STAT 312 Quiz 1

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7/13/21

Problem 1:

Disks of polycarbonate plastic from a supplier are analyzed for scratch and shock resistance. The results from 100 disks are summarized as follows: Let A denote the event that a disk has high shock resistance, and let B denote the event that a disk has high scratch resistance. If a disk is selected at random, determine the following probabilities: (6 points)

a)

P(A) = 0.86

b)

P(B) = 0.79

c)

P(A') = 0.14

d)

P(A n B) = 0.70

e)

P(A u B) = 0.95

f)

P(A' u B) = 0.84

Problem 2:

Suppose that a certain company sends 40% of its overnight mail parcels by service S1, 50% of its overnight mail parcels by service S2, and 10% of its overnight mail parcels by service S3. 98% of those sent by S1 arrive on time, 99% of those sent by S2 arrive on time, 95% of those sent by S3 arrive on time. A parcel is selected at random from the list of those sent one night.

Event -> the probability a parcel arrives on time using a service
Key ->
A = arrived
N = not arrived

a)

What is the probability that it arrives on time? (4points)

P(A) = P(S1) * P(A|S1) + P(S2) * P(A|S2) + P(S3) * P(A|S3)
P(A) = (0.4)(0.98) + (0.5)(0.99) + (0.1)(0.95)
P(A) = 0.392 + 0.495 + 0.095
P(A) = 0.982

b)

Given that it arrives on time, what is the probability that it was sent by service S1?(3points)

P(S1|A) = [P(S1) * P(A|S1)] / [P(A)]
P(S1|A) = [(0.4)(0.98)] / [0.982]
P(S1|A) = [0.392] / [0.982]
P(S1|A) = 0.399

c)

Given that it arrives late, what is the probability that it was sent by service S1? (3points)

P(S1|N) = [P(S1) * P(N|S1)] / [P(A')]
P(S1|N) = [(0.4)(0.02)] / [1 - 0.982]
P(S1|N) = [0.008] / [0.018]
P(S1|N) = 0.444