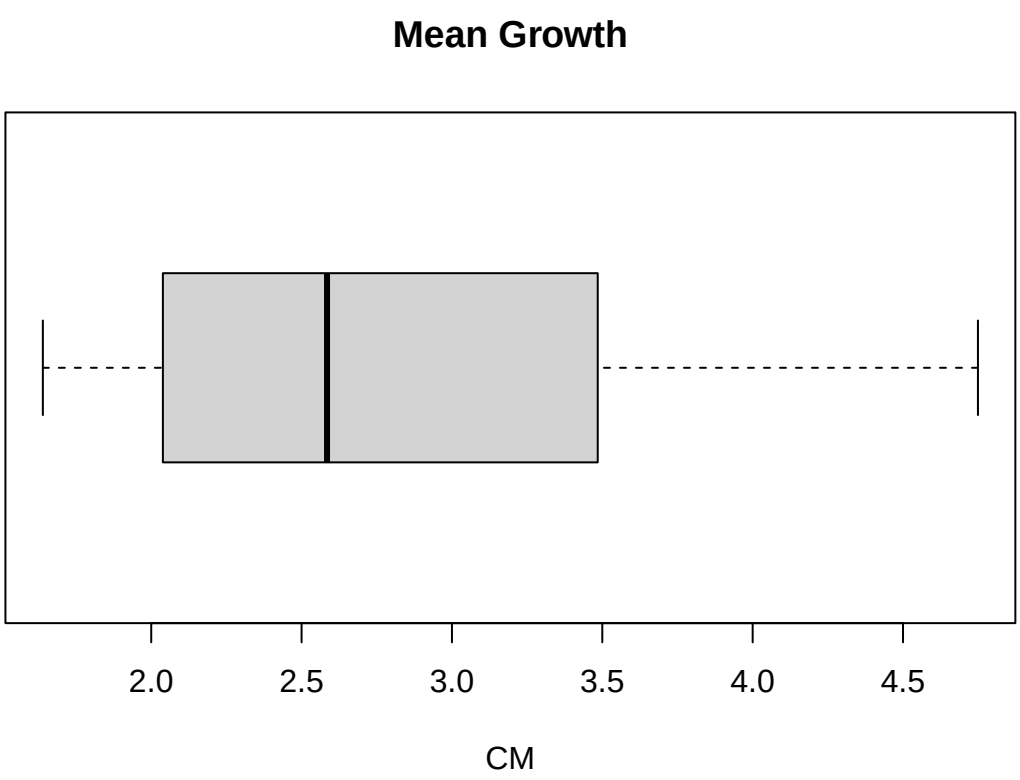
Lab 2 Problems

Grace Randall

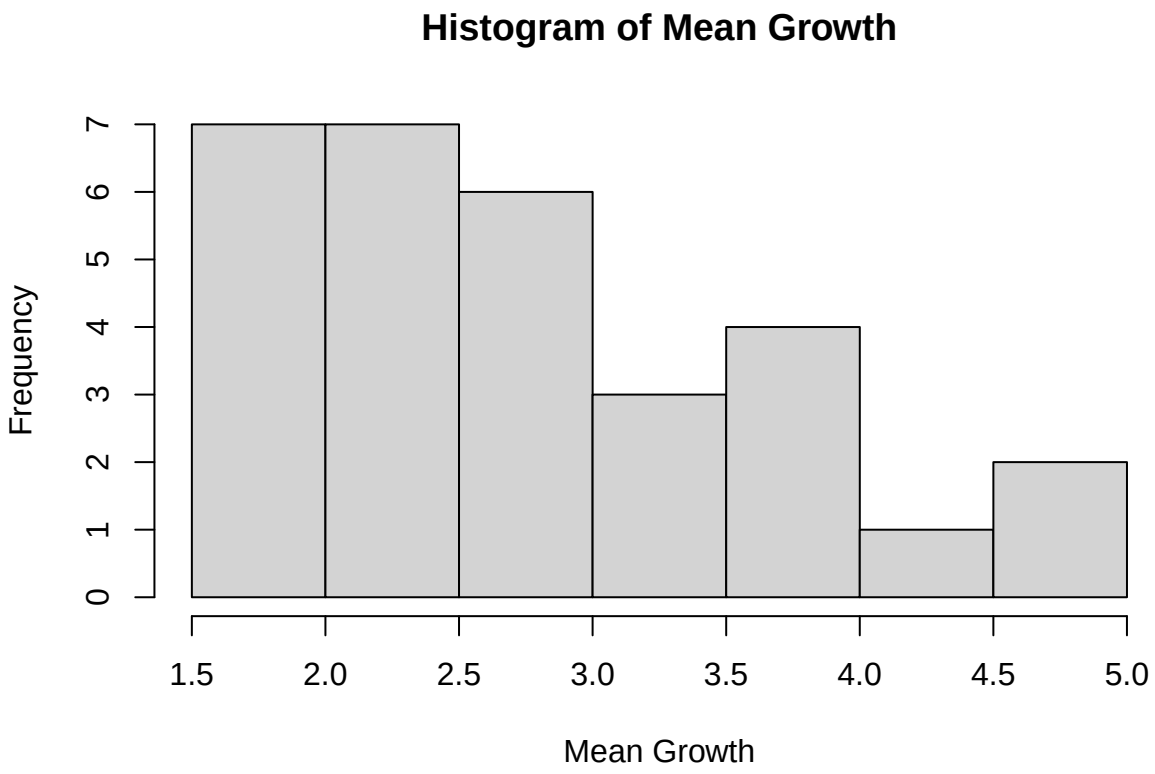
2024-01-24

Problem 1

```
# a)
boxplot(afdat$MeanGr,
        main = "Mean Growth",
        xlab = "CM",
        horizontal = TRUE
        )
```




```
hist(afdat$MeanGr, xlab = 'Mean Growth', main = 'Histogram of Mean Growth')
```




```
# b)
mean(afdat$MeanGr, na.rm = TRUE)
```

```
## [1] 2.705763
```

```
median(afdat$MeanGr, na.rm = TRUE)
```

```
## [1] 2.584666
```

```
var(afdat$MeanGr, na.rm = TRUE)
```

```
## [1] 0.8000796
```

```
sd(afdat$MeanGr, na.rm = TRUE)
```

```
## [1] 0.8944717
```

```
sd(afdat$MeanGr, na.rm = TRUE)/mean(afdat$MeanGr, na.rm = TRUE)
```

```
## [1] 0.3305802
```

b) The mean of mean growth is 2.7cm. The median is 2.6cm. The variance is 0.80 square cm. The standard diviation is 0.89cm. the coefficient of variation is 0.33.

Problem 2

```
# 5 or less
sum(dbinom(0:5, size = 20, prob = 0.5))
```

```
## [1] 0.02069473
```

```
# more than 5
sum(dbinom(6:20, size = 20, prob = 0.5))
```

```
## [1] 0.9793053
```

```
n <- 20
k <- 0:20
p <- 0.5
coinflipPD <- (factorial(n)/(factorial(k)*(factorial(n-k))))*(p^k)*(1-p)^(n-k)
# 5 or less
sum(coinflipPD[1:6])
```

```
## [1] 0.02069473
```

```
# more than 5
sum(coinflipPD[7:21])
```

```
## [1] 0.9793053
```

Problem 3

```
#probability of getting more than 17 right
sum(dbinom(17:20, size = 20, prob = 0.25))
```

```
## [1] 2.960496e-08
```

Problem 4

```
#a)
l<-4
x<-9:13
pd<-l^x/factorial(x)*exp(-l)
sum(pd[1:5])
```

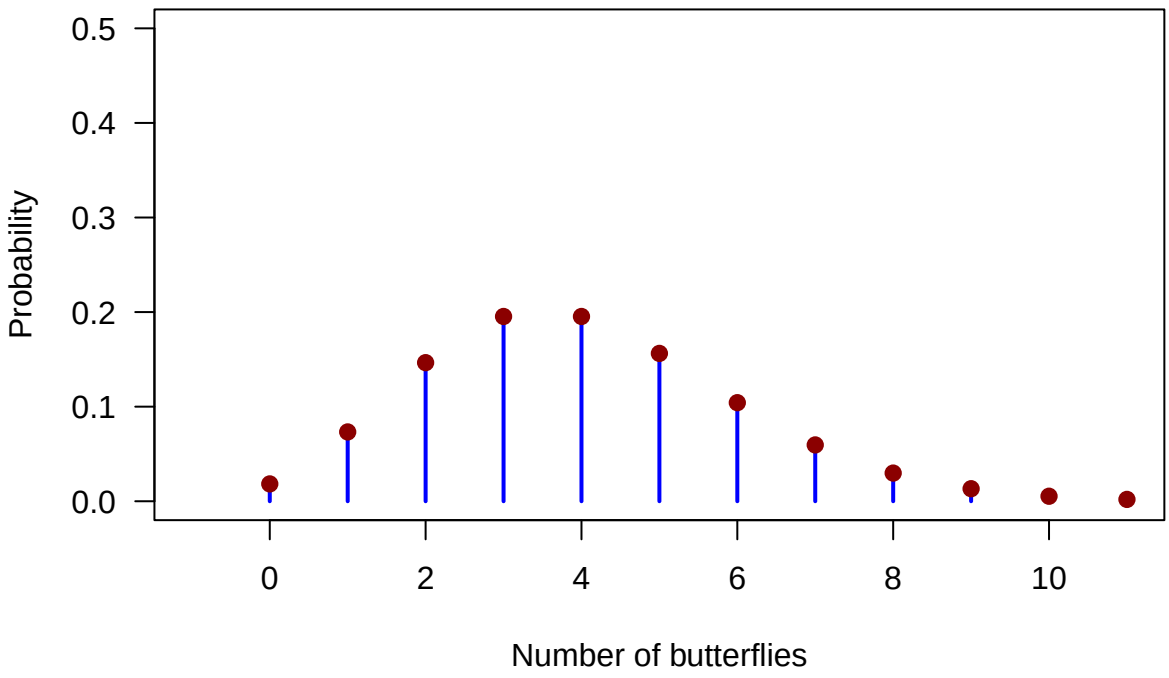
```
## [1] 0.02128711
```

```
#b)
sum(dpois(x = 9:13, lambda = 4))
```

```
## [1] 0.02128711
```

```
#c)
Dist<-dpois(x = 0:13, lambda = 4)
x<-0:13

plot(x, Dist, type="h",xlim = c(-1, 11), ylim = c(0, 0.5),
las = 1, lwd = 2, col = "blue",
ylab = "Probability", xlab = "Number of butterflies")
points(x, Dist, pch = 16, cex = 1.2, col = "dark red")
```



Question 5

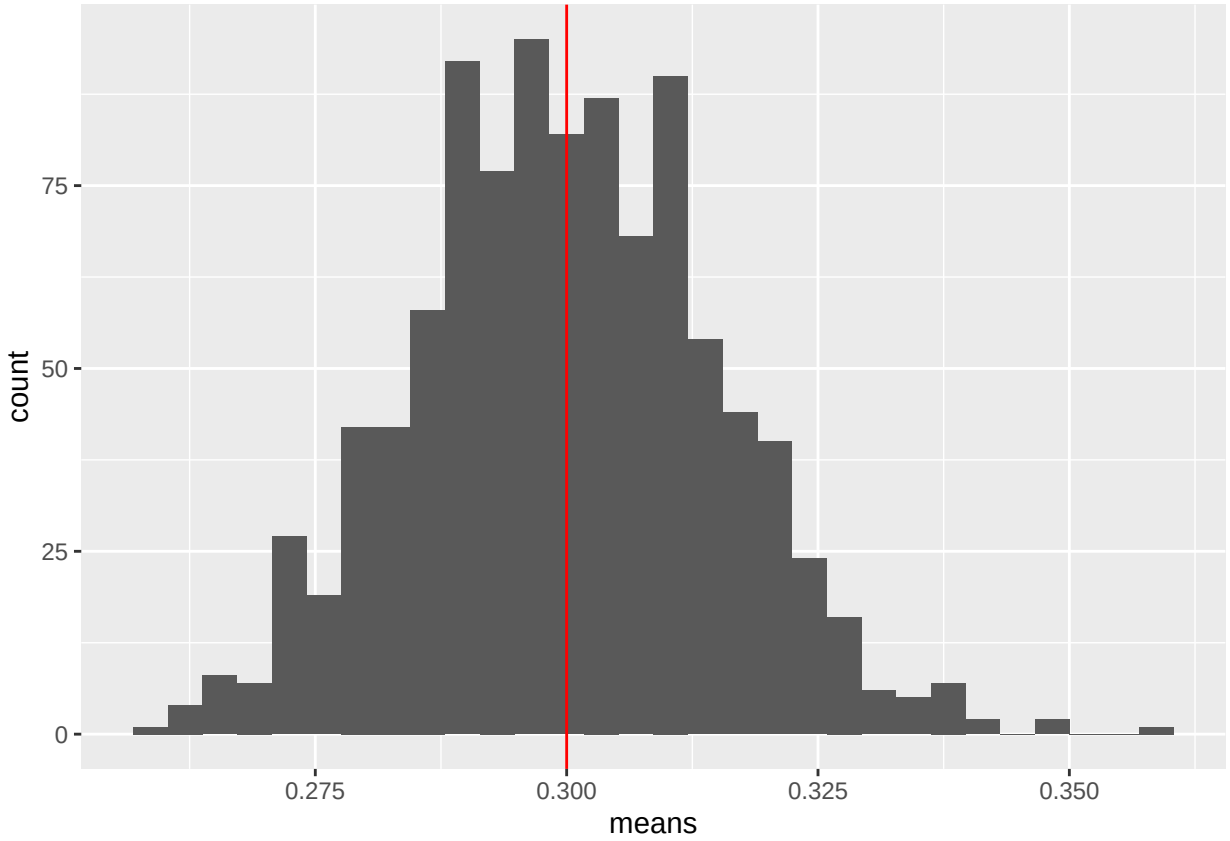
```
#a)
# Define number of experiments
nexp <- 1000
sample_means_pres <- matrix(NA,nrow=nexp)

# experiment
for (i in 1:nexp){
x <-rbinom(1000,1,0.3)
sample_means_pres[i] <- mean(x)
}
#Plot
sample_means_pres.df <- data.frame(means=sample_means_pres)

pres <- ggplot(sample_means_pres.df,aes(means))+
geom_histogram()+
geom_vline(xintercept=0.3,color="red")

pres
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



the sampling distribution seems to follow a normal distribution.

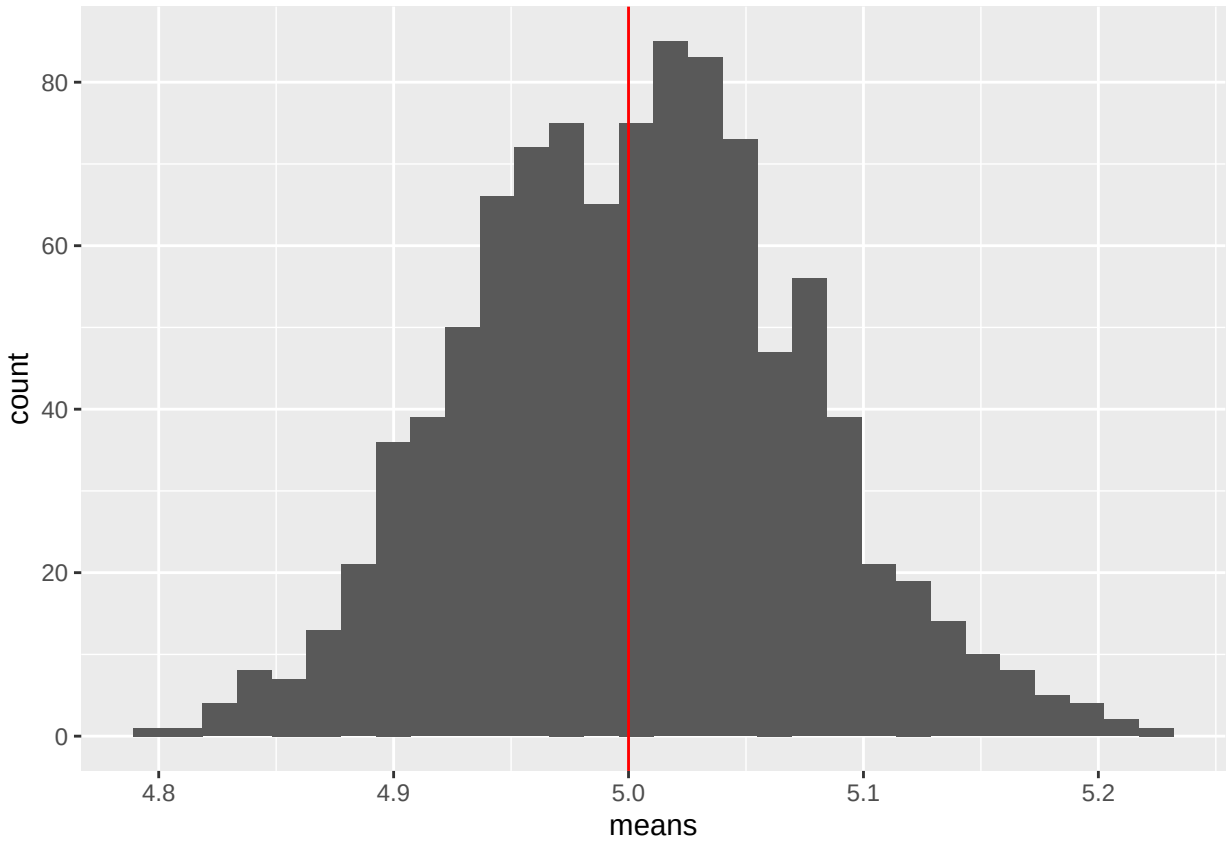
```
#b)
# Define number of experiments
nexp <- 1000
sample_means_num <- matrix(NA,nrow=nexp)

# experiment
for (i in 1:nexp){
x <-rpois(1000,5)
sample_means_num[i] <- mean(x)
}
#Plot
sample_means_num.df <- data.frame(means=sample_means_num)

num <- ggplot(sample_means_num.df,aes(means))+
geom_histogram()+
geom_vline(xintercept=5,color="red")

num
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



the sampling distribution seems to follow a normal distribution.

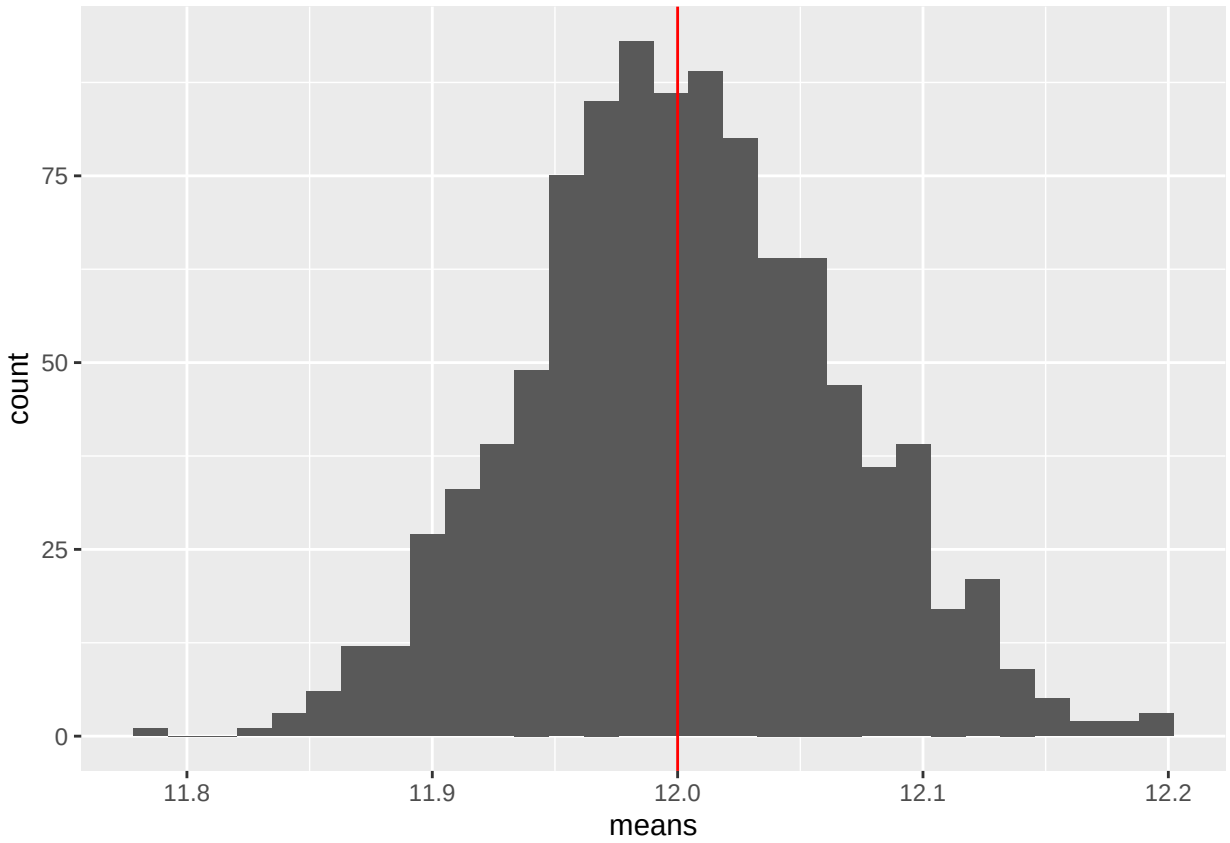
```
#c)
# Define number of experiments
nexp <- 1000
sample_means_DBH <- matrix(NA,nrow=nexp)

# experiment
for (i in 1:nexp){
x <-rnorm(1000,12,2)
sample_means_DBH[i] <- mean(x)
}
#Plot
sample_means_DBH.df <- data.frame(means=sample_means_DBH)

DBH <- ggplot(sample_means_DBH.df,aes(means))+
geom_histogram()+
geom_vline(xintercept=12,color="red")

DBH
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



the sampling distribution seems to follow a normal distribution.