**MAT2001 – Statistics for Engineers - ELA (R Code Studio), Winter Semester 2020-2021**

**Lab Assessment - III**

**By: Jonathan Rufus Samuel (20BCT0332) Date: 17.6.2021**

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**Write R code to solve the following problems:**

**Q1) In a large consignment of electric bulbs 10 % are defective. A random sample of 20 is taken for inspection. Find the probability that:**

**(i) All are good bulbs,**

**(ii) At most there are 3 defective bulbs,**

**(iii) Exactly there are three defective bulbs.**

A1) Code is as follows:

```
#Q3.1)
X=20
P=10/100
#None is defective
D1 = dbinom(0,X,P)
print(D1)
#At most 3 bulbs are defective i.e. X<=3
D2 = pbinom(3,X,P)
print(D2)
# P(X=3)
D3 = dbinom(3,X,P)
print(D3)
```

**Output (via Command Window):**

```
> #Q2.1)
> X=20
> P=10/100
> #None is defective
```

> D1 = dbinom(0,X,P)

> print(D1)

[1] 0.1215767

> #At most 3 bulbs are defective i.e. X<=3

> D2 = pbinom(3,X,P)

> print(D2)

[1] 0.8670467

> # P(X=3)

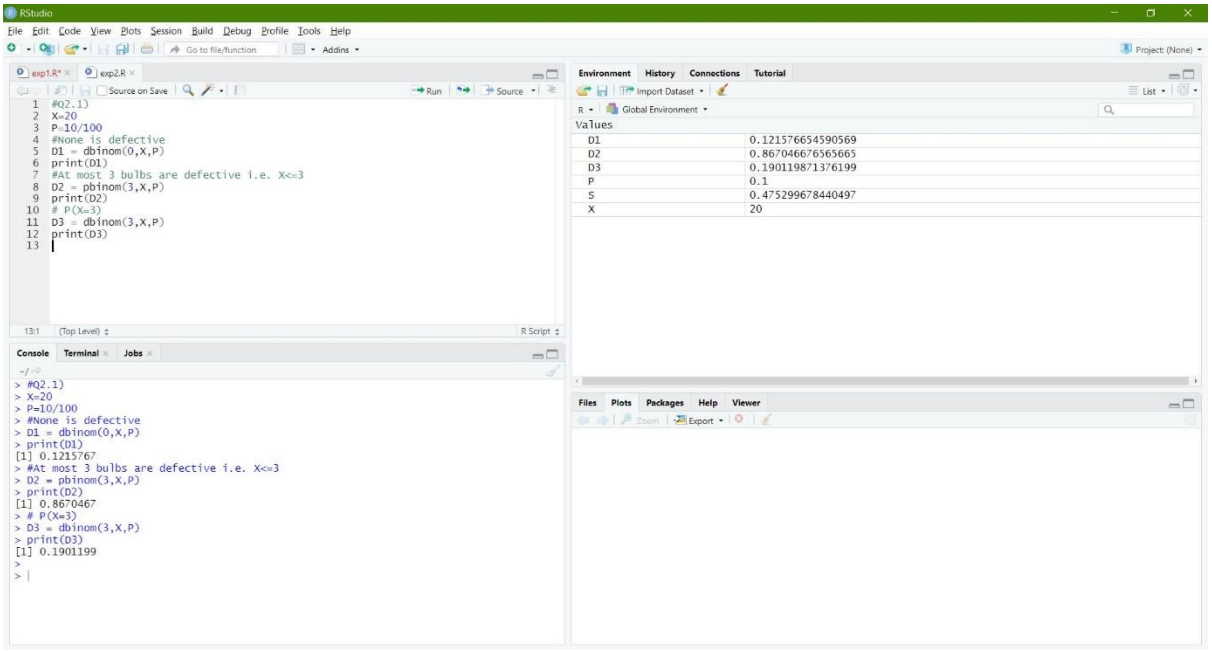
> D3 = dbinom(3,X,P)

> print(D3)

[1] 0.1901199

>

**Implementation on R Studio Code (via Command Window):**



**Q2) Out of 1000 balls 50 are red and the rest white. If 60 balls are picked at random, what is the probability of picking up (i) 3 red balls (ii) not more than 3 red balls in the sample. Assume Poisson distribution for the number of red balls picked up in the sample.**

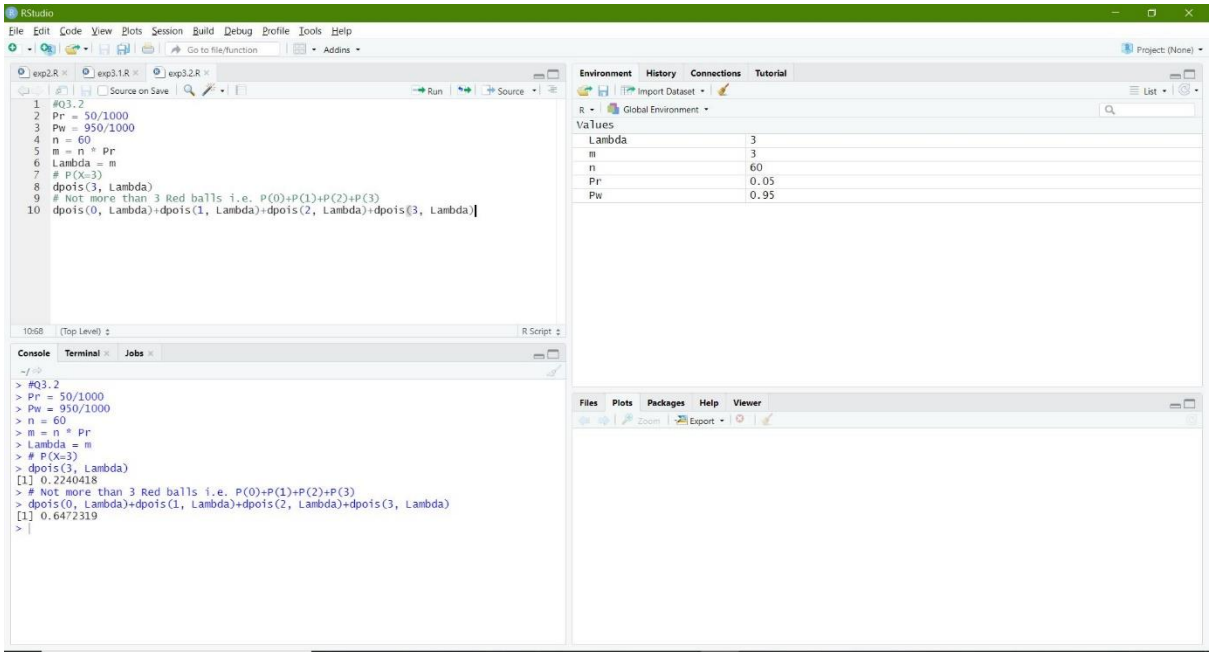
A1) Code is as follows:

```
#Q3.2
Pr = 50/1000
Pw = 950/1000
n = 60
m = n * Pr
Lambda = m
# P(X=3)
dpois(3, Lambda)
# Not more than 3 Red balls i.e. P(0)+P(1)+P(2)+P(3)
dpois(0, Lambda)+dpois(1, Lambda)+dpois(2, Lambda)+dpois(3, Lambda)
```

**Output (via Command Window):**

```
> #Q3.2
> Pr = 50/1000
> Pw = 950/1000
> n = 60
> m = n * Pr
> Lambda = m
> # P(X=3)
> dpois(3, Lambda)
[1] 0.2240418
> # Not more than 3 Red balls i.e. P(0)+P(1)+P(2)+P(3)
> dpois(0, Lambda)+dpois(1, Lambda)+dpois(2, Lambda)+dpois(3, Lambda)
[1] 0.6472319
```

**Implementation on R Studio Code (via Command Window):**



**Q3) In a test on 2000 electric bulbs, it was found that the life of a particular make, was normally distributed with an average life of 2040 hours and S.D. of 60 hours. Estimate the number of bulbs likely to burn for:**

**(i) more than 2150 hours,**

**(ii) less than 1950 hours and**

**(iii) more than 1920 hours but less than 2160 hours.**

A1) Code is as follows:

```
#Q3.3
mean = 2040
SD = 60
bulbs = 2000
# Number of bulbs > 2150 hours
b1 = pnorm(2150, mean, SD)
b1 = (b1)*bulbs
bulbs-b1
# Number of bulbs < 1950 hours
b2 = pnorm(1950, mean, SD)
b2 = (b2)*bulbs
b2
# Number of bulbs > 1920 and < 2160
b3 = pnorm(2160, mean, SD) - pnorm(1920, mean, SD)
b3 = (b3)*bulbs
b3
```

**Output (via Command Window):**

```
> #Q3.3
> mean = 2040
> SD = 60
> bulbs = 2000
> # Number of bulbs > 2150 hours
> b1 = pnorm(2150, mean, SD)
> b1 = (b1)*bulbs
```

> bulbs-b1

[1] 66.75302

> # Number of bulbs < 1950 hours

> b2 = pnorm(1950, mean, SD)

> b2 = (b2)*bulbs

> b2

[1] 133.6144

> # Number of bulbs > 1920 and < 2160

> b3 = pnorm(2160, mean, SD) - pnorm(1920, mean, SD)

> b3 = (b3)*bulbs

> b3

[1] 1908.999

**Implementation on R Studio Code (via Command Window):**