STAT 3355 - HW 5 - Yebom Kim

2024-03-30

Problem 1

```r
library(ggplot2)
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----------------------- tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v lubridate 1.9.3     v tibble    3.2.1
## v purrr     1.0.2     v tidyr     1.3.1
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

Problem 1-(a)

```r
defective <- 3/75
not_defective <- 1 - defective
k <- 6
probability <- (not_defective^(k - 1)) * defective
probability <- round(probability, 3)
cat("The probability of finding the first faulty bulb on the 6th test is", probability, "\n")
```

```
## The probability of finding the first faulty bulb on the 6th test is 0.033
```

Problem 1-(b)

```r
probability_b <- 1 - sum((not_defective^(1:4)) * defective)
probability_b <- round(probability_b, 3)
cat("Probability of taking at least four trials to find the first defective bulb:", probability_b, "\n")
```

```
## Probability of taking at least four trials to find the first defective bulb: 0.855
```
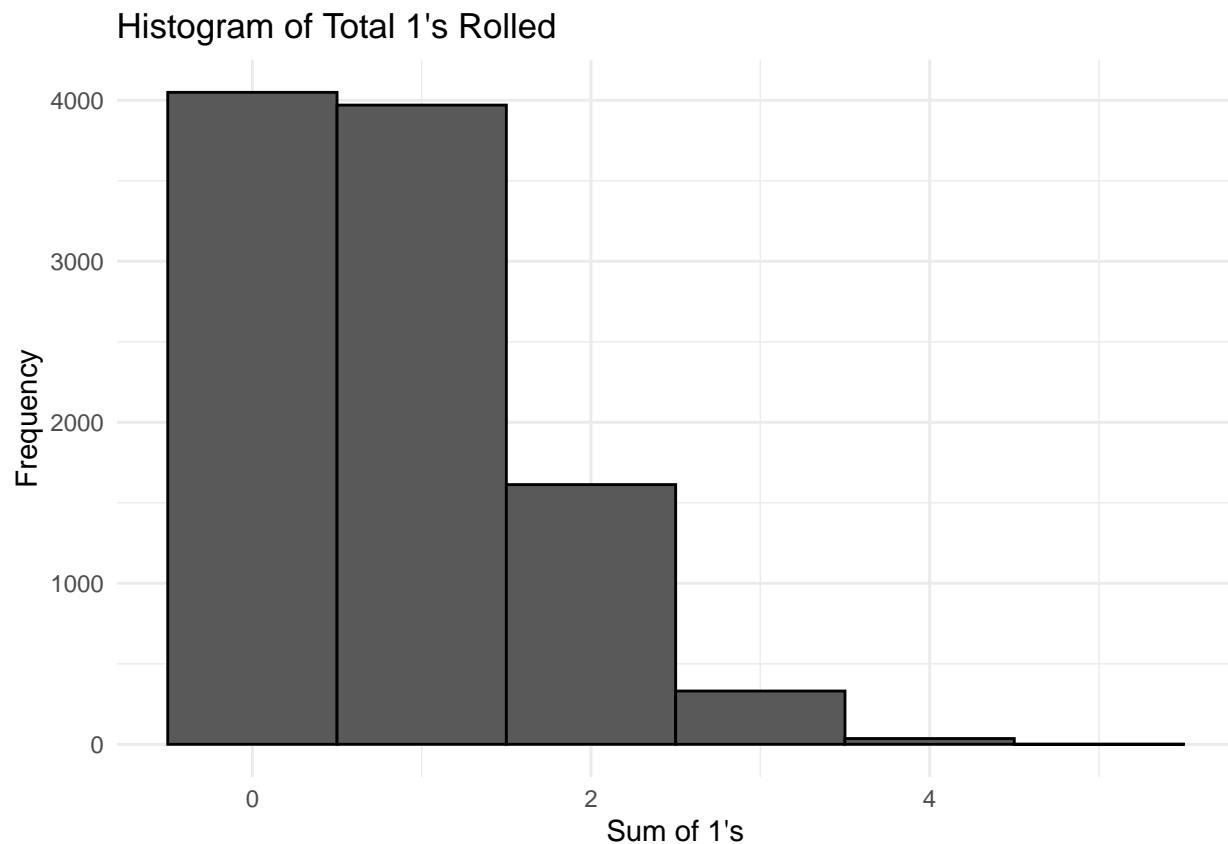
Problem 1-(c)

```r
probability_c <- sum((not_defective^(1:10)) * defective)
probability_c <- round(probability_c, 3)
cat("Probability of taking at most 10 trials to find the first defective bulb is", probability_c)
```

```
## Probability of taking at most 10 trials to find the first defective bulb is 0.322
```

Problem 2

```r
library(ggplot2)
library(tidyverse)
set.seed(20220707)
X <- replicate(10000, sum(sample(1:6, 5, replace = TRUE) == 1))
dataX <- data.frame(X)
ggplot(dataX, aes(x = X))+
geom_histogram(binwidth = 1, color = "black") + labs(title = "Histogram of Total 1's Rolled", x = "Sum
```



```r
cat("Sample Mean: ", round(mean(X), 3), "\n", "Sample Variance: ", round(var(X),3))
```

```
## Sample Mean:  0.834
##  Sample Variance:  0.705
```

Problem 3

```r
library(ggplot2)
library(tidyverse)
#using p(x)
congestionP <- round((1 - (ppois(5, 3))), 3)
cat("Probabilty of Congestion: ", congestionP, "\n")
```

```
## Probabilty of Congestion:  0.084
```

```r
#using d(x)
xVals <- (0:10)
probs <- dpois(xVals, 3)
dataC <- data.frame(cars = xVals, probability = probs)
ggplot(dataC, aes(x = cars, y = probability)) +
geom_bar(stat = "identity", fill = "rosybrown2", color = "black") + labs(title = "Passing Cars vs Probal
```
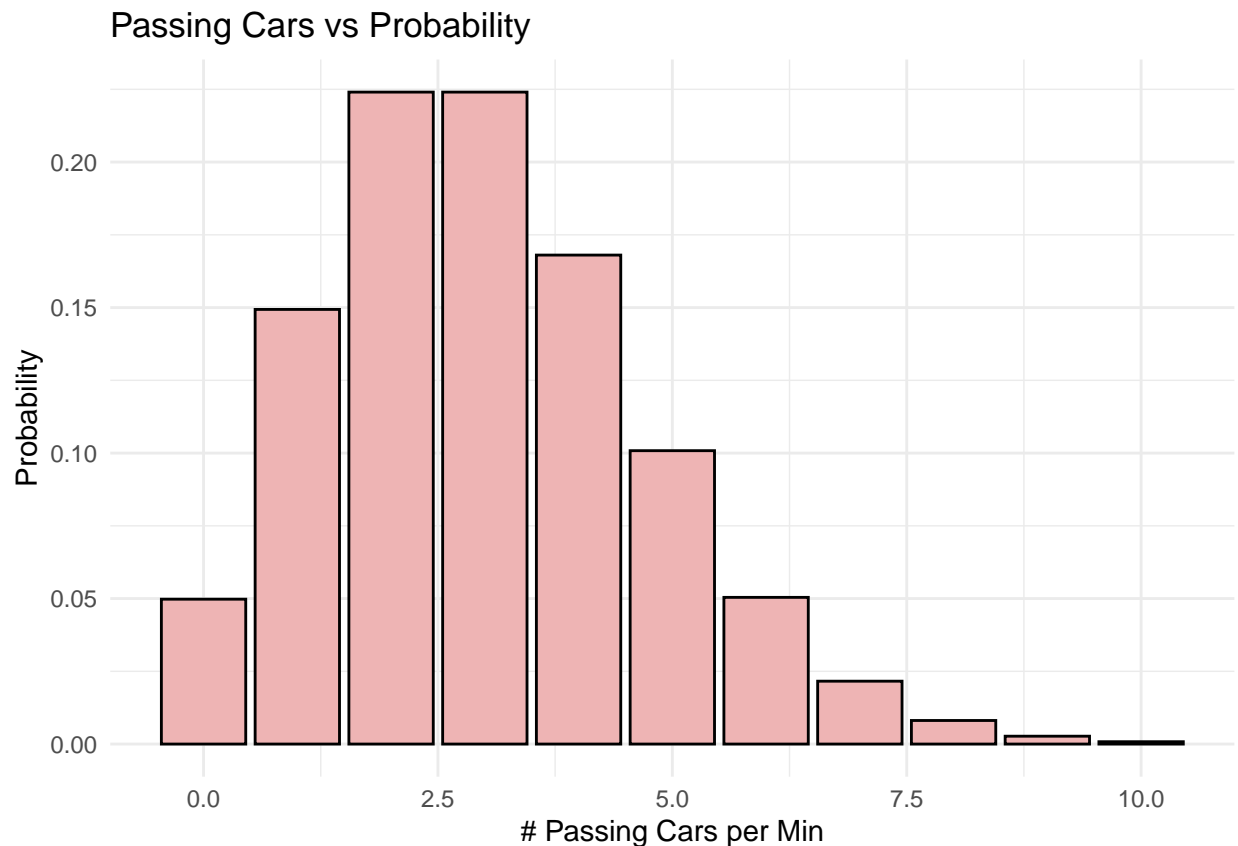

Problem (4)

```r
library(ggplot2)
library(tidyverse)
score <- round(pnorm(585, 500, 100), 3)
cat("Probability of 585 or less: ", score)
```

```
## Probability of 585 or less:  0.802
```

```r
cat("Quartiles\n", "Lower: ", round(qnorm(0.25, 500, 100), 3), "\n",
    "Median: ", round(qnorm(0.50, 500, 100), 3), "\n",
    "Upper: ", round(qnorm(0.75, 500, 100), 3), "\n")
```

```
## Quartiles
##  Lower:  432.551
##  Median:  500
##  Upper:  567.449
```

Problem (5)

```r
library(ggplot2)
library(tidyverse)
cat("P(A|B): ",
(((0.8)*(0.05)) / (0.23)))
```

```
## P(A|B):  0.173913
```