Homework 2

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## R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

summary(cars)

## speed dist   
## Min. : 4.0 Min. : 2.00   
## 1st Qu.:12.0 1st Qu.: 26.00   
## Median :15.0 Median : 36.00   
## Mean :15.4 Mean : 42.98   
## 3rd Qu.:19.0 3rd Qu.: 56.00   
## Max. :25.0 Max. :120.00

## Including Plots

You can also embed plots, for example:



Note that the echo = FALSE parameter was added to the code chunk to prevent printing of the R code that generated the plot.

# Problem 1

### A

Expected value is 33.75 and Standard deviation is 4.308

n = 75 p = 0.45 x = 75

expectedvalue = n*p standarddeviation = sqrt(n*p\*(1-p))

expectedvalue standarddeviation

### B

All possible values of X.

dbinom(c(0:75),75,0.45)

### C

If the true effetiveness of the drug is truly 45% and the probablility of such finding in the trial, with the assumption that the true effectiveness of the drug is 45%.

sd = sqrt(.45\*.55/75)

sd

P = ((0.3-0.45)/sd)

P

### D

The Mean is 33.7641 and the Standard Deviation is 4.340592.

x = rbinom(10000, 75, 0.45) mean(x) sd(x)

The results are very close to the results in part A. They would be different based on sampling errors.

# Problem 2

### A

The expected value is 600 and the standard deviation is 24.4949.

lambda = 600

expected\_value = lambda

standard\_deviation = sqrt(lambda)

expected\_value standard\_deviation

### B

Possibility of all possible values of X graphically and the collective probability of each grouping of 100.

x = 0:600 lambda = 600

x = 0:600 prob = dpois(x, lambda)

plot(x, prob, type = “h”, main = “Poisson Distribution”, xlab = “Number of Patrons”, ylab = “Probability”)

group\_probabilities = sapply(seq(0, 900, by = 100), function(a) sum(dpois(a:(a + 99), lambda))) group\_probabilities

### C

The probablility is 0.0012

prob\_more\_than\_675 = 1 - ppois(675, lambda) prob\_more\_than\_675

### D

Both probabilities of B and D are similar. This means that the simulation in D aligns with the Poisson distribution.

simulated\_patrons = rbinom(365, size = 600, prob = lambda/600)

hist(simulated\_patrons, main = “Simulated Workload”, xlab = “Number of Patrons”, ylab = “Frequency”, breaks = seq(0, 600, by = 100))

# Problem 3

### A

Yes, this does look normally distributed. The shape of the histogram indicates that it is normally distributed.

insurance <- read.csv(“<https://raw.githubusercontent.com/EricBrownTTU/ISQS5346/main/insurance.csv>”)

hist(insurance$bmi, main = “BMI Histogram”, xlab = “BMI”, ylab = “Frequency”)

### B

mean\_bmi <- mean(insurancebmi) n <- length(insurance$bmi) set.seed(123) simulated\_bmi <- replicate(5, rnorm(n, mean\_bmi, sd\_bmi))

### C

par(mfrow = c(2, 3)) hist(insurance$bmi, main = “Actual BMI Data”, xlab = “BMI”, ylab = “Frequency”) for (i in 1:5) { hist(simulated\_bmi[, i], main = paste(“Simulated BMI Data”, i), xlab = “BMI”, ylab = “Frequency”) }

### D

The points on the plot closely follow the straight line. This indicates that the BMI data is within a normal distribution.

qqnorm(insurance$bmi, main = "QQ Plot of BMI Data") qqline(insurance$bmi)

### E