# Class 3 Summary

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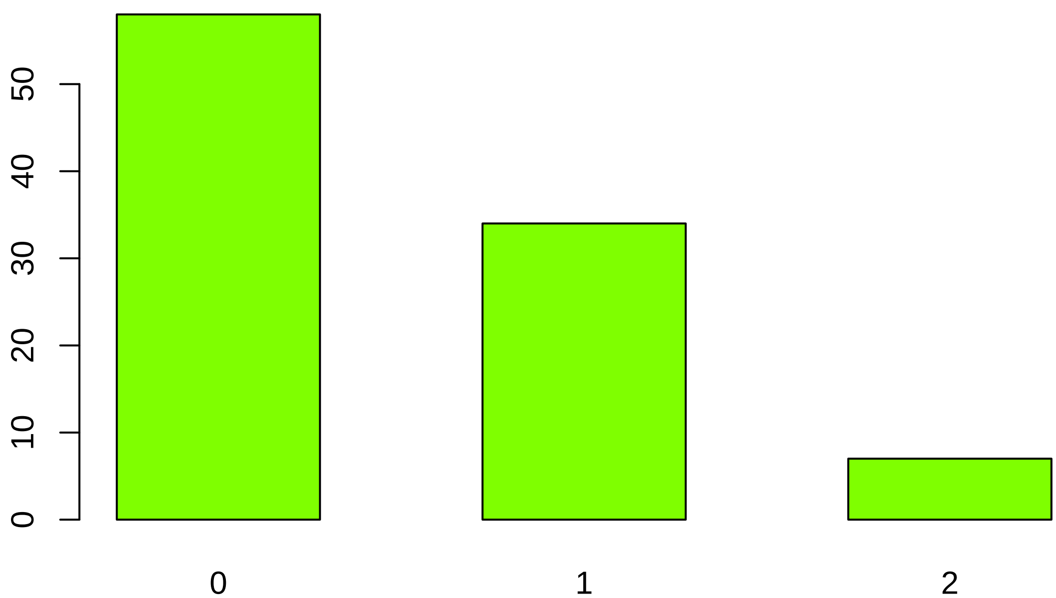
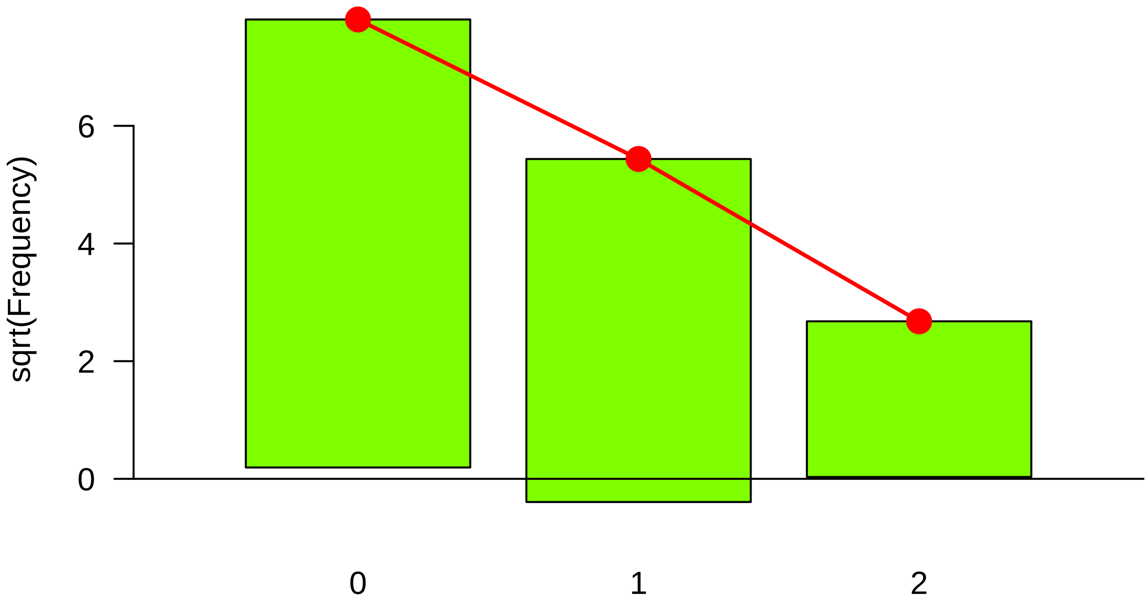
### 2.3 A simple Example of Statistical Modeling

This is a process for taking real data and trying to decide which distribution we should set it to.

```
load(here("data", "e100.RData"))

#remove outlier to make dataset easier to work with
e99 = e100[-which.max(e100)]

#see picture of distribution to try to decide distribution
barplot(table(e99), space = 0.8, col = "chartreuse")
```




```
#Using vcd library, create theoretical fit of data set to poisson
gf1 = goodfit( e99, "poisson")

#The rootogram shifts the barplot to match theoretical values to show how far off you are
rootogram(gf1, xlab = "", rect_gp = gpar(fill = "chartreuse"))
```

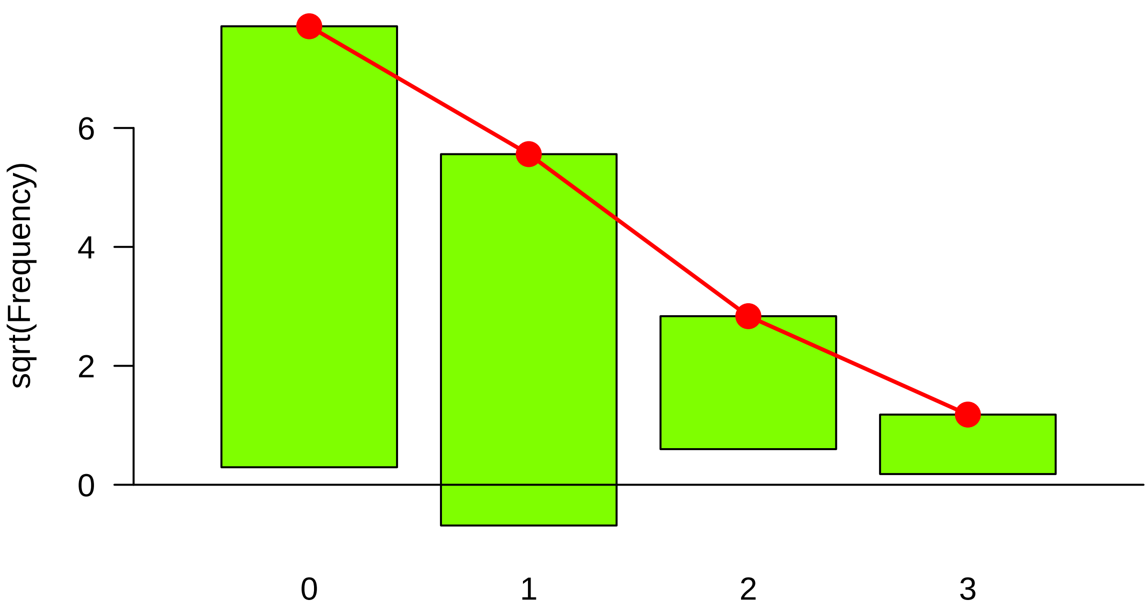



*R tip: `goodfit` takes in "poisson", "binomial", "nbinomial"

**Q2.1**

Generate 100 random poissons with $\lambda = 0.5$ to test out rootogram

```
pois.100<-rpois(100,0.5)
gf2 = goodfit(pois.100, "poisson")
rootogram(gf2, xlab="", rect_gp = gpar(fill = "chartreuse"))
```




For the **MLE** we are looking for the most likely parameter based on the observed data.

```
table(e100)
```

```
## e100
```

```
##  0  1  2  7
## 58 34  7  1
```

```r
table(rpois(100,3))
```

```
##
##  0  1  2  3  4  5  6  7  8
##  6 19 25 23 12  8  2  3  2
```

Comparing our dataset to a Poisson 3 obviously shows that 3 would be a bad parameter estimate

### Q2.2

Given that we have 58 0's, 34 1's, and 7 2's, what's the probability of that happening given they are Poisson $m$?

$$P(0)^{58} \times P(1)^{34} \times P(2)^{7} \times P(7)^{1}$$

for $m = 3$ this is:

```r
#Side Note This gives individual probabilities
dpois(c(0,1,2,7),lambda = 3)^(c(58, 34, 7, 1))
```

```
## [1] 2.708695e-76 8.396253e-29 2.833371e-05 2.160403e-02
```

```r
#the Prod function gives us the product
prod(dpois(c(0,1,2,7),lambda = 3)^(c(58, 34, 7, 1)))
```

```
## [1] 1.392143e-110
```