Chapter 3

|  |  |  |  |
| --- | --- | --- | --- |
| Binomial Count | Probability | Product count\*prob | Poisson count |
| 0 | 0 | 0 | 0.135335283 |
| 1 | 0 | 0 | 0.270670566 |
| 2 | 0 | 0 | 0.270670566 |
| 3 | 0 | 0 | 0.180447044 |
| 4 | 0.00462 | 0.01848 | 0.090223522 |
| 5 | 0.01479 | 0.07395 | 0.036089409 |
| 6 | 0.03696 | 0.22176 | 0.012029803 |
| 7 | 0.07393 | 0.51751 | 0.003437087 |
| 8 | 0.12013 | 0.96104 | 0.000859272 |
| 9 | 0.16018 | 1.44162 | 0.000190949 |
| 10 | 0.1762 | 1.762 | 3.81899E-05 |
| 11 | 0.16018 | 1.76198 | 6.94361E-06 |
| 12 | 0.12013 | 1.44156 | 1.15727E-06 |
| 13 | 0.07393 | 0.96109 | 1.78041E-07 |
| 14 | 0.03696 | 0.51744 | 2.54345E-08 |
| 15 | 0.01479 | 0.22185 | 3.39126E-09 |
| 16 | 0.00462 | 0.07392 | 4.23908E-10 |
| 17 | 0 | 0 | 4.98715E-11 |
| 18 | 0 | 0 | 5.54128E-12 |
| 19 | 0 | 0 | 5.83292E-13 |
| 20 | 0 | 0 | 5.83292E-14 |
| 40 | 0 | 0 | 1.82375E-37 |

For a count of 40, the probability gets closer and closer to zero. The probability was already small, but the larger the count gets the lower the probability gets of it actually happening.

Question 5:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Column1** | **X** | **Y** | **E sum** | **e top** | **e bottom** | **Sum (Y-𝑦¯)(X-x¯)** | **Sum (X-Xbar)** |
|  | 1 | 5.19947114 | 0.19947114 | 0.5 | 2.50662827 | 96.71135824 | -7 |
|  | 2 | 7.02699548 | 0.02699548 | 0.06766764 | 2.50662827 | 14.05399097 | 2 |
|  | 3 | 9.00365344 | 0.00365344 | 0.00915782 | 2.50662827 | 27.01096032 | 3 |
|  | 4 | 11.0004944 | 0.00049444 | 0.00123938 | 2.50662827 | 44.00197776 | 4 |
|  | 5 | 13.0000669 | 6.6915E-05 | 0.00016773 | 2.50662827 | 65.00033458 | 5 |
|  | 6 | 15.0000091 | 9.056E-06 | 2.27E-05 | 2.50662827 | 90.00005434 | 6 |
|  | 7 | 17.0000012 | 1.2256E-06 | 3.0721E-06 | 2.50662827 | 119.0000086 | 7 |
|  | 8 | 19.0000002 | 1.6587E-07 | 4.1576E-07 | 2.50662827 | 152.0000013 | 8 |
|  | 9 | 21 | 2.2448E-08 | 5.6268E-08 | 2.50662827 | 189.0000002 | 9 |
|  | 10 | 23 | 3.0379E-09 | 7.615E-09 | 2.50662827 | 230 | 10 |
|  | 11 | 25 | 4.1114E-10 | 1.0306E-09 | 2.50662827 | 275 | 11 |
|  | 12 | 27 | 5.5642E-11 | 1.3947E-10 | 2.50662827 | 324 | 12 |
|  | 13 | 29 | 7.5303E-12 | 1.8876E-11 | 2.50662827 | 377 | 13 |
|  | 14 | 31 | 1.0191E-12 | 2.5545E-12 | 2.50662827 | 434 | 14 |
|  | 15 | 33 | 1.3792E-13 | 3.4572E-13 | 2.50662827 | 495 | 15 |
|  |  |  |  |  |  |  |  |
| Averages | 8 | 19.0153795 |  |  |  |  |  |
|  |  |  |  |  | Totals | 2931.778686 | 112 |

Ratio = 2931.778686/112 = 26.17

Question 6:

Means of exponential simulation:

0.9974549, 1.018549, 0.9992617, 0.9765836

Means of exponential simulation data > 1 minus 1:

0.975083, 1.009555, 0.9846835, 0.9778989

Means of normal simulation:

-0.008487133, -0.007966228, 0.004588967, 0.01660273  
Means of normal simulation data > 1 minus 1:

0.5271926, 0.5321445, 0.531575, 0.5351935

Interestingly, the normal data actually had negative results. The data with values subtracted were significantly lower in the normally distributed data, but not much lower in the exponential data. Since the exponential distributions are skewed and the normal data are symmetrical, subtracting 1 has more of an effect on the normal data which is why we observe this phenomenon.

R code used for above problem:

data <- rexp(n = 10000, rate= 1)

datagreaterone <- subset(data, data > 1)

minusone <- datagreaterone - 1

print(mean(data))

print(mean(minusone))

#normal data

normaldata <- rnorm(10000, mean = 0, sd =1)

greaterone <- subset(normaldata, normaldata >1)

minussone <- greaterone - 1

print(mean(normaldata))

print(mean(minussone))