Group 2

25255 Assimwe Ivan

25203 Umutesi Fatu Celine

25308 Hirwa Willy

25347 Iradukunda Jean Louis

25703 Twahirwa James

26094 Miyomkuru Fabrice

26192 Munezero Nora Tracy

26238 Muhawenayo Joseph Jonathan

26253 Shema Owen

26259 Kalisa Ineza Jovith

Probability and Statistics

Assignment 1

Q1. If S = A□B, P(A)= 0.7, and P(B) =0.9

a. P(A□B) = P(A) + P(B) – P(A□B)
   Since P(A□B)≤ 1 as probability can't exceed 1
   Let's calculate P(A□B)
   P(A□B) = P(A) + P(B) – P(A□B)
   1 = 0.7 + 0.9–P(A□B)
   1 = 1.6 – P(A□B)
   P(A□B) = 1.6 – 1 = 0.6

b. i. P(A) = 0.4, P(B) = 0.5, and P(A□B) = 0.3
   P(A□B) = P(A) +P(B) –P(A□B)
   P(A□B) = 0.4 + 0.5 –0.3 = 0.1

   ii. P(A□B') This represent the probability of A occurring and B not occurring

P(A□B’) = P(A) –P(A□B) = 0.4– 0.3 = 0.1

iii. P(A’□B’) his represents the probability of B occurring i.e, the compliment of P(A□B)
P(A’□B’) = 1–P(A□B = 1–0.6 = 0.4

Q2.a.

- P(B1) This is Probability of carrying the virus
  P(B1) = = 0.005

- P(A1)This is the probability of testing Positive
  P(A1) =

- P(A1 |B2) This is the probability of testing positive given not carrying the virus
  P(A1 |B2) = = 0.074

- P(B1 |A1) This is probability of carrying the virus given testing positive
  P(B1 |A1) = = ~0.0622

b .In words what do parts P(A1 |B2) and P(B1 |A1) say

- P(A1 |B2) tells us the probability that a person who does not carry the AIDs virus tests positive. This is measures of the false positive rate of the taste.

- P(B1 |A1) tells us the probability that a person who tests positive actually carries the 0virus. This is a measures of the positive predictive value of the test.

3. Using binomial distribution formula

$P(X = K) =)\ P^k(1–p)^n–k$

i. If n=4 and p=0.20, then find P(X = 1)

$P(x = 1) = ()(0,20)^1(0.80)^3 = 4 * 0.20 * 0.512 = 0.4096$

ii. If n=3 and p = 0.10, then find P(x<2)

$P(X < 2) = p(X = 0) + P(X = 1)$

$P(X = 0) = ((0.10)^0 (0.90)^3 = 1 * 1 * 0.729 = 0.729$

$P(X = 1) = ()(0.10)^1(0.90)^2 = 3 * 0.10 * 0.81 = 0.243$

$P(X > 2) = 0.729 + 0.243 = 0.972$

iii. If n=6 and p= 0.30, then find $P(X > 1)$

$P(X > 1) = 1 – P(X \leq 1)$

$P(X \leq 1) = P(X = 0) + P(X = 1)$

$P(X = 0) = (0.30)^0(0.70)^6 = 1 * 1 * 0.117649 = 0.117649$

$P(X = 1) = 30)^1(0.70)^5 = 6 * 0.30 * 0.16807 = 0.302526$

$P(X \leq 1)$ 0.117649 +0.302526 =0.420175

$P(X > 1) = 1 – 0.420175 = 0.579825$