Assignment9

#6.10  
#discrete rand var P(49800 <=X<=50200) = F(50200) - F(49800-1)  
Fb = pbinom(50200, size= 100000, p=1/2)  
Fa = pbinom(49800, size= 100000, p=1/2, lower.tail = FALSE)  
prob= Fb-Fa  
prob

## [1] 0.00113372

#6.12  
oned = dbinom(1, size=4, prob = 1/6)  
twod = dbinom(2, size=24, prob = 1/36)  
oned

## [1] 0.3858025

twod

## [1] 0.1145898

6.12 discussion: The probability of rolling 1 die 4 times and getting one 6 (0.3858025) was higher than rolling 2 dice 24 times and getting at least one double six(0.1145898).

#6.19  
#X ~ N(3.25, 0.35)  
#P(3.5 <= X <= 4) = F(b) - F(a) = F(4) - F(3.5)  
pnorm(4, 3.2, 0.35) - pnorm(3.5, 3.2, 0.35)

## [1] 0.1845475

6.19 discussion: Approximately 18.45% of the population will have gloves that fit from this manufacturer.

#6.22  
library(UsingR)

fheight <- with(father.son, c(fheight))  
m.fh <- mean(fheight)  
sd.fh <- sd(fheight)  
up2 <- (m.fh+(2\*sd.fh))  
low2 <- (m.fh-(2\*sd.fh))  
up3 <- (m.fh+(3\*sd.fh))  
low3 <- (m.fh-(3\*sd.fh))  
up1 <- (m.fh+sd.fh)  
low1 <- (m.fh-sd.fh)  
dev1 <- fheight[fheight >= low1 & fheight <= up1]  
dev2 <- fheight[fheight >= low2 & fheight <= up2]  
dev3 <- fheight[fheight >= low3 & fheight <= up3]  
length(dev1)/length(fheight)\*100

## [1] 67.53247

length(dev2)/length(fheight)\*100

## [1] 96.19666

length(dev3)/length(fheight)\*100

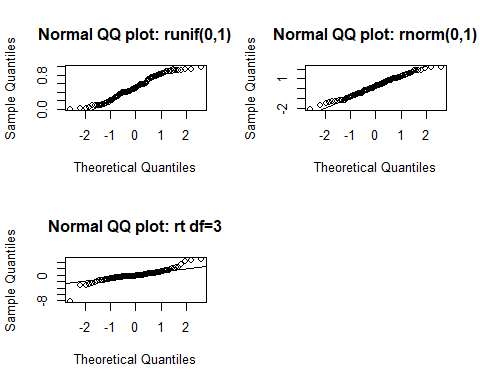
## [1] 99.90724

6.22 Discussion: Compared to the expected percentages of 68%, 95%, and 99.7%, the calculated percent of the sample observations were extremely close (67.5%, 96.2%, and 99.9%).

#6.24  
dev.unif1 <- punif(q=(.5 + sqrt(1/12)), min=0, max=1, log=FALSE) - punif(q=(.5 - sqrt(1/12)), min=0, max=1, log=FALSE)  
dev.unif2 <- punif(q=(.5 + 2\*sqrt(1/12)), min=0, max=1, log=FALSE) - punif(q=(.5 - 2\*sqrt(1/12)), min=0, max=1, log=FALSE)  
dev.unif3 <- punif(q=(.5 + 3\*sqrt(1/12)), min=0, max=1, log=FALSE) - punif(q=(.5 - 3\*sqrt(1/12)), min=0, max=1, log=FALSE)  
  
dev.exp1 <- pexp(q=(5 + sqrt(5)), rate=1/5, log=FALSE) - pexp(q=(.5 - sqrt(5)), log=FALSE)  
dev.exp2 <- pexp(q=(5 + 2\*sqrt(5)), rate=1/5, log=FALSE) - pexp(q=(.5 - 2\*sqrt(5)), rate=1/5,log=FALSE)  
dev.exp3 <- pexp(q=(5 + 3\*sqrt(5)), rate=1/5, log=FALSE) - pexp(q=(.5 - 3\*sqrt(5)), rate=1/5, log=FALSE)

6.24 discussion: Compared to the expected percentages of 68%, 95%, and 99.7%, the calculated probability shows that the uniform distribution is not correct (76%, 100%, and 100%), but the exponential distribution was much closer (76%, 84%, 90%).

#6.25  
my.unif <- runif(n=100, min=0, max=1)  
my.norm <- rnorm(n=100, mean=0, sd=1)  
my.t <- rt(n=100, df=3)  
par(mfrow = c(2, 2))  
qqnorm(my.unif, main = "Normal QQ plot: runif(0,1)"); qqline(my.unif)  
qqnorm(my.norm, main = "Normal QQ plot: rnorm(0,1)"); qqline(my.norm)  
qqnorm(my.t, main = "Normal QQ plot: rt df=3"); qqline(my.t)



6.25 discussion: When comparing the uniform and t distributions to the normal distributions, it is easy to see that there is a definite curve to each. The uniform plot has a more gentle curve at each end while the t distribution has a more dramatic/sharp curve at each end. When the t distribution is on the line, however, it is more consistently on the exact line when compared to the uniform distribution.

#6.29  
pnorm(q=.35, mean = .3, sd= sqrt(.3\*.07/600), lower.tail = FALSE)

## [1] 1.437395e-17

6.29 discussion: The player will have an extremely low probability (1.437395e-17) of having a batting average higher that 0.35.

#6.30  
pbinom(549, 1000, .5, lower.tail = FALSE)

## [1] 0.000865268

6.30 discussion: The probability that the random sample will have more than 550 votes in favor of the issue will be 0.000865268.

#6.31  
mu <- 180  
sigma <- 25  
n <- 15  
pnorm(3500/15, mean=mu, sd=sigma/sqrt(n), lower.tail = F)

## [1] 7.140742e-17

6.31 discussion: There is an extremely small chance (7.140742e-17) that an elevator holding only 15 people would be carrying more than 3,500 pounds.

#7.2  
library(UsingR)  
mean(rivers)

## [1] 591.1844

riv.mean <- replicate(1000, mean(sample(rivers, length(10), replace = T)))  
mean(riv.mean)

## [1] 587.617

7.2 discussion: The mean of the rivers data before sampling is lower (591.1844) than the mean of rivers after sampling (598.384). The difference, however, is not a lot.