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EXERCISE: SIMPLE PROPERTIES (4/4 points)

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Let A, B, and C be disjoint subsets of the sample space. For each one of the following statements, determine whether it is true or false. *Note:* "False" means "not guaranteed to be true."

a) $\mathbf{P}(A) + \mathbf{P}(A^c) + \mathbf{P}(B) = \mathbf{P}(A \cup A^c \cup B)$

[False ▾] ✔ **Answer: False**

b) $\mathbf{P}(A) + \mathbf{P}(B) \leq 1$

[True ▾] ✔ **Answer: True**

c) $\mathbf{P}(A^c) + \mathbf{P}(B) \leq 1$

[False ▾] ✔ **Answer: False**

d) $\mathbf{P}(A \cup B \cup C) \geq \mathbf{P}(A \cup B)$

[True ▾] ✔ **Answer: True**

Answer:
a) False. For a counterexample, let $A = \emptyset$, $B = \Omega$, and $C = \emptyset$. In that case, the left-hand side of the equation equals 2, whereas the right-hand side equals 1.

b) True. Since A and B are disjoint, we have
$\mathbf{P}(A) + \mathbf{P}(B) = \mathbf{P}(A \cup B) \leq 1$

c) False. For a counterexample, let $A = \emptyset$, $B = \Omega$, and $C = \emptyset$. In that case, $\mathbf{P}(A^c) + \mathbf{P}(B) = 2$.

d) True. Since A, B, and C are disjoint, we have
$\mathbf{P}(A \cup B \cup C) = \mathbf{P}(A) + \mathbf{P}(B) + \mathbf{P}(C) \geq \mathbf{P}(A) + \mathbf{P}(B) = \mathbf{P}(A \cup B$.

You have used 1 of 1 submissions

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