MAT5007 – Applied Statistical Methods

Embedded Lab – R Statistical Software

FALL SEMESTER – 2022~2023 L25+L26 SLOT

E-RECORD

Assignment No.: 4

Submitted By

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SITE

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Experiment 1:

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

```
> n = 20
> p = 0.5
```

```
> n = 20
> p = 0.5
```

(i). Find Pr(X<8)

```
> pbinom(7, n, p)
```

```
> pbinom(7, n, p)
[1] 0.131588
```

(ii). Find Pr(X > 12)

```
> 1 - pbinom(12, n, p)
```

```
> 1 - pbinom(12, n, p)
[1] 0.131588
```

(iii). Find Pr(8 <= X <= 10)

```
> dbinom(8, n, p) + dbinom(9, n, p) + dbinom(10, n, p)
```

```
> dbinom(8, n, p) + dbinom(9, n, p) + dbinom(10, n, p)
[1] 0.4565105
```

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Experiment 2:

Let X be the number of heads in 10 tosses of a fair coin.

```
> n = 10
> p = 0.5
```

```
> n = 10
> p = 0.5
```

(i). Find the probability of getting at least 5 heads (that is, 5 or more).

```
> 1 - pbinom(4, n, p)
```

```
> 1 - pbinom(4, n, p)
[1] 0.6230469
```

(ii). Find the probability of getting exactly 5 heads.

```
> dbinom(5, n, p)
```

```
> dbinom(5, n, p)
[1] 0.2460938
```

(iii). Find the probability of getting between 4 and 6 heads, inclusive

```
> dbinom(4, n, p) + dbinom(5, n, p) + dbinom(6, n, p)
```

```
> dbinom(4, n, p) + dbinom(5, n, p) + dbinom(6, n, p)
[1] 0.65625
```

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Experiment 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?

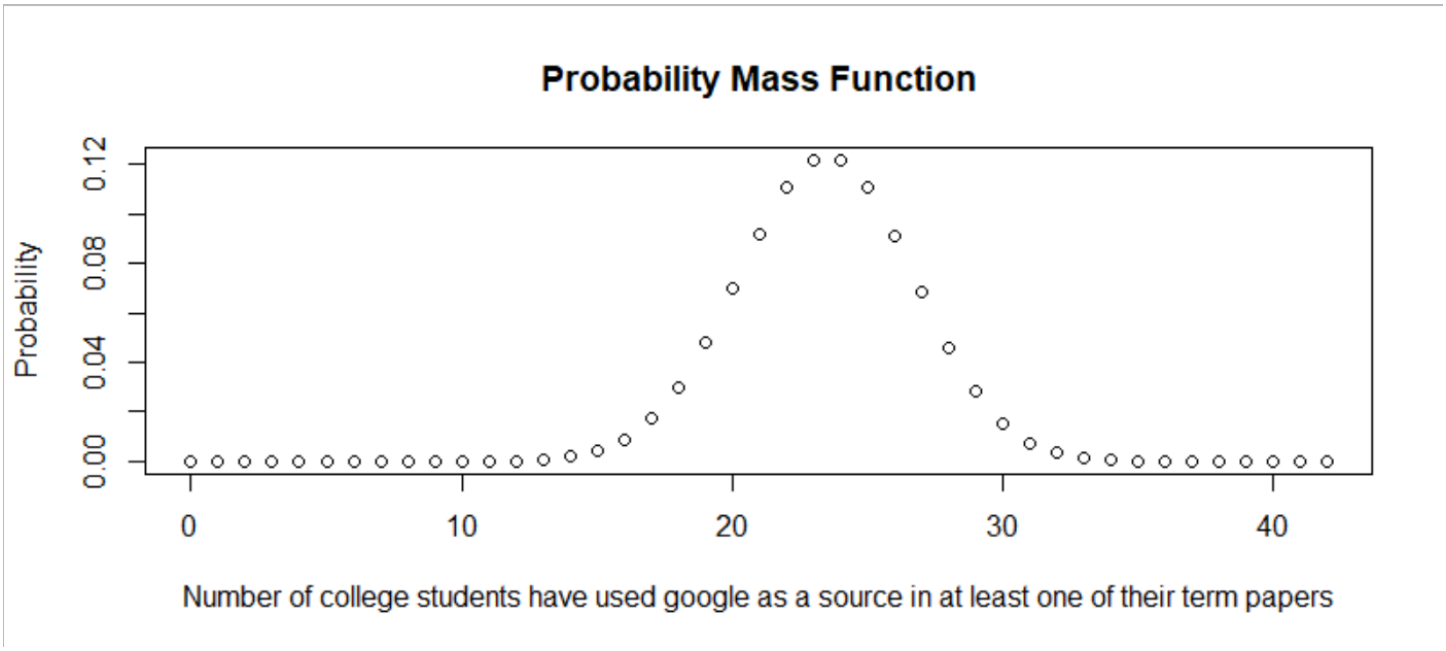
X follows binomial distribution with n = 42 and p = 0.558. With X denoting number of students who have used Google as a source in at least one of their papers.

```
> n = 42
> p = 0.558
```


```
> n = 42
> p = 0.558
```


I. Sketch the probability mass function (roughly).

```
> x = 0:n
> plot(x, dbinom(x, n, p), main = "Probability Mass Function", xlab = "Number of college students have used google as a source in at least one of their term papers", ylab = "Probability")
```



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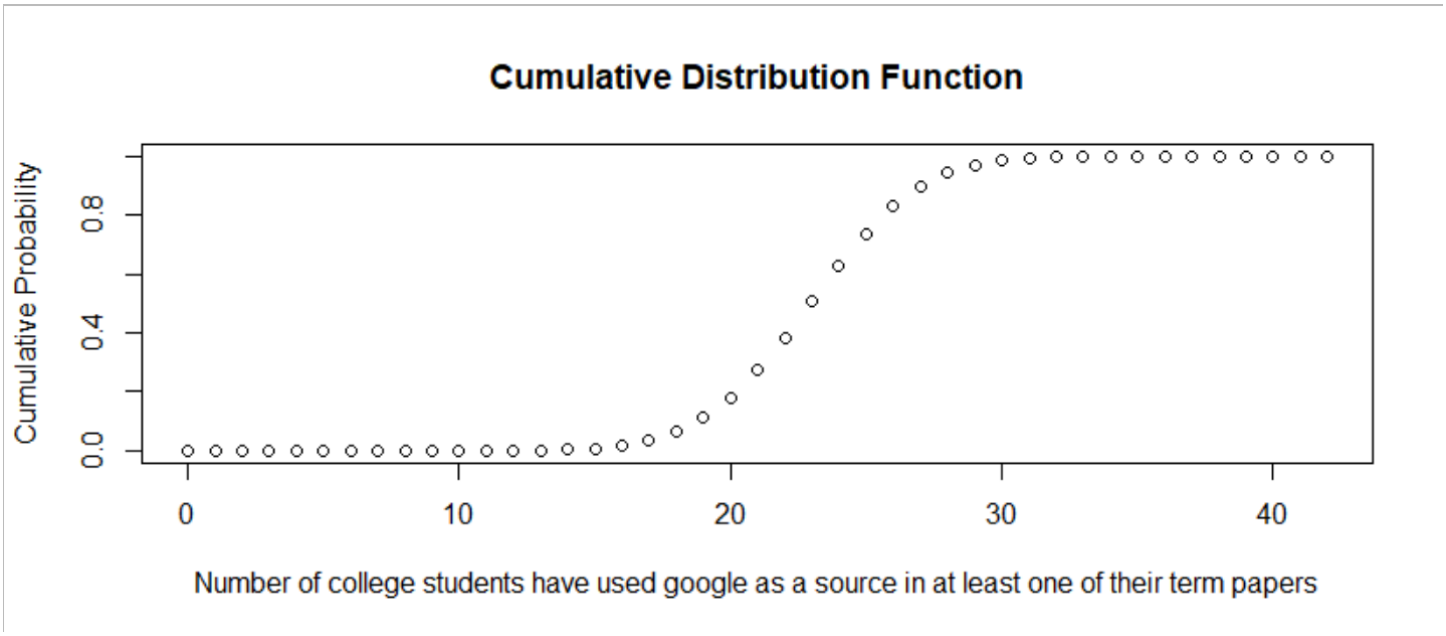
II. Sketch the cumulative distribution function (roughly).

```
> x = 0:n
```

```
> plot(x, pbinom(x, n, p), main = "Cumulative Distribution Function", xlab = "Number of college students have used google as a source in at least one of their term papers", ylab = "Cumulative Probability")
```



III. Find the probability that X is equal to 17.

```
> dbinom(17, n, p)
```

```
> dbinom(17, n, p)
[1] 0.0171515
```

IV. Find the probability that X is at most 13.

```
> pbinom(13, n, p)
```

```
> pbinom(13, n, p)
[1] 0.001005323
```

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V. Find the probability that X is bigger than 11.

```
> 1 - pbinom(11, n, p)
```

```
> 1 - pbinom(11, n, p)
[1] 0.9999036
```

VI. Find the probability that X is at least 15.

```
> dbinom(15, n, p) + pbinom(15, n, p, lower.tail = FALSE)
```

```
> dbinom(15, n, p) + pbinom(15, n, p, lower.tail = FALSE)
[1] 0.9972253
```

VII. Find the probability that X is between 16 and 19, inclusive

```
> pbinom(19, n, p) - pbinom(16, n, p) + dbinom(16, n, p)
```

```
> pbinom(19, n, p) - pbinom(16, n, p) + dbinom(16, n, p)
[1] 0.1040649
```

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