(Feel free to fix my ugly google equations/translate into equations)

1)

i) C.

N.B. X, Y independent -> Cov(X, Y) = 0 but not the reverse.

ii) A.

X ~ Poisson(5/24)

P(X >= 1) = 1 - P(X = 0) = 1 - e^(-5/24) = 0.188

iii) D.

The integrand gives a quarter of a circle for the limits 0 to 2, we can use to find the value of the integral.

Which gives c = .

iv) F.

Which gives s\_ Mean is (4.9 + 6.1) / 2 = 5.5

Therefore t\_(29, 0.995) \* (s\_(n-1) / sqrt(30)) = 0.6

(n-1) ~= 1.19

So s\_(n-1)^2 ~= 1.4

v) (b)

See course notes.f

2)

i) Potentially infinite number of Bernoulli trials (?). The trials are independent. The result of the trial is either success or failure. The probability of success is the same for each trial.

ii)

Solving gives:

Proving is maximum:

iii)

1. X~Geo(⅓) [p = ⅓ here because it is supposed that we have an equal chance to get the lion, flamingo or the elephant toy]

|  |  |
| --- | --- |
| Box | Expected |
| 1 | 33 |
| 2 | 22 |
| 3 | 15 |
| 4 | 10 |
| 5 | 7 |
| 6 | 4 |
| 7 | 3 |
| 8 | 2 |
| >= 9 | 4 |

b) H\_0: p = ⅓

c)

Expected cell count >= 5

d)

|  |  |  |
| --- | --- | --- |
| Box | Expected | Observed |
| 1 | 33 | 19 |
| 2 | 22 | 15 |
| 3 | 15 | 9 |
| 4 | 10 | 11 |
| 5 | 7 | 8 |
| 6, 7 | 7 | 11 |
| 8, >= 9 | 6 | 27 |

Which for is massive so p-value must be very small, less than 0.005. Which therefore means it is very unlikely. (Or my test is completely wrong?)

e)

For both, reject H\_0.

There is sufficient evidence to suggest the manufacturer’s claim is incorrect.

3)

i) P(H\_k | S\_k) = P(H\_k and S\_k) / P(S\_k)

= (999/1000 \* 1/21) / (999/1000 \* 1/21 + 20/21 \* 1/ 3721)

= 0.995

ii) (Assumed not in the course anymore?)

4)

i) 0 <= p\_(x, y)(x, y) <= 1 for all x, y in the real numbers.

ii)

b)

Both follow Poisson Distribution

c)

Similar proof for Y.

d) Yes. p\_(X, Y)(x, y) = p\_X(x)p\_Y(y)

e) Independent -> Cor(X, Y) = 0

f)

Therefore Z~Poi(20)