HW2-STA631

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```
library(tidyverse)
library(patchwork)
library(kableExtra)
```

Problems

3.1

```
age_ranges=c("18-29","30-44", "45-64", "65+")
n=c(200,250,300, 250) #total number of respondents by age_ranges
age_proportion=c(.5, .6, .4, .3) #prop of age range who support taxes
support_higher_taxes=sum(age_proportion*n) / sum(n) #

#display table of stratum, associated weights, and the weighted average of
#respondents supporting higher taxes
table <- tibble(age_ranges, n, age_proportion)
kable(table, caption = "Table of Weighted Responses by Age Range") %>%
  kable_styling(latex_options = "hold_position")
```

Table 1: Table of Weighted Responses by Age Range

age_ranges	n	age_proportion
18-29	200	0.5
30-44	250	0.6
45-64	300	0.4
65+	250	0.3

```
sprintf("Proportion of Respondents Supporting Higher Taxes = %.2f%%", support_higher_taxes)
```

```
## [1] "Proportion of Respondents Supporting Higher Taxes = 0.45%"
```

3.2

```
age_ranges=c("18-29","30-44", "45-64", "65+")
n=c(200,250,300, 250) #total number of respondents by age_ranges
age_prop_new=c(.4, .5, .4, .3) #prop of age range who support taxes
support_higher_taxes_new=sum(age_prop_new*n) / sum(n) #weighted average

#display table of stratum, associated weights, and the weighted average of
#respondents supporting higher taxes
table <- tibble(age_ranges, n, age_prop_new)
```

```
kable(table, caption = "Table of Weighted Responses by Age Range") %>%
  kable_styling(latex_options = "hold_position")
```

Table 2: Table of Weighted Responses by Age Range

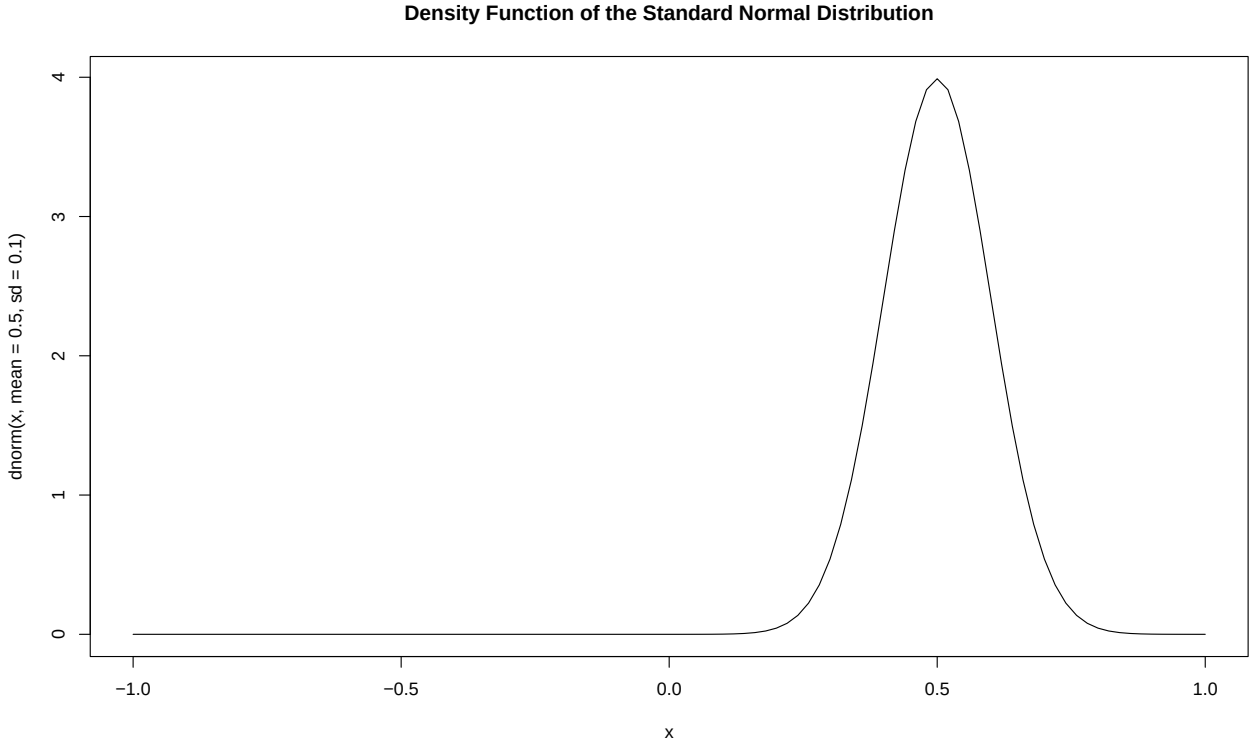
age_ranges	n	age_prop_new
18-29	200	0.4
30-44	250	0.5
45-64	300	0.4
65+	250	0.3

```
sprintf("New Proportion of Respondents Supporting Higher Taxes = %.2f%%",
        support_higher_taxes_new)
```

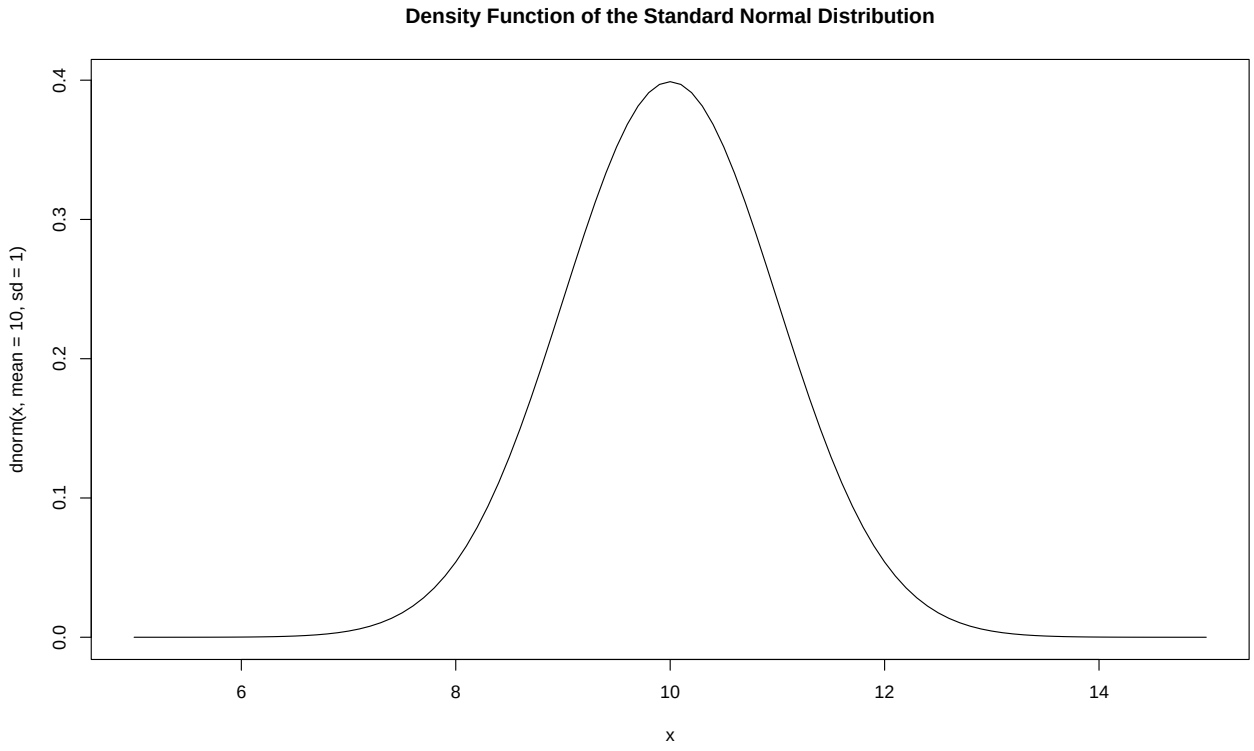
```
## [1] "New Proportion of Respondents Supporting Higher Taxes = 0.40%"
```

3.3

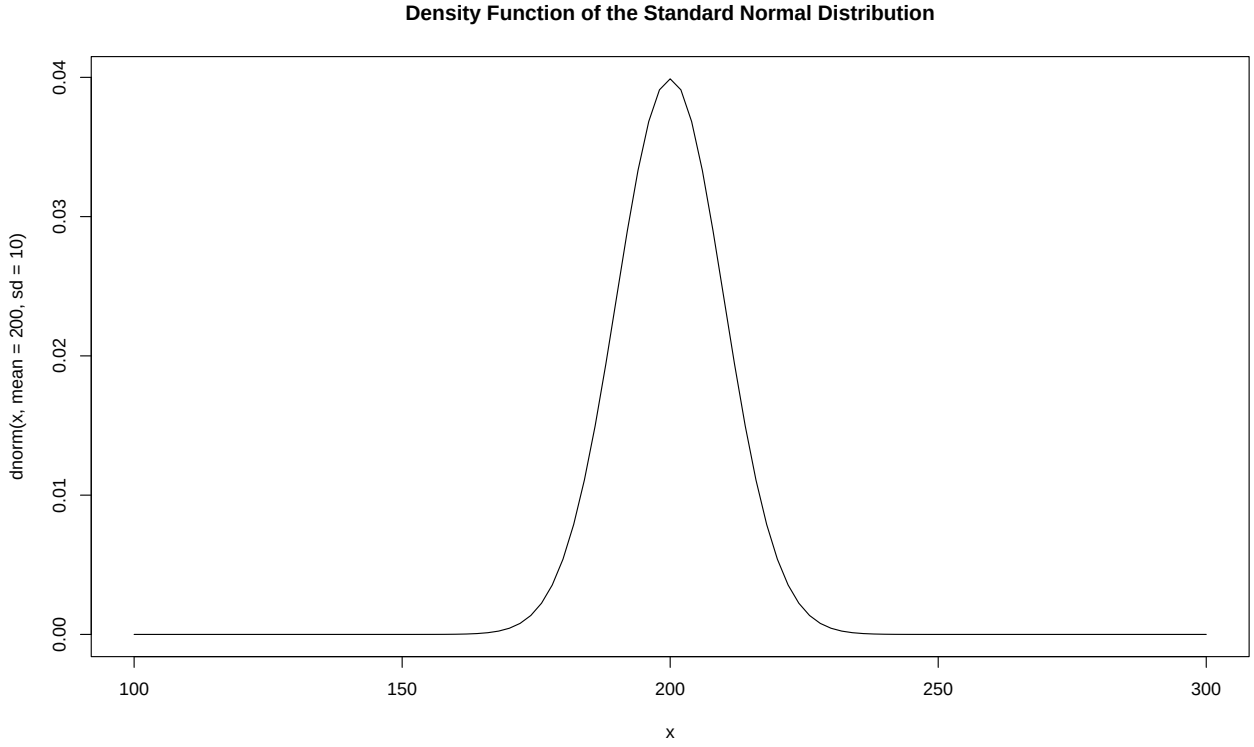
```
curve(dnorm(x, mean = .5, sd = .1), from=-1, to=1, main="Density Function of the Standard Normal Distri
```




```
curve(dnorm(x, mean = 10, sd = 1),from=5, to=15, main="Density Function of the Standard Normal Distribu
```




```
curve(dnorm(x, mean = 200, sd = 10), from=100, to=300, main="Density Function of the Standard Normal Di
```

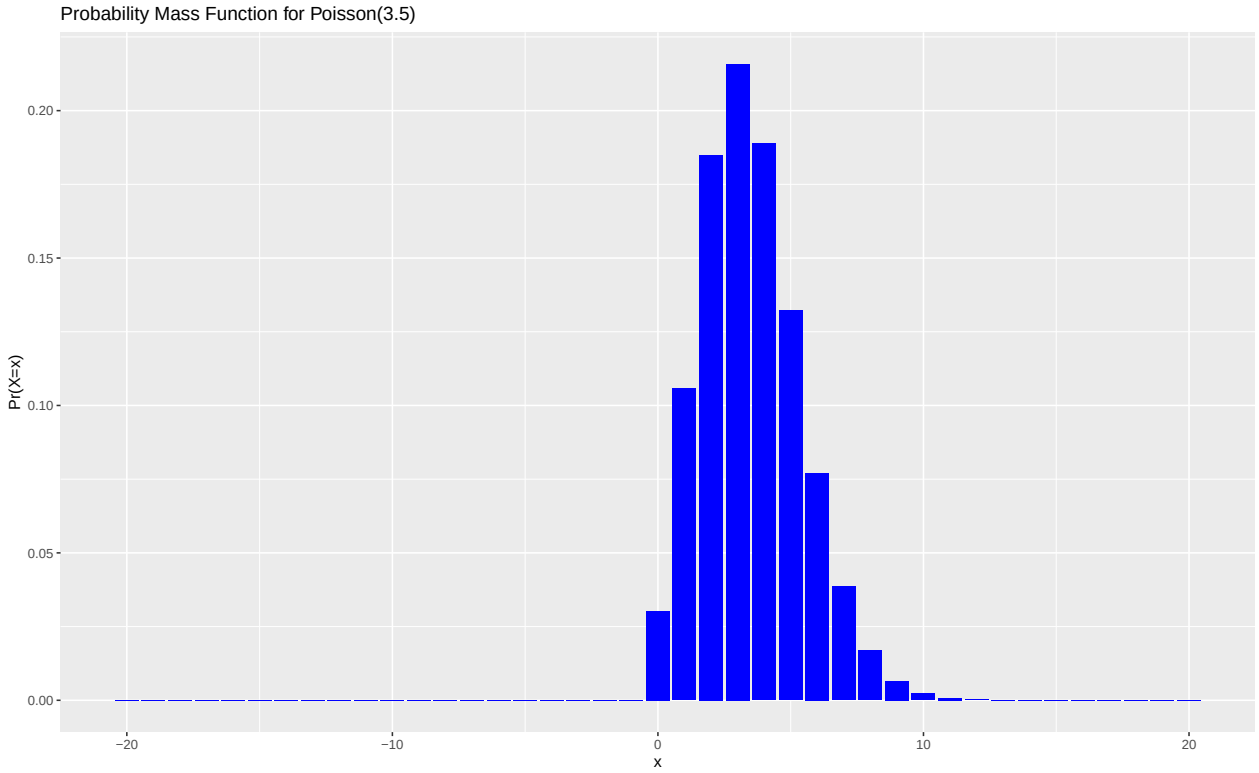


3.4

```
poissonpmf <- tibble(
                    x = -20:20,
```

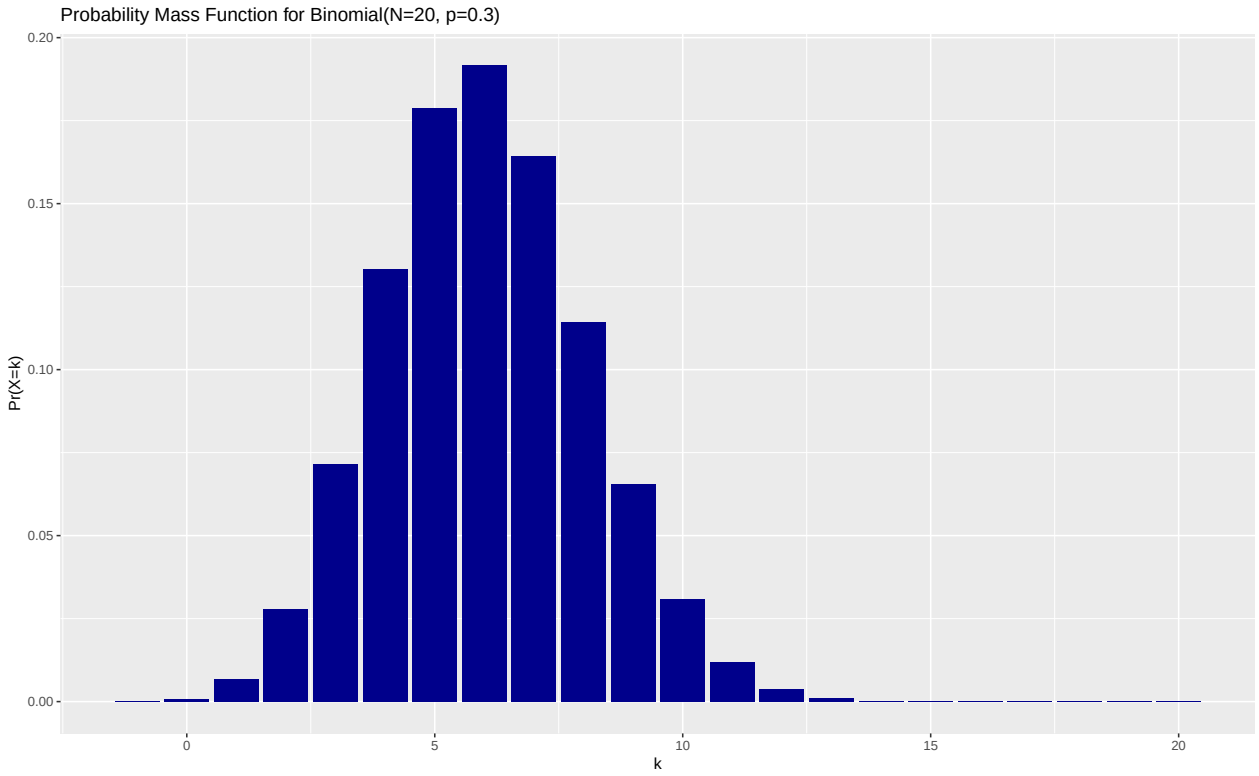
```
                      prob = dpois(x,3.5)
                     )

ggplot(data = poissonpmf, mapping = aes(x = x, y = prob)) +
      geom_col(fill="blue") +
      ggtitle("Probability Mass Function for Poisson(3.5)") +
      xlab("x") +
      ylab("Pr(X=x)")
```



3.5

```
dbinom <- tibble(x = -1:20,
                 success = dbinom(x, 20, 0.3)
                 )
ggplot(data = dbinom, mapping = aes(x = x, y = success)) +
      geom_col(fill="dark blue") +
      ggtitle("Probability Mass Function for Binomial(N=20, p=0.3)") +
      xlab("k") +
      ylab("Pr(X=k)")
```



3.8

```
sigma_x <- 2.9
sigma_y <- 2.7
mu_x <- 69.1
mu_y <- 63.7
ro <- 0.3

#produce variates of normal distribution for each partner in marriage with n 10,000
z1 <- rnorm(10000)
z2 <- rnorm(10000)

#sample of 1000 from normal distribution of each marriage partner
sims_z1 <- sample(z1, size = 1000)
sims_z2 <- sample(z2, size = 1000)

#define X and Y
X <- sigma_x * sims_z1[1] + mu_x
Y <- sigma_y * ((ro * sims_z1[1]) + (sims_z2[1] * (sqrt(1 - ro**2)))) + mu_y

#create variable 'average' and compare correlation of simulation to ro
average <- (X + Y) / 2
correlation <- cor(sims_z1, sims_z2)

#produce table of results
tibble("Z_1" = sims_z1[1],
       "Z_2" = sims_z2[1],
       X,
       Y,
```

```
       "Average" = average,
       "Correlation" = correlation)
```

```
## # A tibble: 1 x 6
##     Z_1   Z_2     X     Y Average Correlation
##   <dbl> <dbl> <dbl> <dbl>   <dbl>       <dbl>
## 1  1.66  1.10  73.9  67.9    70.9     -0.0425
```

Tyler Reed: I could not get my simulation to confirm my calculations consistently. the correlation function at the end of this code chunk would not consistently produce a ro of 0.3.