Home Work #3

Question 4.45

Solutions:

Part a)
THE PROBABILITY THAT ALL 15 DRIVERS WILL HAVE A BLOOD ALCOHOL LEVEL EXCEEDING THE LEGAL LIMIT IS 3.2768e-9% OR 0%

Part b)
THE PROBABILITY THAT EXACTLY 6 OF THE 15 DRIVERS WILL HAVE A BLOOD ALCOHOL LEVEL EXCEEDING THE LEGAL LIMIT IS 4.299262%

Part c)
THE PROBABILITY THAT 6 OR MORE OF THE 15 DRIVERS WILL EXCEED THE LEGAL LIMIT WILL IS 6.105143%

Part d)
THE PROBABILITY THAT ALL 15 DRIVERS WILL HAVE A BLOOD ALCOHOL LEVEL WITHIN THE LEGAL LIMIT IS 3.518437%

Code:

```
p <- 0.2
n <- 15

probability <- function(y,n,p) {
    return((factorial(n)/(factorial(y)*factorial(n-y)))*(p^y)*((1-p)^(n-y)))
}

# Part a)
y <- 15
prob <- probability(y,n,p)
print(prob)

# Part b)
y <- 6
prob <- probability(y,n,p)
print(prob)

# Part c)
y <- 0:5
prob <- 1-sum(probability(y,n,p))
print(prob)

# Part d)
y <- 0
prob <- probability(y,n,p)
print(prob)
```

Question 4.53

Solutions:

Part a)
THE AREA UNDER THE STANDARD NORMAL CURVE BETWEEN z = 0 and z = 1.3 is 40.31995

Code:

```
# Part a)
a1 <- pnorm(0)
a2 <- pnorm(1.3)
a <- a2-a1
print(a)
```

Question 4.55

Solutions:

Part a)
THE AREA UNDER THE STANDARD NORMAL CURVE BETWEEN z = -2.5 and z = -1.2 is 10.886

Code:

```
# Part a)
a1 <- pnorm(-2.5)
a2 <- pnorm(-1.2)
a <- a2-a1
print(a)
```

Question 4.57

Solutions:

Part a)
THE PROBABILITY THAT THE STANDARD NORMAL DISTRIBUTION IS LESS THAN 1.23 IS 89.06514%

Code:

```
# Part a)
a <- pnorm(1.23)
print(a)
```

Question 4.59

Solutions:

Part a)
THE VALUE OF z WHEN THE PROBABILITY IS 50% IS 0

Code:

```
# Part a)
z <- qnorm(0.5)
print(z)
```

Question 4.61

Solutions:

Part a)
THE VALUE OF z WHEN THE PROBABILITY IS 0.91 IS 2.361524

Code:

```
# Part a)
z <- -1*qnorm(0.0091)
print(z)
```

Question 4.65

Solutions:

Part a)
THE PROBABILITY THAT P(y > 250) IS 0%

Part b)
THE PROBABILITY THAT P(y > 150) IS 97.72499%

Part c)
THE PROBABILITY THAT P(150 < y < 350) IS 95.44997%

Part d)
THE VALUE OF k SUCH THAT P(250 - k < y < 250 + k) = 0.60 IS 42.0766

Code:

```
mean <- 250
stdev <- 50

find_z <- function(y,mean,stdev) {
    return((y-mean)/stdev)
}

# Part a)
y <- 250
z <- find_z(y,mean,stdev)
prob <- pnorm(z)
print(prob)

# Part b)
y <- 150
z <- find_z(y,mean,stdev)
prob <- 1-pnorm(z)
print(prob)

# Part c)
y1 <- 150
z1 <- find_z(y1,mean,stdev)
y2 <- 350
z2 <- find_z(y2,mean,stdev)
prob <- pnorm(z2)-pnorm(z1)
print(prob)

# Part d)
k <- 0
prob <- 0
while (prob != 0.60) {
    k <- k + 0.0002
    y1 <- 250 - k
    z1 <- find_z(y1,mean,stdev)
    y2 <- 250 + k
    z2 <- find_z(y2,mean,stdev)
    prob <- abs(round(pnorm(z2)-pnorm(z1),digits=4))
}
print(k)
```

Question 4.69

Solutions:

Part a)
IF A TRAVEL VOUCHED SUBMITTED MORE THAN 55 DAYS AGO IT IS SAFE TO CONCLUDE THAT THE PROBABILITY OF REIMBURSEMENT IS 11.99603e-9% OR 0%

Part b)
THE PROBABILITY THAT THE ELAPSED TIME BETWEEN SUBMISSION AND REIMBURSEMENT WILL EXCEED 30 DAYS IS 97.72499%

Code:

```
mean <- 36
stdev <- 3

find_z <- function(y,mean,stdev) {
    return((y-mean)/stdev)
}

# Part a)
y <- 30
z <- find_z(y,mean,stdev)
prob <- 1-pnorm(z)
print(prob)


# Part b)
y <- 55
z <- find_z(y,mean,stdev)
prob <- 1-pnorm(z)
print(prob)
```

Question 4.79

Solutions:

Part a)
THE PROBABILITY THAT THE MEAN SCORE IS BETWEEN 900 AND 960 IS 69.79426%

Part b) THE PROBABILITY THAT THEIR MEAN SCORE WAS GREATER THAN 960 IS 15.10287%

Part c) THE 90th PERCENTILE OF THEIR MEAN SCORE IS 967.2533

Code:

```
mean <- 930
stdev <- 130
n <- 20

find_z <- function(y,mean,stdev,n) {
        return((y-mean)/(stdev/sqrt(n)))
}

# Part a)
y1 <- 900
z1 <- find_z(y1,mean,stdev,n)
y2 <- 960
z2 <- find_z(y2,mean,stdev,n)
prob <- pnorm(z2)-pnorm(z1)
print(prob)

# Part b)
y <- 960
z <- find_z(y1,mean,stdev,n)
prob <- pnorm(z)
print(prob)

# Part c)
z <- qnorm(0.90)
y <- mean+z*(stdev/sqrt(n))
print(y)
```

Question 4.83

Solutions:

Part a)
IF A VALUE OF y = 2.7 CANNOT BE EXCEEDED 2.275013% OF POLUTERS WILL BE IN VIOLATION

Part b) THE y VALUE THAT 25% OF POLLUTERS EXCEED IS 2.302347

Part c) THE MEAN LEVEL OF A COMPANY SO THAT ONLY 5% OF POLLUTERS EXCEED y = 2.7 IS 2.206544

Code:

```
 mean <- 2.1
stdev <- 0.3

find_z <- function(y,mean,stdev) {
    return((y-mean)/stdev)
}

# Part a)
y <- 2.7
z <- find_z(y,mean,stdev)
prob <- pnorm(z)
print(1-prob)

# Part b)
z <- qnorm(0.75)
y <- mean+(z*stdev)
print(y)

# Part c)
z <- qnorm(1-0.05)
y <- 2.7
mean <- y-(z*stdev)
print(mean)
```