Given no evidence:

\[ P(AC) \neq P(A) \cdot P(C) \]

\[ P(AC) = \sum_B P(ABC) \]

\[ = \sum_B P(A) \cdot P(B/A) \cdot P(C/B) \]

Can't be simplified.

So A not independent of C.

Given B as evidence:

Need to show:

\[ P(AC|B) = \frac{P(ABC)}{P(B)} \cdot P(C|B) \]

\[ P(AC|B) = \frac{P(ABC)}{P(B)} \]

\[ = \frac{P(A) \cdot P(B|A) \cdot P(C|B)}{P(B)} \]

\[ = \frac{P(A) \cdot P(B|A) \cdot P(C|B)}{P(B)} \]

\[ \text{QED} \]
Given no evidence need to show

\[ P(AC) \neq P(A) \cdot P(C) \]

\[ P(AC) = \sum_{B} P(ABC) \]

\[ = \sum_{B} P(B) \cdot P(AB) \cdot P(C|B) \]

\[ \text{Can't be simplified} \]

\[ P(A) \cdot P(C) \]

So \( A \) is not independent of \( C \)