



## 10. Exercise: Simple properties

Exercises due Feb 5, 2020 05:29 IST Completed

### Exercise: Simple properties

4/4 points (graded)

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

### Solution:

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  $\mathbf{P}(A \cup B \cup C) = \mathbf{P}(A) + \mathbf{P}(B) + \mathbf{P}(C) \geq \mathbf{P}(A) + \mathbf{P}(B) = \mathbf{P}(A \cup B)$ .

Submit

You have used 1 of 1 attempt

**i** Answers are displayed within the problem

## Discussion

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? Can you clarify my understanding of (a) and (c)  
Is my understanding and logic correct as below? (a) is false because A and A^c are disjoint and do not...

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💬 less than 1 can be negative  
Option (b) :  $P(A) + P(B) \leq 1$  will satisfy the event of  $P(A) + P(B) = -2$  Then how can it be "True"

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? Question 1  
I don't quite understand how you get 1 on the right side:  $P(A \cup A^c \cup B) = P(A \cup A^c) + P(B) = 1 + 1 = 2$ . Can yo...

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💬 Haha that is so great!  
Finally after 10 years of management my brain starts to work. And after coursera I understand that th...

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💬 Union  
For Question a, in the right-hand side, if  $A = \emptyset$ , then  $A \cup A^c$  is  $\Omega$ . So basically it is  $\Omega \cup \Omega$  as B is also  $\Omega$ . In u...

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? First Problem Check Understanding  
Left side would go,  $P(A) + P(A^c) + P(B) = P(\emptyset) + P(\Omega) + P(\Omega) = 0 + 1 + 1 = 2$  then for the right side  $P(A \cup A^c \cup B)$  so A...

2

💬 Devious part a  
It suggests another generalization: if A and B are disjoint, then A-complement and B can't be.

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✓ Not able to submit assignment  
Is the submission of assignment not allowed after deadline??

6

? Question A answer validation (is there another reason that makes it false?)  
I need to know if my correct answer to the question a is based on a correct understanding or not. I ch...



✓ Question No. 1

I don't understand Q1... Here's why:  $P(A) + P(A^c) + P(B) = P(A \cup A^c \cup B)$   $P(A) + P(B \cup C) + P(B) = P(A \cup \dots$

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? Question about following statement:  $P(A) + P(A^c) = 1$

Hello everyone, I got a few questions regarding one statement: As I understood  $P(A)$  can be an empty...

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? Part B- equal to?

So fine  $P(A)+P(B) \leq 1$ . But how is it possibly equal to? If  $P(A)+P(B)$  was to be equal to 1 then wouldn't tha...

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? Ambiguity in the question

The questions states that A,B and C are disjoint subsets of a sample set. Assuming that disjoint subse...

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