Project 2.3

Jared Barber

2/10/2022

5.78

a. A good machine will be rejected if it misses more than 3 welds, or P(X > 3) = 1 - P(X <= 3). A 99% success rate is equivalent to a 1% failure rate.

```
1 - pbinom(3,100,0.01)
```

```
## [1] 0.01837404
```

b. With a 95% success rate there is a 5% failure rate and the probability an inefficient machine will be accepted is

```
pbinom(3,100,0.05)
```

```
## [1] 0.2578387
```

5.80

a. The probability of no more than 4 calls in one minute is P(X <= 4)

```
ppois(4,2.7)
```

```
## [1] 0.8629079
```

b. The probability of fewer than 2 calls in one minute is P(X < 2) = P (X <= 1)

```
ppois(1,2.7)
```

```
## [1] 0.2486604
```

c. The probability more than 10 calls come in in 5 minutes is P(X > 10) = 1 - P(X <= 10)

```
1-ppois(10, 13.5)
```

```
## [1] 0.7887735
```

5.90

a. The probability of drilling at 10 locations and having one success is binomial. P(X = 1)

```
dbinom(1,10,0.25)
```

```
## [1] 0.1877117
```

b. The probability of bankrupcy is the sam as the probability of having 0 successes. P(X = 0)

```
dbinom(0,10,0.25)
```

```
## [1] 0.05631351
```

5.91

The company will ‘hit it big’ if the second success occurs on or before the 6th attempt - there can be at most 4 failures before the 2nd success.

```
dnbinom(4,2,0.25)
```

```
## [1] 0.09887695
```

6.2

P (X > 2.5 | X < 4) = ∫1/(B-A) from 2.5 to 4 / ∫1/(B-A) from 1 to 4 ∫1/(B-A) from 2.5 to 4 = 0.375 ∫1/(B-A) from 1 to 4 = 0.5 0.375 / 0.75 = 0.5 so P (X > 2.5 | X < 4) = 0.5

6.11

a. P(X > 224) = 1-P(X < 224) = 1-P(Z < (224-200)/15) = 1-P(Z < 1.6) = 1 - 0.9452 = 0.0548

b. P(191 < x < 209) = P((191-200)/15 < Z < (209-200)/15) = P(-0.6 < z < 0.6) = 0.7257 - 0.2743 = 0.4514

c. P(x > 230) = 1 - P(z < (230-200)/215) = 1 - P(z < 2) = 1 - 0.9772 = 0.0228 * 1000 = 22.8 = 23

d. P(X < y) = 0.25 => z = -0.68 => (-0.68)(15) + 200 => y = 189.8

8.23

a. μ = 4(0.2) + 5(0.4) + 6(0.3) + 7(0.1) = 5.3 σ2 = (4-5.3)^2(0.2) + (5-5.3)^2(0.4) + (6-5.3)^2(0.3) + (7-5.3)^2(0.1) = 0.81

b. μx = μ = 5.3 σx2 = σ2/n = 0.81/36 = 0.0225

c. P(x < 5.5) = P(Z < (5.5-5.3)/0.15) = P(z < 1.33) = 0.9082

8.24

The probability that 36 resistors will have a combined resistance of 1458 ohms is $P(\bar{x} > 1458/36)$ $P(\bar{x} > 1458/36) = P(\bar{x} > 40.5) = P(z > (40.5-40)/(2/\sqrt{36})) = P(z > 1.5) = 1 - P(z < 1.5) = 0.0668$

8.54

```
my_data <- Ex08.54
qqnorm(my_data$life, pch = 1, frame = FALSE)
qqline(my_data$life, col = "steelblue", lwd = 2)
```