EXERCISE: THE MULTIPLICATION RULE (4/4 points)

Are the following statements true or false? (Assume that all conditioning events have positive probability.)

1. $\mathrm{P}(A \cap B \cap C^c) = \mathrm{P}(A \cap B)\,\mathrm{P}(C^c \mid A \cap B)$

   True ✔ **Answer:** True

2. $\mathrm{P}(A \cap B \cap C^c) = \mathrm{P}(A)\,\mathrm{P}(C^c \mid A)\,\mathrm{P}(B \mid A \cap C^c)$

   True ✔ **Answer:** True

3. $\mathrm{P}(A \cap B \cap C^c) = \mathrm{P}(A)\,\mathrm{P}(C^c \cap A \mid A)\,\mathrm{P}(B \mid A \cap C^c)$

   True ✔ **Answer:** True

4. $\mathrm{P}(A \cap B \mid C) = \mathrm{P}(A \mid C)\,\mathrm{P}(B \mid A \cap C)$

   True ✔ **Answer:** True

Answer:

1. True. This is the usual multipication rule applied to the two events $A \cap B$ and C^c.

2. True. This is the usual multiplication rule.

3. True. This is because

$$\mathrm{P}(C^c \cap A \mid A) = \frac{\mathrm{P}(C^c \cap A \cap A)}{\mathrm{P}(A)} = \frac{\mathrm{P}(C^c \cap A)}{\mathrm{P}(A)} = \mathrm{P}(C^c \mid A).$$

   So, this statement is equivalent to the one in part 2.

4. True. This is the usual multiplication rule $\mathrm{P}(A \cap B) = \mathrm{P}(A)\mathrm{P}(B \mid A)$ applied to a model/universe in which event C is known to have occurred.

You have used 1 of 1 submissions