BIRZEIT UNIVERSITY

Probability and Statistical Engineering, ENEE2307

Quiz_solution#1 Sec #1 16 Oct 2017

The blood groups of 200 people is distributed as follows: 50 have type **A** blood, 65 have **B** blood type, 70 have **O** blood type and 15 have type **AB** blood. Where 30%, 40%, 60%, and 40% of these groups has the blood group **H** antigen (+) respectively, if a person from this group is selected at random,

a- What is the probability that this person can give his blood to **A+** (A-type with H antigen) blood type person?

$$P = P(A \cup O) = P(A) + P(O) = \frac{50}{200} + \frac{70}{200} = \frac{3}{5}$$

Hint: (**A+**) type can get blood from **A** type or **O** type regardless of the **H** antigen.

b- What is the probability that this person has **H** antigen (+ blood type)?

$$P(H) = P(A)P(H/A) + P(B)P(H/B) + P(O)P(H/O) + P(AB)P(H/AB)$$
$$= 0.3 * \frac{50}{200} + 0.4 * \frac{65}{200} + 0.6 * \frac{70}{200} + 0.4 * \frac{15}{200} = \frac{89}{200}$$

c- If this person has negative **H** antigen what is the probability that he have **B** blood type?

$$P(B/\overline{H}) = \frac{P(\overline{H}/B)P(B)}{P(\overline{H})} = \frac{0.6 * \frac{65}{200}}{\frac{111}{200}} = 0.35$$

BIRZEIT UNIVERSITY

Probability and Statistical Engineering, ENEE2307

Quiz_solution#1 Sec #4 17 Oct 2017

A building construction project, the completion of the building requires the successive completion of a series of activities. Define

E = event that excavation is completed within its time schedule of 3 months;
F=event that the foundation is completed within its time schedule of 2 months
S=event that the superstructure is completed within its time schedule of 6 months.

The probability that the excavation is completed within its time schedule is 0.8, or P(E)=0.8. If the excavation is completed on schedule, then the probability that the foundation is completed within its time schedule is 0.9, or P(F|E)=0.9. However, if the excavation is not completed on schedule, then the probability that the foundation is completed within its time schedule is smaller and equal to 0.6, or P(F|E')=0.6. Finally, the following probabilities correspond to the construction of the superstructure:

P(S|FE)= 0.8 5, P(S|FE’) = 0.7 , P=(S |F’E) = 0.65 , and P(S |F’E’)=0.5

a- Are F and E statistically independent events.

$$0.9 = P(F/E) \overset{?}{=} P(F)$$

$$0.6 = P(F/\bar{E}) = \frac{P(F \cap (1-E))}{P(\bar{E})} = \frac{P(F) - P(F \cap E)}{P(\bar{E})} \overset{?}{=} \frac{P(F) - P(F)P(E)}{P(\bar{E})}$$

$$= \frac{P(F)(1-P(E))}{P(\bar{E})} = P(F)$$

$$0.9 \neq P(F) \neq 0.6$$

So F and E are not statistically independent events

b- Calculate the probability for completing all the activities in their schedule.

$$P(E \cap F \cap S) = P(E)P(F/E)P(S/FE) = 0.8 * 0.9 * 0.85 = 0.612$$

c- Calculate the probability for completing the activities E and F in their schedule but not S.

$$P(E \cap F \cap \bar{S}) = P(E \cap F \cap (1-S)) = P(E \cap F) - P(E \cap F \cap S)$$

$$= P(E)P(F/E) - P(E)P(F/E)P(S/FE)$$

$$P(E \cap F \cap \bar{S}) = 0.8 * 0.9 * (1 - 0.85) = 0.108$$

Ahmad Alyan