STAT-1301; Lecture 11; Feb. 13, '24

New! Assignment #3 on Nexus due Feb. 26th.

Test 1 Info. on Nexus

Ex. Past records indicate that the Probability of a bank Customer opening a Savings account is 0.4, the Probability that a Customer opens a Chequeing account is 0.7, and that a Customer opens a Savings and a Chequeing account is 0.25.

a) What is the probability that a randomly Selected customer will open either a Savings account or a Chequeing account?

Sol'n:

Given: $P(S) = 0.4$; $P(C) = 0.7$; $P(S \cap C) = 0.25$

Want: $P(S \cup C)$

$P(S \cup C) = P(S) + P(C) - P(S \cap C)$

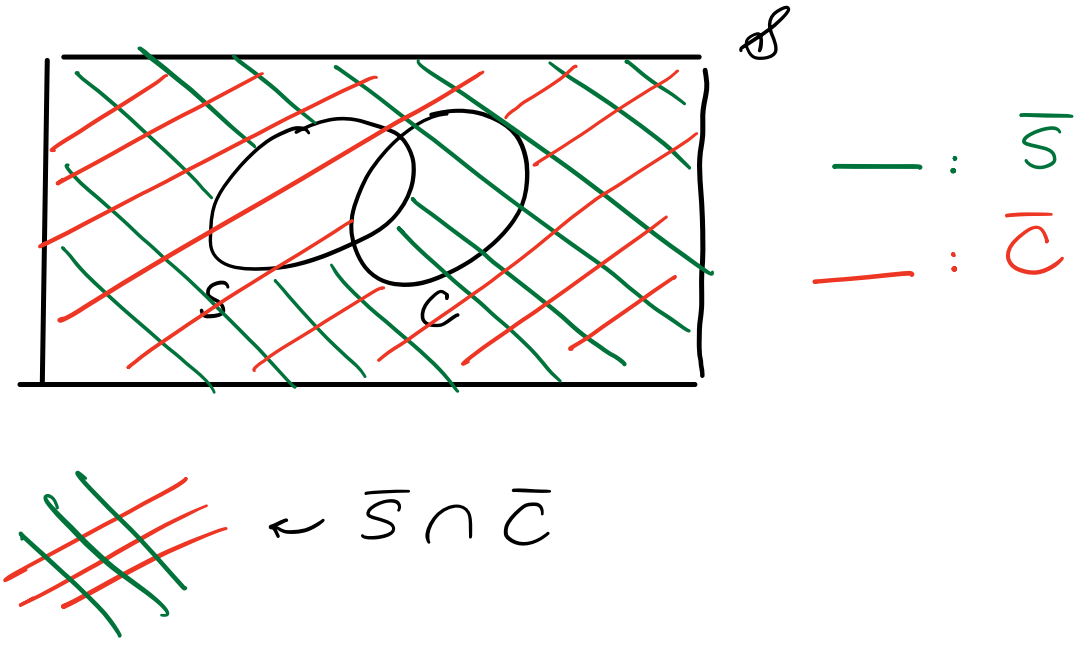
$= 0.4 + 0.7 - 0.25 = 0.85$

b) What is the probability that a randomly selected customer will open neither a Savings account nor a Chequeing account?

want: $P(\bar{S} \cap \bar{C})$.

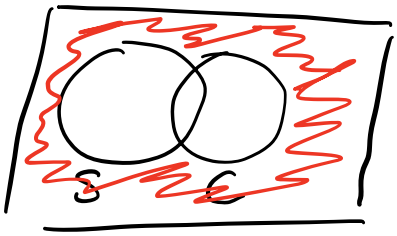
Try: $P(\bar{S} \cap \bar{C}) = P(\bar{S}) \times P(\bar{C} \mid \bar{S})$ — ?

Try: $P(\bar{S} \cap \bar{C}) = P(\bar{C}) \times P(\bar{S} \mid \bar{C})$ — ?




$\leftarrow \bar{S} \cap \bar{C}$

Outside of $S \cup C$




$$\bar{S} \cap \bar{C} = \overline{S \cup C}$$

$$P(\bar{S} \cap \bar{C}) = P(\overline{S \cup C}) = 1 - P(S \cup C)$$

$$= 1 - 0.85 = 0.15 \quad \text{using Part (a).}$$

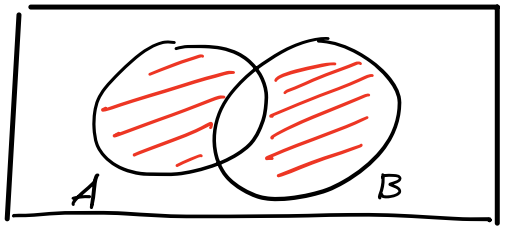
Rule: $P(\bar{S} \cap \bar{C}) = P(\overline{S \cup C}) = 1 - P(S \cup C)$

$P($"neither S nor C$) = 1 - P($Either S or C$)$.

Other rules of Probability (NOT in ebook):

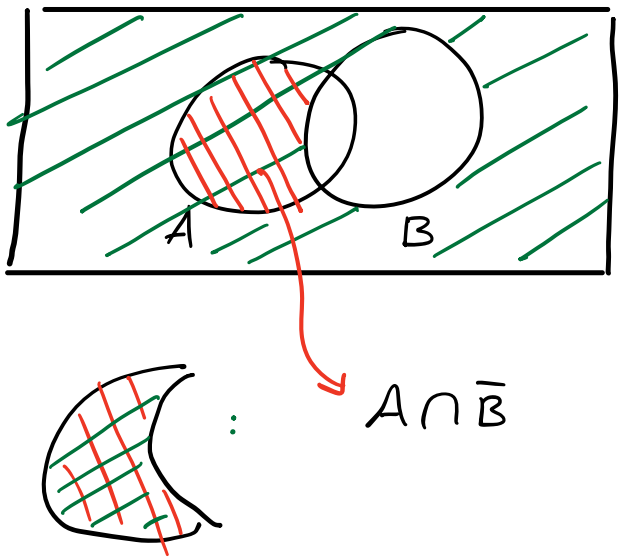
1. $P(\bar{A} \cap \bar{B}) = P(\overline{A \cup B}) = 1 - P(A \cup B)$.

2. $P(A$ or $B$ but not both$) = ? = (**)$




$$(**) = P(A \cup B) - P(A \cap B).$$

3. $P(A \cap \overline{B}) = P(A \text{ and not } B) = (\star\star\star)$




$(\star\star\star) = P(A) - P(A \cap B)$.

4. $P(\overline{B} \mid A) = 1 - P(B \mid A)$

"Law of Complements for Conditional Probabilities".

[ Aside:

$$P(\overline{B} \mid A) = \frac{P(\overline{B} \cap A)}{P(A)}$$

See formula sheet for conditional prob.

$$= \frac{P(A \cap \overline{B})}{P(A)}$$

$$= \frac{P(A) - P(A \cap B)}{P(A)}$$

$$= \frac{P(A) - P(A) \times P(B|A)}{P(A)}$$

$$= \frac{P(A)\,(1 - P(B|A))}{P(A)} \quad ]$$

5) Bayes' Rule (FYI).

Now see PowerPoint Slides for a mix of Probability Problems.