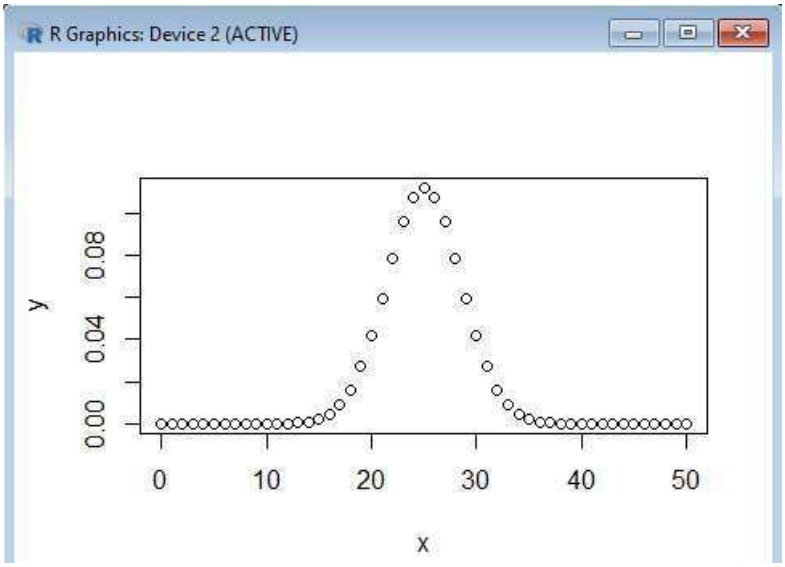
KHAN MOHD OWAIS RAZA (20BCD7138)

Q1.] Create a sample of 50 numbers which are incremented by 1 and create binomial distribution

```
> # Create a sample of 50 numbers which are incremented by 1.
> x <- seq(0,50,by = 1)
>
> # Create the binomial distribution.
> y <- dbinom(x,50,0.5)
>
> # Plot the graph for this sample.
> plot(x,y)
>
```



Q.2] Find probability of getting 26 or less heads from 51 tosses of coin

```
> # Probability of getting 26 or less heads from a 51 tosses of a coin.
> x <- pbinom(26,51,0.5)
>
> print(x)
[1] 0.610116
```

Q3.] How many heads will have a probability of 0.25 will come out when coin is tossed 51 times

```
> # How many heads will have a probability of 0.25 will come out when a coin
> # is tossed 51 times.
> x <- qbinom(0.25,51,1/2)
>
> print(x)
[1] 23
```

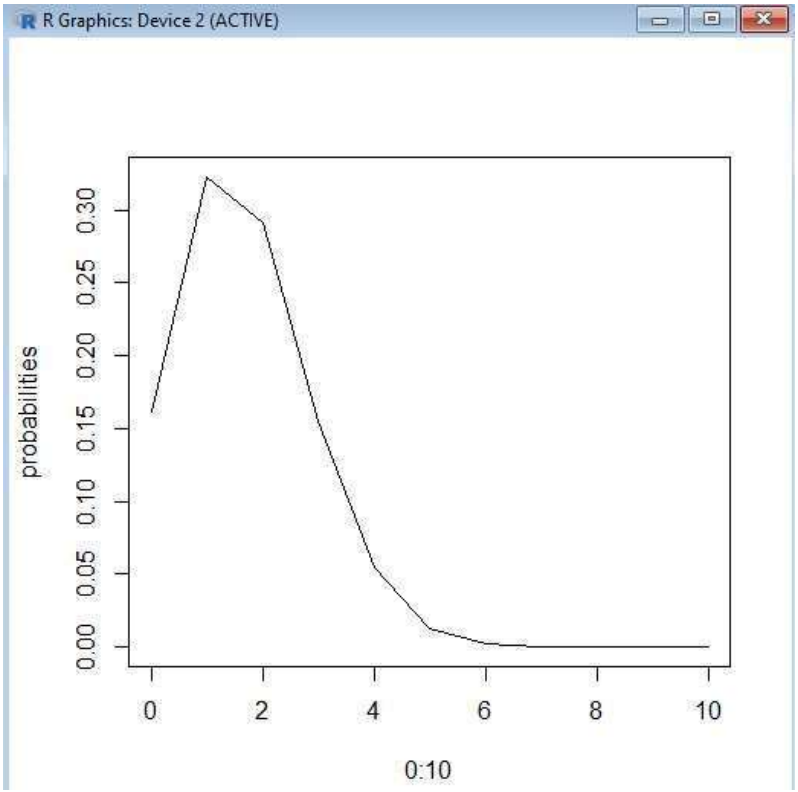
Q.4] Find 8 random values from a sample of 150 with probability of 0.4

```
> # Find 8 random values from a sample of 150 with probability of 0.4.
> x <- rbinom(8,150,.4)
>
> print(x)
[1] 71 53 56 70 59 55 61 70
```

Q.5]

R Console

```
> #KHAN MOHD. OWAIS RAZA__20BCD7138
> #Question for Binomial Distribution
>
> dbinom(3, size = 13, prob = 1 / 6)
[1] 0.2138454
> probabilities <- dbinom(x = c(0:10), size = 10, prob = 1 / 6)
> data.frame(probabilities)
   probabilities
1   1.615056e-01
2   3.230112e-01
3   2.907100e-01
4   1.550454e-01
5   5.426588e-02
6   1.302381e-02
7   2.170635e-03
8   2.480726e-04
9   1.860544e-05
10  8.269086e-07
11  1.653817e-08
> plot(0:10, probabilities, type = "l")
>
```



Q.6]

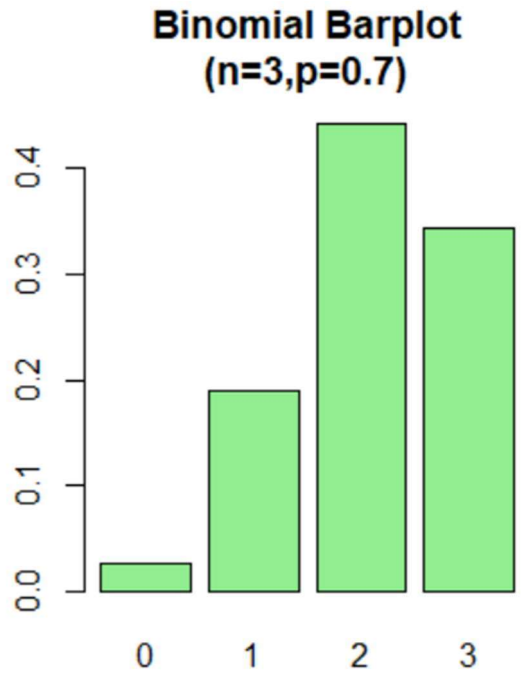
Suppose there are twelve multiple choice questions in an English class quiz. Each question has five possible answers, and only one of them is correct. Find the probability of having four or less correct answers if a student attempts to answer every question at random.

```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> dbinom(4, size=12, prob=0.2)
[1] 0.13
> dbinom(0, size=12, prob=0.2) +
+ + dbinom(1, size=12, prob=0.2) +
+ + dbinom(2, size=12, prob=0.2) +
+ + dbinom(3, size=12, prob=0.2) +
+ + dbinom(4, size=12, prob=0.2)
[1] 0.93
> pbinom(4, size=12, prob=0.2)
[1] 0.93
```

Q.7]

Example 2 – Consider a scenario, let's assume a probability of a student lending a book from a library is 0.7. There are 6 students in the library, what is the probability of 3 of them lending a book?

```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> n=3; p=.7; x=0:n; prob=dbinom(x,n,p);
> barplot(prob,names.arg = x,main="Binomial Barplot\n(n=3,p=0.7)",col="lightgreen")
```

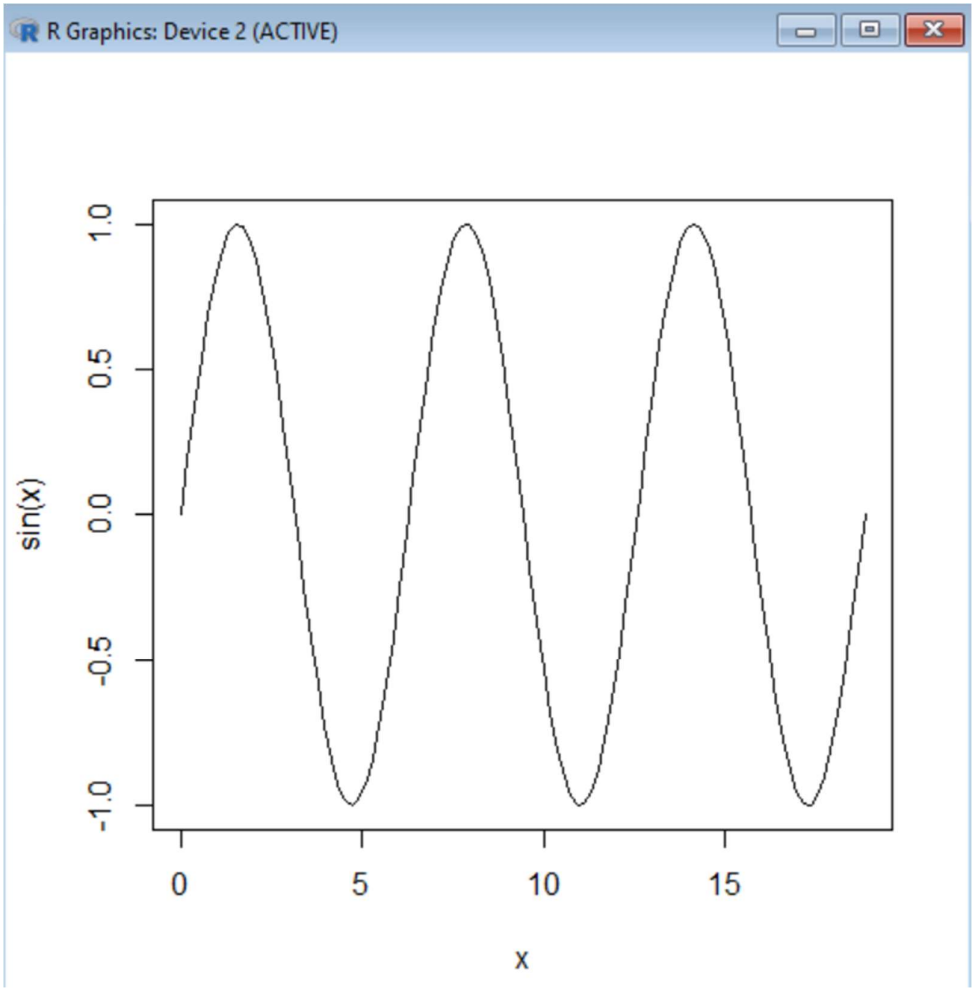


MAT1011 (Applied Statistics) **22-03-2022**

KHAN MOHD. OWAIS RAZA (20BCD7138)

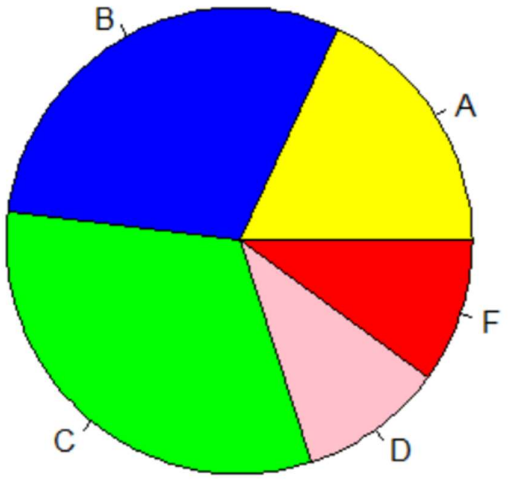
Q1]

```
> ## KHAN MOHD OWAIS RAZA (20BCD7138)
> ## MAT1011 (Applied Statistics)
> ## Lab-2 on 22-03-2022
>
> # Curve()
> curve(expr=sin, from=0, to=6*pi)
```



Q2]

```
> # Pie()
> x=c(18,30,32,10,10)
> labels=c("A","B","C","D","F")
> pie(x,labels,col=c("yellow","blue","green","pink","red"))
> 
```



Q3]

```
price=c(52.00,54.75,57.50,57.50,59.75,62.50,64.75,67.25,67
.50,69.75,70.00,75.50,77.50,78.00,81.25,82.50,86.25,87.50,
88.00,92.00)

FloorArea=c(1225,1230,1200,1000,1420,1450,1380,1510,1400,1
550,1720,1700,1660,1800,1830,1790,2010,2000,2100,2240)

Rooms=c(3,3,3,2,4,3,4,4,5,6,6,5,6,7,6,6,6,6,8,7)

Age=c(6.2,7.5,4.2,,4.8,1.9,5.2,6.5,9.2,0.0,5.7,7.3,4.5,6.8,0.7,5.6,2
.3,6.7,3.4,5.6,3,4)

CentralHeating=c("Yes","No","No","No","Yes","Yes","No","No","No","No
","Yes","No","Yes","Yes","Yes","No","Yes","No","Yes","Yes")

DataTable = data.frame(price,FloorArea,Rooms,Age,CentralHeating)

DataTable
```

	price	FloorArea	Rooms	Age	CentralHeating
1	52.00	1225	3	6.2	Yes
2	54.75	1230	3	7.5	No
3	57.50	1200	3	4.2	No
4	57.50	1000	2	4.8	No
5	59.75	1420	4	1.9	Yes
6	62.50	1450	3	5.2	Yes
7	64.75	1380	4	6.5	No
8	67.25	1510	4	9.2	No
9	67.50	1400	5	0.0	No
10	69.75	1550	6	5.7	No
11	70.00	1720	6	7.3	Yes
12	75.50	1700	5	4.5	No
13	77.50	1660	6	6.8	Yes
14	78.00	1800	7	0.7	Yes
15	81.25	1830	6	5.6	Yes
16	82.50	1790	6	2.3	No
17	86.25	2010	6	6.7	Yes
18	87.50	2000	6	3.4	No
19	88.00	2100	8	5.6	Yes
20	92.00	2240	7	3.4	Yes

Q4]

(1)

```
> M1=mean(DataTable$price)
> M1
[1] 71.5875
> M2=mean(DataTable$FloorArea)
> M2
[1] 1610.75
> M3=mean(DataTable$Age)
> M3
[1] 4.875
> A1=sd(DataTable$price)
> A1
[1] 12.21094
> A2=sd(DataTable$FloorArea)
> A2
[1] 331.9649
> A3=sd(DataTable$Age)
> A3
[1] 2.366182
> B1=median(DataTable$price)
> B1
[1] 69.875
> B2=median(DataTable$FloorArea)
> B2
[1] 1605
> B3=median(DataTable$Age)
> B3
[1] 5.4
> C1=mode(DataTable$price)
> C1
[1] "numeric"
> C2=mode(DataTable$Age)
> C2
[1] "numeric"
> C3=mode(DataTable$FloorArea)
> C3
[1] "numeric"
```

(2)

```
> DataTable$FloorArea[DataTable$CentralHeating=="No"]
 [1] 1230 1200 1000 1380 1510 1400 1550 1700 1790 2000
> DataTable$FloorArea[DataTable$CentralHeating=="Yes"]
 [1] 1225 1420 1450 1720 1660 1800 1830 2010 2100 2240
```

Q] If 2% of light bulbs are defective. Find

(i) Atleast one is defective

(ii) Exactly 7 are defective

(iii) P(1<x<8) in a sample of 100

```
> # KHAN MOHD OWAIS RAZA 20BCD7138
> # MAT1011 Lab on 29-03-2022
> # If 2% of light bulbs are defective. Find
> # (i) Atleast one is defective
> # (ii) Exactly 7 are defective
> # (iii) P(1<x<8) in a sample of 100
>
>
> l ppois(0,2)
Error: unexpected symbol in "l ppois"
> ppois (0,2)
[1] 0.1353353
> dpois(7,2)
[1] 0.003437087
> dpois(2,2)+dpois(3,2)+dpois(4,2)+dpois(5,2)+dpois(7,2)
[1] 0.5808676
>
```

Q] If 10% of the tools produced in a certain manufacturing process turns out to be defective. Determine the probability that out of 10 bolts chosen at random, exactly two will be defective by using binomial distribution and poisson distribution.

```
> p=10/100
> p
[1] 0.1
> n=10
> lambda=n*p
> dbinom(2,n,0.1,log=FALSE)
[1] 0.1937102
> dpois(2,lambda)
[1] 0.1839397
```

Q.1]

In a manufacturing process where glass products are made, defects or bubbles occur, occasionally rendering the piece undesirable for marketing. It is known that, on average, 1 in every 1000 of these items produced has one or more bubbles. What is the probability that a random sample of 8000 will yield fewer than 7 items possessing bubbles?

```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> P=(1/1000)*100
> n=8000
> lamda=n*p
> dpois(2,lambda)
[1] 0.1839397
```

Q.2]

If there are twelve cars crossing a bridge per minute on average, find the probability of having seventeen or more cars crossing the bridge in a particular minute.

```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> ppois(16, lambda=12, lower=FALSE)
[1] 0.101291
```

Q.3]

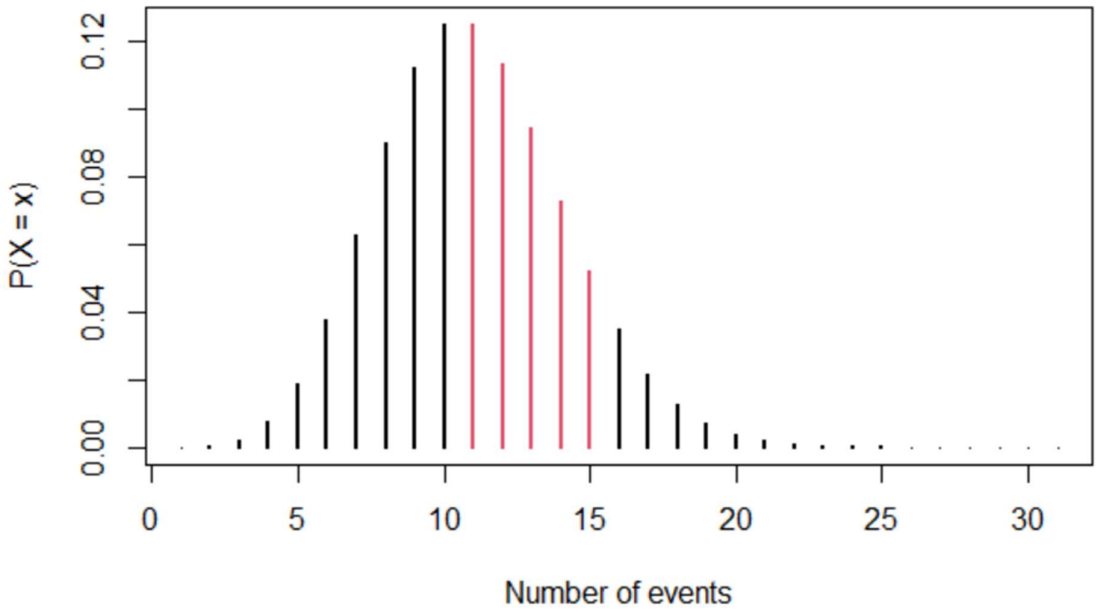
The US rate of meningococcal disease is about 1 case per 100,000 population per year. In San Francisco with a population of 800,000, we would expect 8 cases per year. What is the probability of observing exactly 6 cases? What is the probability of observing more than 10 cases?

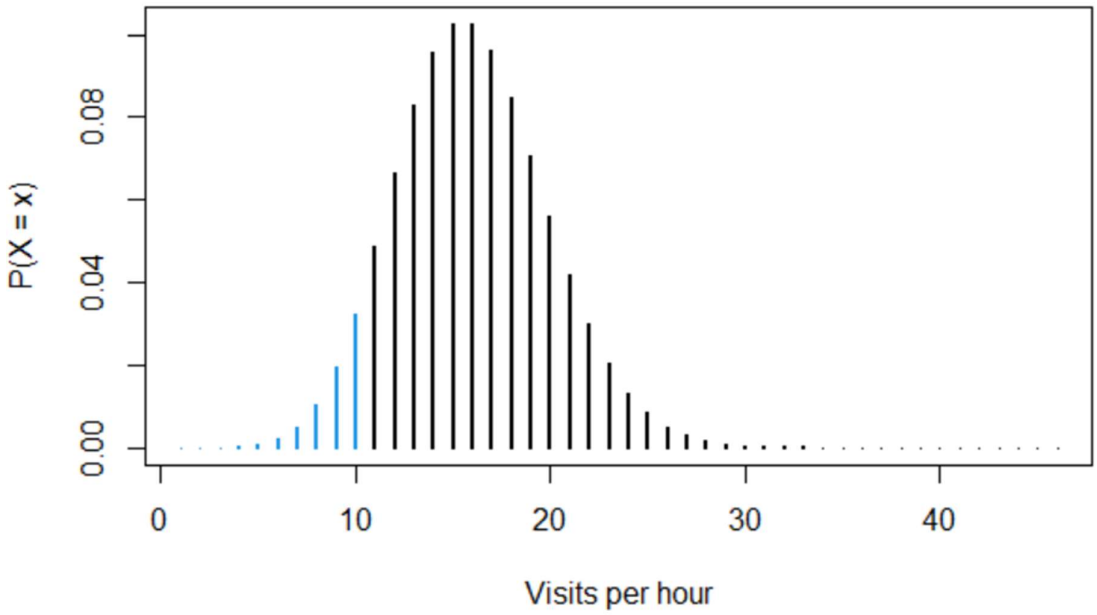
```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> dpois(x = 6, lambda = 8) # 12% chance of 6 cases exactly
[1] 0.1221382
> 1 - ppois(q = 10, lambda = 8)
[1] 0.1841142
>       #about 18% chance of more than 10 cases, 1-Pr[X ≤ 10]
```

Q.4]

Consider that the number of visits on a web page is known to follow a Poisson distribution with mean 15 visits per hour. Find probability of getting 10 or less visits per hour.

```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> ppois(10, lambda = 15)
[1] 0.1184644
> 1 - ppois(10, lambda = 15, lower.tail = FALSE)
[1] 0.1184644
> sum(dpois(0:10, lambda = 15))
[1] 0.1184644
> pois_sum(lambda = 10, lb = 10, ub = 15, lwd = 2,
+            col = 2, ylab = "P(X = x)", xlab = "Number of events")
> pois_sum(lambda = 15, ub = 10, lwd = 2,
+          ylab = "P(X = x)", xlab = "Visits per hour")
```





Q.5]

Example: Customers call us at a rate of 12 per minute. "The boss" wants us to deliver excellent service and stay very productive. Our service will suffer if we get more than twenty calls in a minute. We're going to look lazy if five or less calls arrive in a minute. What are the odds of getting in trouble with the boss?

```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> ppois(20, lambda = 12)
[1] 0.9884023
> ppois(5, lambda = 12, lower=FALSE)
[1] 0.979659
```

Q.6]

What is the probability of making 2 to 4 sales in a week if the average sales rate is 3 per week?

```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> ppois(q = 4, lambda = 3, lower.tail = TRUE) - ppois(q = 1, lambda = 3, lower.tail = TRUE)
[1] 0.616115
> dpois(x = 2, lambda = 3) + dpois(x = 3, lambda = 3) + dpois(x = 4, lambda = 4)
[1] 0.6434504
```