

Seminar 14 (Suggested Solution)

1. $P(\text{failure}) = P(\text{pump failure or leakage})$

 $P(\text{station 1 failure}) = 0.07 + 0.1 - 0 = 0.17$
 $P(\text{station 2 failure}) = 0.09 + 0.12 - 0.06 = 0.15$
 Thus, station 1 has the higher probability of being shut down.

2. $D = \text{disk-drive failure}, \quad K = \text{keyboard failure}$
 - a. $P(D \text{ or } K) = P(D) + P(K) - P(D \cap K)$
 $= P(D) + 3xP(D) - 0.01$

 $\Rightarrow 4P(D) - 0.01 = 0.1$
 $\Rightarrow 4P(D) = 0.11$
 $\Rightarrow P(D) = 0.0275$

 - b. $P(K) = 2P(D) = 2 \times 0.0275 = 0.055$
 Thus, $P(D \text{ or } K) = P(D) + P(K) - 0.01$
 $= 0.0275 + 0.055 - 0.01 = 0.0725$
 This means that the computer is 92.75% resistant to disk drive and/or keyboard failure, it is higher than 90%.

3.
 - a. $\text{prob}(\text{pager works}) = 0.95^{10} = 0.5987$
 - b. $\text{prob}(\text{pager works}) = 10 \times 0.95^9 \times 0.05^1 + 0.95^{10}$
 $= 0.3151 + 0.5987 = 0.9138$

4.
 - a. $P(\text{face}_2 \mid \text{red}_1) = P(\text{face}) = 12/52 = 3/13$
 - b. $P(\text{ace}_2 \mid \text{face}_1) = P(\text{ace}) = 4/52 = 1/13$
 - c. $P(\text{black jack}_2 \mid \text{red ace}_1) = P(\text{black jack}) = 2/52 = 1/26$

5.
 - a. $P(A \text{ passes} \mid B \text{ fails}) = P(A \text{ passes}) = 0.02$
 - b. $P(B \text{ passes} \mid A \text{ passes}) = P(B \text{ passes}) = 0.07$
 - c. $P(A \text{ and } B \text{ pass}) = P(A \text{ passes}) \times P(B \text{ passes}) = 0.02 \times 0.07 = 0.0014$

6. $P(\text{alcoholic} \mid \text{male}) = \frac{P(\text{male and alcoholic})}{P(\text{male})} = \frac{0.21}{0.59} = 0.356$

7. Let $I = \text{income} > 35,000 \quad C = 2 \text{ cars}$

 $P(C \text{ and } I) = P(C \mid I) P(I) = (0.75)(0.6) = 0.45$

8.
 - a. $P(\text{neither A nor B}) = 1 - P(A \text{ or } B) = 1 - 0.47 = 0.53$
 - b. $P(A \text{ and } B) = P(A) + P(B) - P(A \text{ or } B)$
 $= 0.39 + 0.21 - 0.47 = 0.13$
 - c. $P(B \mid A) = P(A \text{ and } B) / P(A) = 0.13 / 0.39 = 1/3$
 - d. $P(A \mid B) = P(A \text{ and } B) / P(B) = 0.13 / 0.12 = 13/12$