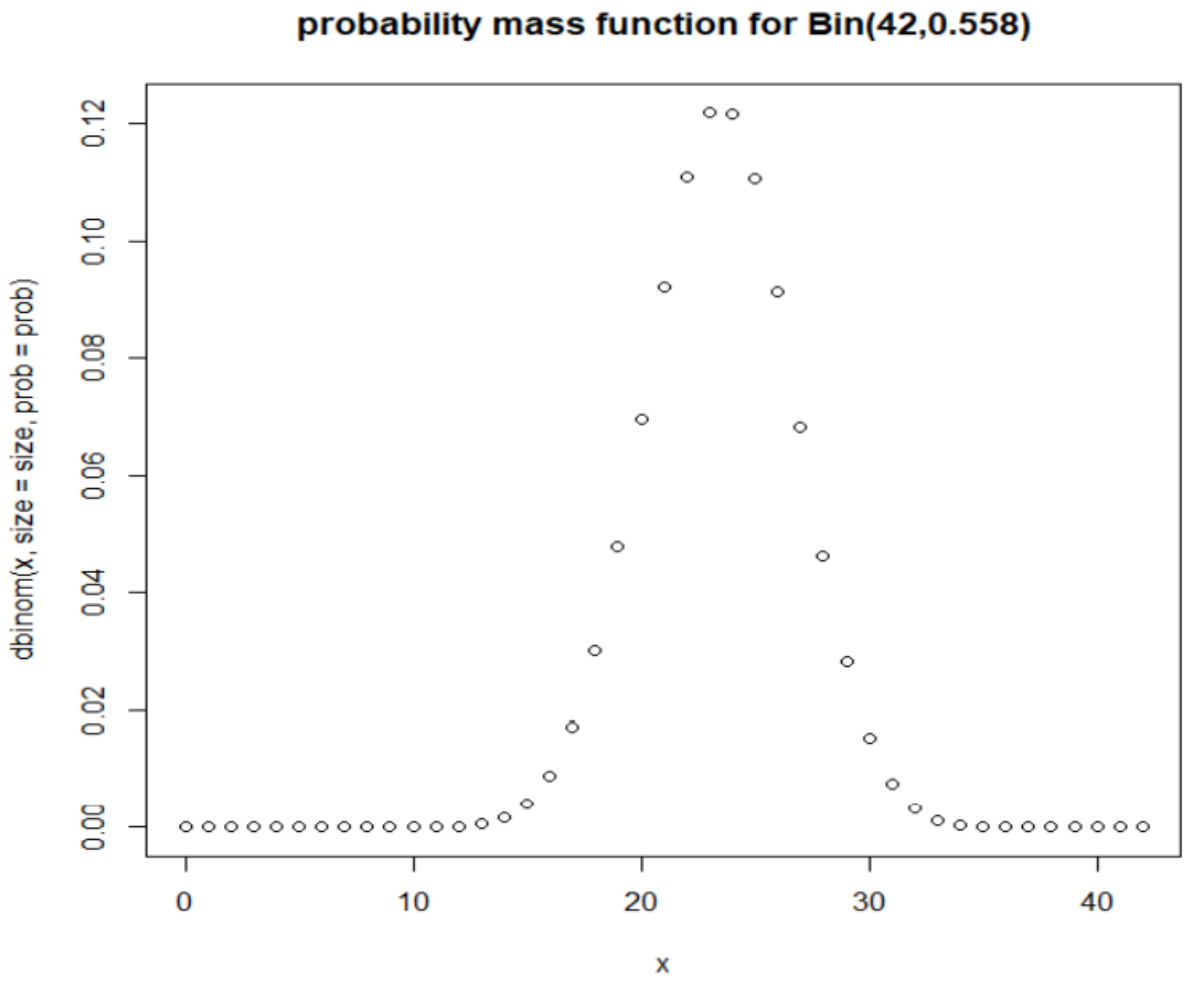
```
> #Pr(X<8)
>
> pbinom(7,size=20,prob=0.5)
[1] 0.131588
>
>
> #Pr(X>12)
>
> pbinom(12,size=20,prob=0.5,lower.tail=FALSE)
[1] 0.131588
>
>
> #Pr(8<=X<=1)
>
> pbinom(8,20,0.5)-pbinom(0,20,0.5)
[1] 0.2517214
```

2. Let X be the number of heads in 10 tosses of a fair coin.
(i). Find the probability of getting at least 5 heads (that is, 5 or more).
(ii). Find the probability of getting exactly 5 heads.
(iii). Find the probability of getting between 4 and 6 heads, inclusive.

```
> #Pr(X>=5)
>
> pbinom(4,size=10,prob=0.5,lower.tail=FALSE)
[1] 0.6230469
>
>
> #Pr(X=5)
>
> dbinom(5,size=10,prob=0.5)
[1] 0.2460938
>
>
> #Pr(4<=X<=6)
>
> pbinom(6,size=10,prob=0.5)-pbinom(3,size=10,prob=0.5)
[1] 0.65625
```

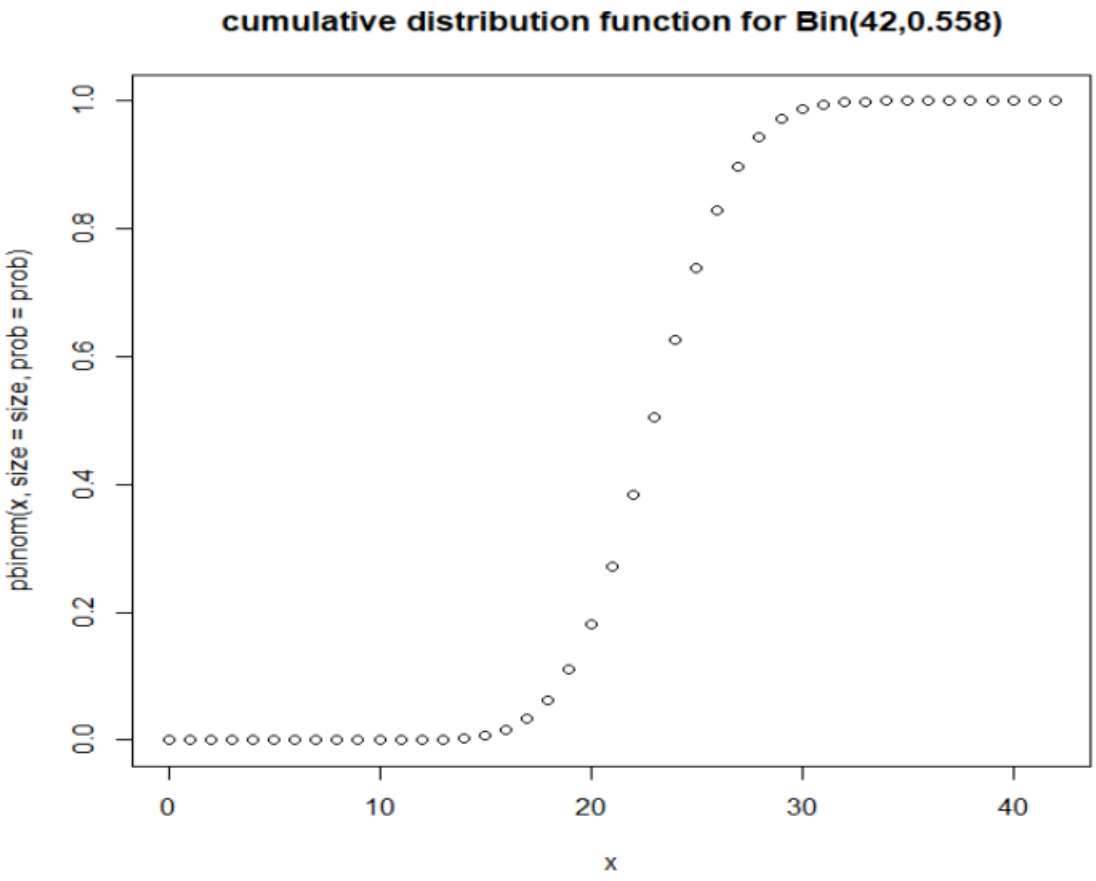
3. A recent national study showed that approximately 55.8% of college students have used Google as a source in at least one of their term papers. Let X equal the number of students in a random sample of size n=42 who have used Google as a source: How is X distributed?
(i) Sketch the probability mass function (roughly).

```
> size=42
> prob=0.558
> x=0:size
> plot(x,dbinom(x,size=size,prob=prob),
+ main="probability mass function for Bin(42,0.558)")
```


probability mass function for Bin(42,0.558)
dbinom(x, size = size, prob = prob)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0
10
20
30
40
x

(ii) Sketch the cumulative distribution function (roughly).

```
> plot(x,pbinom(x,size=size,prob=prob),
+ main="cumulative distribution function for Bin(42,0.558)")
```



(iv) Find the probability that X is equal to 17.
(v) Find the probability that X is bigger than 11.
(vi) Find the probability that X is at least 15.
(vii) Find the probability that X is between 16 and 19, inclusive

```
> #P(X<=13)
>
> pbinom(13,size,prob)
[1] 0.001005323
```

```
> #P(X>11)
>
> pbinom(11,size,prob,lower.tail=FALSE)
[1] 0.9999036

> #P(X>=15)
>
> pbinom(14,size,prob,lower.tail=FALSE)
[1] 0.9972253

> #P(16<=X<=19)
>
> pbinom(19,size,prob)-pbinom(15,size,prob)
[1] 0.1040649
```