Assignment #5

2023-02-26

Contents

Introduction

This homework assignment provided applied problems for using the various probability distributions. There were a number of problems that I wasn't too certain of how to answer effectively.

Question 1

UNABLE TO FIGURE THIS ONE OUT

Question 2

(a) The probability of receiving exactly two inspections after 24-months is **22.3%**
(b) The probability of of receiving 2 or more inspections after 24-months is **33.9%**
(c) The probability of receiving less than 2 inspections after 24-months is **66.1%**
(d) The expected number of inspections is **1.2**
(e) The standard deviation of inspections is **1.07**

```
p = .05
q = 1-p
k = 24

#Probability of receiving exactly 2 inspections after 24-months
dbinom(2, size=k, p)
```

```
## [1] 0.2232381
```

```r
#Probability of receiving 2 or more inspections after 24-months
pbinom(1,size=k, p, lower.tail=FALSE)
```

```
## [1] 0.3391827
```

```r
#Probability of receiving fewer than 2 inspections after 24-months
pbinom(1,size=k, p)
```

```
## [1] 0.6608173
```

```r
#What is the expected number of inspections you should have received?
ev = k*p
print(ev)
```

```
## [1] 1.2
```

```r
#What is the standard deviation?
sd = sqrt(k*p*(1-p))
print(sd)
```

```
## [1] 1.067708
```

Question 3

(a) The probability that exactly 3 patients arrive in one hour is **.76%**
(b) The probability that more than 10 patients arrive in one hour is **42%**
(c) In 8 hours, we would expect **80 patients** to arrive
(d) The standard deviation of this probability distribution is **3.16**
(e) DON'T UNDERSTAND THE QUESTION

```r
lambda = 10

#What is probability that exactly 3 arrive in one hour?
k=3

dpois(k,lambda)
```

```
## [1] 0.007566655
```

```r
((lambda^k)*(exp(-lambda)))/factorial(k)
```

```
## [1] 0.007566655
```

```r
#What is the probability that more than 10 arrive in one hour?
x = 10
ppois(x, lambda, lower.tail = FALSE)
```

```
## [1] 0.4169602
```

```r
#How many would you expect to arrive in 8 hours?


#What is the standard deviation of the appropriate probability distribution?
sd = sqrt(lambda)
print(sd)
```

```
## [1] 3.162278
```

Question 4

For this problem, there are 30 total employees, with 15 of these being nurses and 15 non-nurses. This results in a probability of selecting a nurse in any single event (p) of 50%; and the probability of selecting a non-nurse (q) of 50%.

(a) The probability of selective 5 nurses out of 6 trips is **7.6%**
(b) The expected number of nurses in 6-trips is **3**
(c) The expected number of non-nurses in 6-trips is **3**

```r
k =
p = 15/30
q = 1-p

#What is the probability of selecting five nurses out of 6 trips?
M = 15
N = 30
n = 6
x = 5

(choose(M,x)*choose(N-M,n-x))/choose(N,n)
```

```
## [1] 0.07586207
```

```r
#What is the expected number of nurses for 6 trips
6 * p
```

```
## [1] 3
```

```r
#How many non-nurses would we have expected subordinate to send?
```

Question 5

(a) The probability the driver will be seriously injured during the course of 12 months is **67%**
(b) The probability the driver will be seriously injured during the course of 15 months is **77.7%**
(c) The expected number of hours that a driver drives before he is seriously injured is **1000 hours**
(d) The probability that the driver will have a serious injury in next 100-hours given no injury in 1200 hours is **72.7%**

```
lambda = .001
lambda * 1200
```

```
## [1] 1.2
```

```
q = 1-p


#What is probability that the driver will be seriously injured during course of 12-months?
n=0
p0 = (exp(-1.2)*(1.2^n))/factorial(n)
1-p0
```

```
## [1] 0.6988058
```

```
#What is the probability that driver will be seriously injured during course of 15-months?

k = 1200
num_months = 15
hours_monthly = k/12

total_hours = num_months*hours_monthly
lambda = .001*total_hours


n=0
p0 = (exp(-lambda)*(lambda^n))/factorial(n)
1-p0
```

```
## [1] 0.7768698
```

```
#What is expected number of hours that a driver will drive before being seriously injured?
ev = 1/.001


#Given that a driver has driven 1200 hours, what is probability that they will be injured in the next 1


#Probability of injury in 100-hours is
n=0
p0 = (exp(-1.3)*(1.3^n))/factorial(n)
pa = 1-p0
pb =  (exp(-1.2)*(1.2^n))/factorial(n)
pab = pa*pb
cond_prob = pab/pb
```

Question 6

(a) The probability the generator will fail more than twice in 1000 hours is **8%**
(b) The expected value is **1**

```r
lambda = 1
p = 1/1000
q = 1-p

#What is the probability the generator will fail more than twice in 1000 hours?
p0 = (exp(-1)*lambda^0)/factorial(0)
p1 = (exp(-1)*lambda^1)/factorial(1)
p2 = (exp(-1)*lambda^2)/factorial(2)

p = p0+p1+p2
1-p
```

```
## [1] 0.0803014
```

```r
#What is the expected value?
```

Question 7

(a) The probability the patient will wait more than 10-minutes is **66%**
(b) The probability the patient will wait at least another 5 minutes after waiting 10-minutes is **55%**
(c) The expected wait time is **15-minutes**

```r
#What is the probability the patient will wait more than 10-minutes?
1- punif(10,0,30)
```

```
## [1] 0.6666667
```

```r
#If patient has already waited 10 minutes, what is probability they will wait another 5 minutes?
1-punif(5,0,30)
```

```
## [1] 0.8333333
```

```r
#What is expected waiting time?
a = 0
b = 30
ev = (a+b)/2
ev
```

```
## [1] 15
```

Question 8

(a) The expected failure time is **.10**
(b) The standard deviation is also **.10**
(c) The probability of failure after 8-years is **45%**
(d) The probability of failure in next 2-years after already owning it for 8-years is **8.1%**

```r
#What is expected failure time?

ev = 1/10

#What is the standard deviation?

sd = sqrt(1/100)

#What is probability of failure after 8-years?
1-pexp(8,ev)
```

```
## [1] 0.449329
```

```r
#What is probability of failure in 2-years given you already owned it for 8-years?
p2 = pexp(2,ev)
```