

Homework 2: Problem 6

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Problem 6:

We wish to show that E_1 and E_2 are conditionally independent given E_3 and that

$$Pr[E_1 \cap E_2 | E_3] = Pr[E_1 | E_3] \cdot Pr[E_2 | E_3]$$

We first note that if $P(A) > 0$ we have that $P(B|A) = P(B)$ are independent. We now have that

$$Pr[E_1 \cap E_2 | E_3] = Pr[E_1] \cdot Pr[E_2]$$

We are given that E_1, E_2, E_3 are mutually independent, so we now have that

$$Pr[E_1 \cap E_2] = Pr[E_1] \cdot Pr[E_2]$$

The intersection of two mutually independent events is just their product, so we have that

$$Pr[E_1] \cdot Pr[E_2] = Pr[E_1] \cdot Pr[E_2]$$

We have successfully shown that E_1 and E_2 are conditionally independent given E_3 .