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## Exercise: Independence of multiple events

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### Exercise: Independence of multiple events

2/2 points (graded)

Suppose that  $A$ ,  $B$ ,  $C$ , and  $D$  are independent. Use intuitive reasoning (not a mathematical proof) to answer the following.

1. Is it guaranteed that  $A \cap C$  is independent from  $B^c \cap D$ ?

✓ Answer: Yes

2. Is it guaranteed that  $A \cap B^c \cap D$  is independent from  $B^c \cup D^c$ ?

✓ Answer: No

Answer:

1. The occurrence of event  $A \cap C$  contains information about  $A$  and  $C$ , but provides no information on the occurrence of  $B$ ,  $D$ , or for that matter,  $B^c \cap D$ . Hence we have independence.
2. Event  $D$  influences both of the events  $A \cap B^c \cap D$  and  $B^c \cup D^c$ , and therefore introduces a dependence between them. For a more concrete argument, if we are told that event  $A \cap B^c \cap D$  occurs, then we know that  $D$  occurred. Therefore,  $D^c$  did not occur, and this generally reduces the probability of event  $B^c \cup D^c$ .

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You have used 1 of 1 attempt

✓ Correct (2/2 points)

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