

UNIVERSITY OF KARACHI



Probability and Statistical Methods

BSCS-306

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Semester No: 2nd

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UNIVERSITY OF KARACHI

WEEK 2 LAB

QUESTION: 01

```
#p=0.1, 0.3, 0.5, 0.8
```

```
# n=10
```

```
v11=rbinom(1000, 10 ,0.1)
```

```
v12=rbinom(1000, 10 ,0.3)
```

```
v13=rbinom(1000, 10 ,0.5)
```

```
v14=rbinom(1000, 10 ,0.8)
```

```
#p=0.1, 0.3, 0.5, 0.8
```

```
# n=30
```

```
v21=rbinom(1000, 30 ,0.1)
```

```
v22=rbinom(1000, 30 ,0.3)
```

```
v23=rbinom(1000, 30 ,0.5)
```

```
v24=rbinom(1000, 30 ,0.8)
```

```
#p=0.1, 0.3, 0.5, 0.8
```

```
# n=50
```

```
v31=rbinom(1000, 50 ,0.1)
```

```
v32=rbinom(1000, 50 ,0.3)
```

```
v33=rbinom(1000, 50 ,0.5)
```

```
v34=rbinom(1000, 50 ,0.8)
```

```
#p=0.1, 0.3, 0.5, 0.8
```

```
# n=100
```

```
v41=rbinom(1000, 100 ,0.1)
```

```
v42=rbinom(1000, 100 ,0.3)
```

```
v43=rbinom(1000, 100 ,0.5)
```

```
v44=rbinom(1000, 100 ,0.8)
```

```
sim = data.frame(v11, v12, v13, v14, v21, v22, v23, v24, v31, v32, v33, v34,  
v41, v42, v43, v44)
```

```
# What is the impact of increase in sample size?
```

```
# Then the sample size is increased the mean will also be increased.
```

```
# What is the effect of p on the results?
```

```
# The effect of p on the result is that, the greater the probability the greater will be the result
```

QUESTION: 02

#simulated mean and variance

```
sim_mean = mean(v33)
print(sim_mean)
```

```
## [1] 24.928
```

```
sim_var = var(v33)
print(sim_var)
```

```
## [1] 11.07189
```

#theoretical mean and variance

```
theo_mean = np = 50*0.5
print(theo_mean)
```

```
## [1] 25
```

```
theo_var= npq = 50*0.5*0.5
print(theo_var)
```

```
## [1] 12.5
```

```
mean_diff = (theo_mean)-(sim_mean)
print(mean_diff)
```

```
## [1] 0.072
```

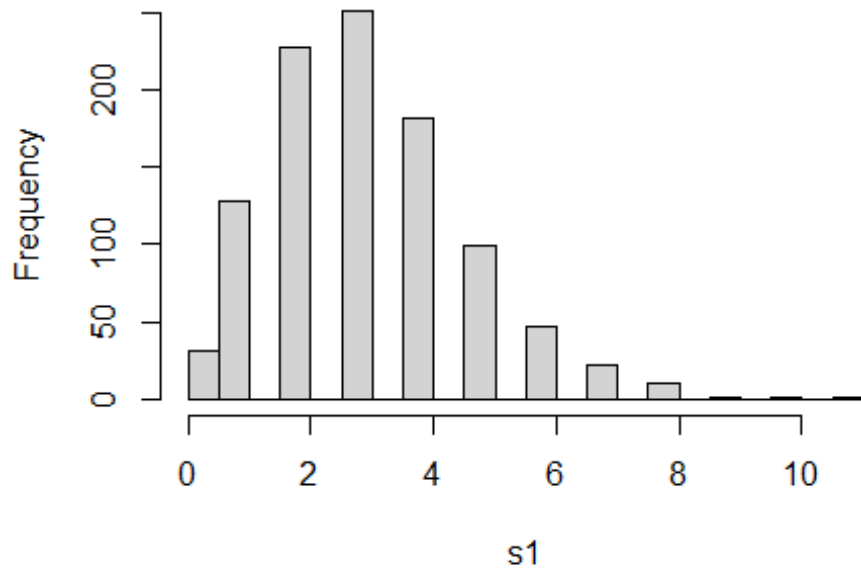
```
var_diff = (theo_var)-(sim_var)
print(var_diff)
```

```
## [1] 1.428112
```

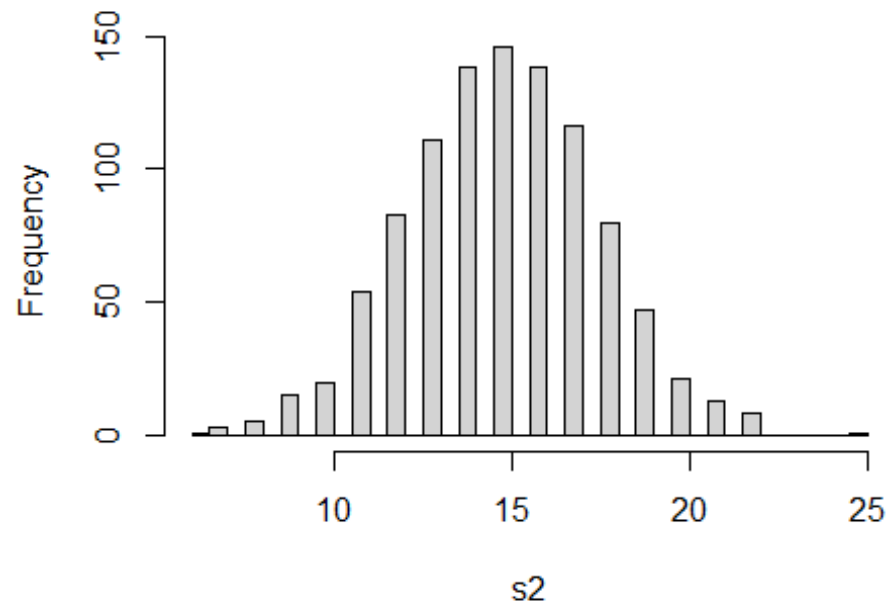
yes ! there is a little bit difference in the results of empirical mean and actual mean.

QUESTION: 03

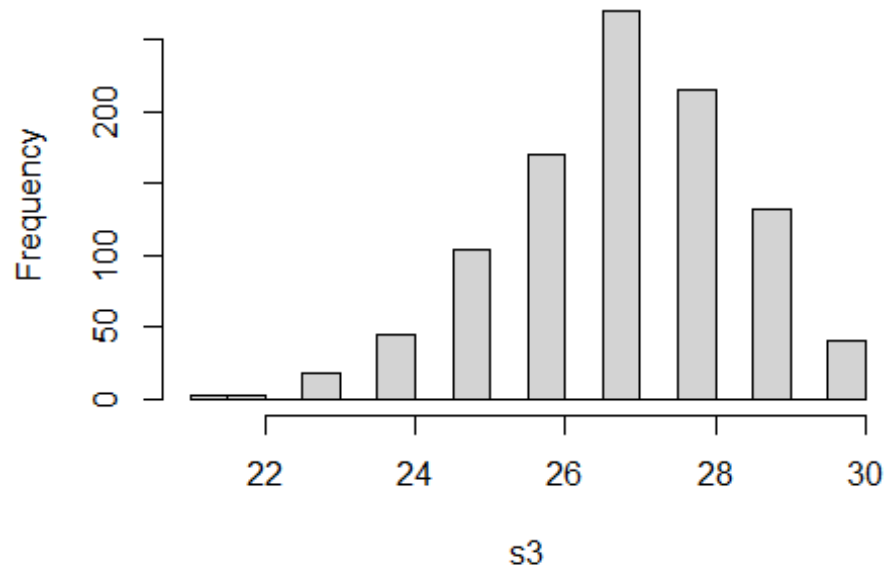
```
s1=rbinom(1000, 30 ,0.1)  
hist(s1,breaks = 30,main = "")
```



```
s2=rbinom(1000, 30 ,0.5)  
hist(s2,breaks = 30,main = "")
```



```
s3=rbinom(1000, 30 ,0.9)
hist(s3,breaks = 30,main = "")
```



QUESTION: 04

```
y1 = rpois(1000, 5)
summary(y1)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##      0.000   4.000   5.000   5.045   6.000   13.000
```

```
y2 = rpois(1000, 10)
summary(y2)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       3.00    8.00   10.00    9.94   12.00   21.00
```

```
y3 = rpois(1000, 15)
summary(y3)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       4.00   12.00   15.00   15.04   18.00   28.00
```

```
y4 = rpois(1000, 25)
summary(y4)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##      11.00   22.00   25.00   25.12   28.00   46.00
```

```
y5 = rpois(1000, 30)
summary(y5)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##      13.00   26.00   30.00   30.08   34.00   53.00
```

```
y6 = rpois(1000, 50)
summary(y6)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##      25.00   45.00   50.00   49.76   54.00   80.00
```

#As increase with the value of parameter which is Lambda the overall value and the mean is increasing too.

QUESTION: 05

#simulated mean and variance

```
sim_mean_pois = mean(y3)
print(sim_mean_pois)
```

```
## [1] 15.036
```

```
sim_var_pois = var(y3)
print(sim_var_pois)
```

```
## [1] 15.06177
```

#theoretical mean and variance

```
theo_mean_pois = np = 15
print(theo_mean_pois)
```

```
## [1] 15
```

```
theo_var_pois= npq = 15
print(theo_var_pois)
```

```
## [1] 15
```

```
mean_diff_pois = (theo_mean_pois)-(sim_mean_pois)
print(mean_diff_pois)
```

```
## [1] -0.036
```

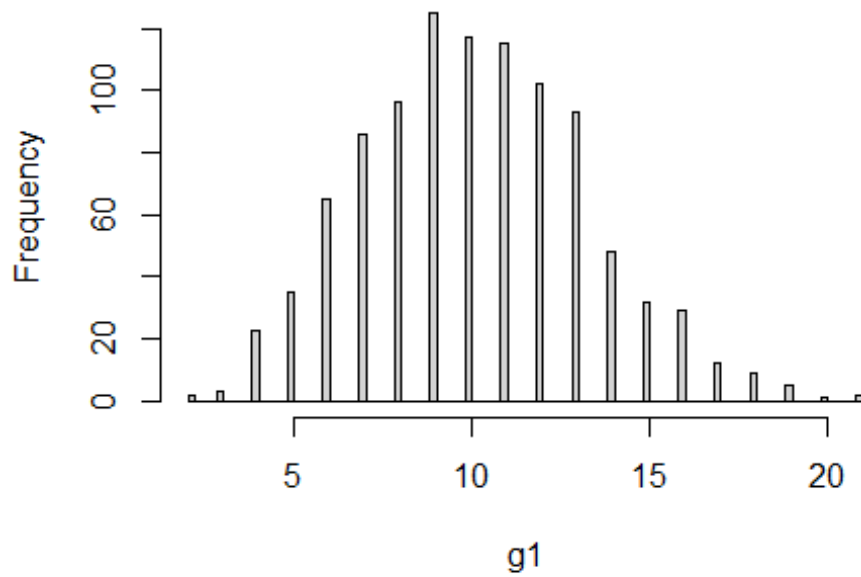
```
var_diff_pois = (theo_var_pois)-(sim_var_pois)
print(var_diff_pois)
```

```
## [1] -0.06176577
```

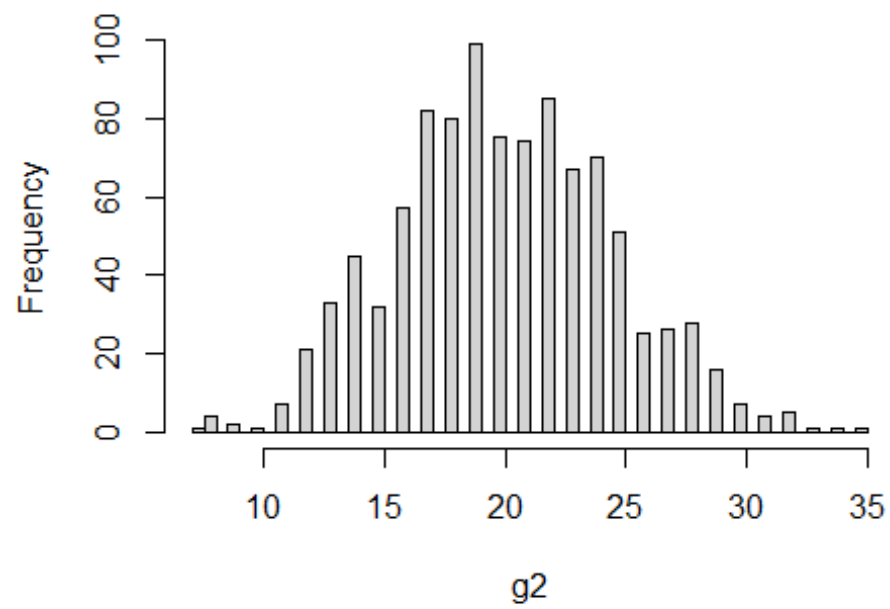
yes ! there is a little bit difference in the results of empirical mean and actual mean.

#QUESTION: 06

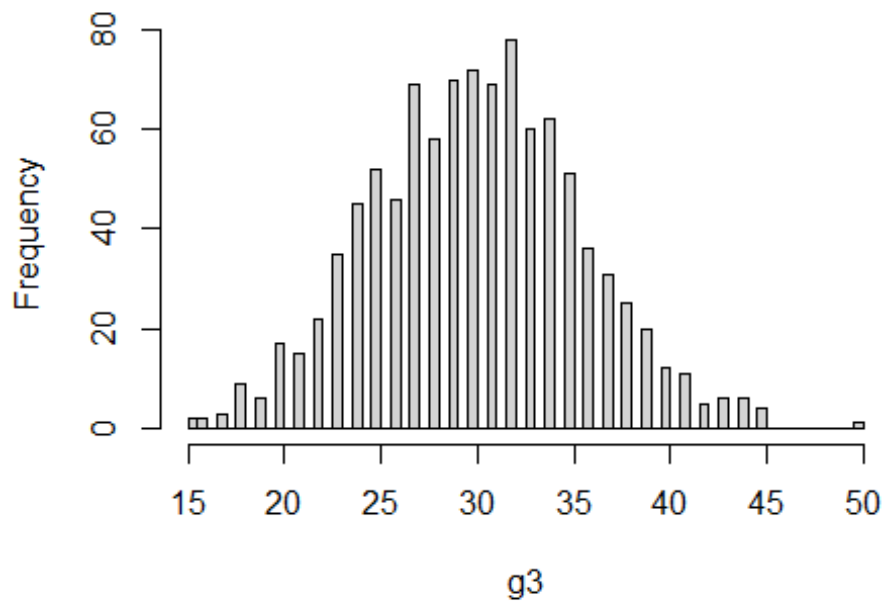
```
g1 = rpois(1000, 10)
hist(g1,
     breaks = 100,
     main = "")
```



```
g2 = rpois(1000, 20)
hist(g2,
     breaks = 100,
     main = "")
```



```
g3 = rpois(1000, 30)
hist(g3,
     breaks = 100,
     main = "")
```



From the above plot we concluded, as the Mean(Lambda) value increases the spread of the graph increases.