Problem Set #5

Friday, September 16, 2022 2:32 PM

1.

	A	!A	
B	$P(A \text{ and } B)$	$P(!A \text{ and } B)$	$P(B)$
!B	$P(A \text{ and } !B)$	$P(!A \text{ and } !B)$	$P(!B)$
	$P(A)$	$P(!A)$	1

a. $P(A|B) = \frac{P(A \text{ and } B)}{P(B)}, P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$

b. No unless P(A) and P(B) are the same chance. Different because the numerator is always P(A and B) but denominator changes based on what is given since it's the total amount where both are fulfilled given only 1 condition is already fulfilled

c. $P(A \text{ and } B) = P(A|B) * P(B) = P(B|A) * P(A)$

2.

	A	!A	
B	0.16		
!B			0.31
		0.6	1

a.

	A	!A	
B	0.16	<u>0.53</u>	<u>0.69</u>
!B	<u>0.24</u>	<u>0.07</u>	0.31
	<u>0.4</u>	0.6	1

b. $0.2319 \neq 0.4 \text{ because } 0.69 \neq 0.4$

i. $P(A|B) = \frac{0.16}{0.69} \approx 0.2319$

ii. $P(B|A) = \frac{0.16}{0.4} = \frac{2}{5} = 0.4$

c. $\frac{0.16}{0.69} * 0.69 = 0.16 = \frac{0.16}{0.4} * 0.4$

d. $\frac{0.24}{0.31} \approx 0.7742, P(A|!B) = \frac{P(A \text{ and } !B)}{P(!B)}$

3.

	A	!A	
B	$P(A \text{ and } B)$	$P(!A \text{ and } B)$	$P(B)$
!B	$P(A \text{ and } !B)$	$P(!A \text{ and } !B)$	$P(!B)$
	$P(A)$	$P(!A)$	1

a. Rewrite P(B):

i. $P(B) = P(A \text{ and } B) + P(!A \text{ and } B)$

ii. $P(B) = P(A|B) * P(B) + P(!A|B) * P(B) = [P(A|B) + P(!A|B)] * P(B)$

1) $P(B) = 1P(B)$

b. $0.69 = \frac{0.16}{0.69} * 0.69 + \frac{0.53}{0.69} * 0.69 = 0.16 + 0.53 = 0.69$

4. $P(A) = 0.3, P(B) = 0.4$

a. $P(A|B) = 0.3 = P(A)$

b. Because if they are independent, then the given B does not impact the chance of event A occuring.