Assignment: Probability

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Problem: If A and B are events such that P(A|B) = P(B|A), then

(i) A $\subset$ B but A $\neq$ B

(ii) A = B

(iii) A $\cap$ B = ϕ

(iv) P(A) = P(B)

Solution: Given, P(A|B) = P(B|A)

$$\implies \frac{P(A,B)}{P(B)} = \frac{P(B,A)}{P(A)}$$
$$\implies \frac{P(A,B)}{P(B)} = \frac{P(A,B)}{P(A)} (Since P(A,B) = P(B,A))$$
$$\implies \frac{1}{P(B)} = \frac{1}{P(A)}$$
$$\therefore P(A) = P(B)$$