Exam 3

April 9, 2018

1 Exam 3

1.1 1.

1.1.1 (a)

```
In [1]: pnorm(q = 8.5, mean = 8.3, sd = .24, lower.tail = F)
```

0.202328380963644

1.1.2 (b)

```
In [13]: pnorm(q = 8.55, mean = 8.3, sd = .24) - pnorm(q = 8.15, mean = 8.3, sd = .24)
```

0.585231346769548

1.1.3 (c)

```
In [12]: qnorm(p = .95, mean = 8.3, sd = .24)
```

8.69476487046835

1.2 2

```
In [15]: n <- 16
         x_bar <- 23.2
         s <- 3.5
```

1.2.1 (a)

```
In [19]: alpha <- .1
         error <- qt(p = 1-alpha/2, df = n-1)*s/sqrt(n)
         lower_bound <- x_bar - error
         upper_bound <- x_bar + error
         cat('90% CI: (',lower_bound,',',upper_bound,')')
```

```
90% CI: ( 21.66608 , 24.73392 )
```

1.2.2 (b)

```
In [21]: alpha <- .05
         error <- qt(p = 1-alpha/2, df = n-1)*s/sqrt(n)
         lower_bound <- x_bar - error
         upper_bound <- x_bar + error
         cat('95% CI: (',lower_bound,',',upper_bound,')')
```

```
95% CI: ( 21.33498 , 25.06502 )
```

1.3 4

```
In [23]: lifespans = rexp(100, runif(1, .01, .02))
```

1.3.1 (a)

```
In [34]: cat('lifespans mean :', mean(lifespans), '\n')
         cat('lifespans var :', var(lifespans), '\n')
         cat('lifespans sd :', sd(lifespans))
```

```
lifespans mean : 50.79297
lifespans var : 2924.849
lifespans sd : 54.08187
```

1.3.2 (b)

```
In [60]: n <- 100
         x_bar <- mean(lifespans)
         s <- sd(lifespans)
         alpha <- .05
         error <- qnorm(p = 1-alpha/2)*s/sqrt(n)
         lower_bound <- x_bar - error
         upper_bound <- x_bar + error
         cat('95% CI: (',lower_bound,',',upper_bound,')')
```

```
95% CI: ( 40.19312 , 61.39283 )
```

1.3.3 (c viii)

```
In [62]: pnorm(q = -2.95, lower.tail = T)
```

0.00158886964736487

1.3.4 CCs <- rnorm(30, runif(1, 1.85, 2.05), runif(1, .6, .8))

1.3.5 (a)

```
In [47]: cat('CCs mean:', mean(CCs), '\n')
         cat('CCs var:', var(CCs), '\n')
         cat('CCs sd:', sd(CCs))
```

```
CCs mean: 2.047347
CCs var: 0.4734769
CCs sd: 0.6880966
```

1.3.6 (b)

```
In [51]: alpha <- .01
         error <- qnorm(p = 1-alpha/2)*sd(CCs)/sqrt(30)
         ci <- c(mean(CCs) - error, mean(CCs) + error)
         ci
```

1. 1.72374856411143 2. 2.37094458936012

1.3.7 (c)

```
In [56]: z <- (mean(CCs)-2)/(sd(CCs)/sqrt(30))
         critical_value <- qnorm(0.005,lower.tail = F)
         p_value <- pnorm(z,lower.tail = F)
         cat('Test statistic:', z, '\n')
         cat('Critical Value:', critical_value, '\n')
         cat('P-Value:', p_value)
```

```
Test statistic: 0.3768772
Critical Value: 2.575829
P-Value: 0.3531324
```

p-value is greater than alpha, so we fail to reject the null hypothesis that the patient's true mean compound concentration is less than or equal to 2%.