IMM - DTU

02405 Probability
2003-10-12
BFN/bfn

Solution for review exercise 25 (chapter 2) in Pitman

Question a) We define the events Ai that player A wins in i sets. We have immediately

$$P(A3) = p^3$$

Correspondingly, player A can win in 4 sets if he wins 2 out of the first 3 and the 4'th.

$$P(A4) = p \cdot p \cdot q \cdot p + p \cdot q \cdot p \cdot p + q \cdot p \cdot p \cdot p = 3p^3 q$$

similary we find

$$P(A5) = 6p^3 q^2$$

Question b) The event A (player A wins) is $A = A1 \cup A2 \cup A3$. The events Ai are mutually exclusive and we get

$$P(A) = P(A1 \cup A2 \cup A3) = P(A1) + P(A2) + P(A3) = p^3(1 + 3q + 6q^2)$$

Question c) The question can be reformulated as

$$P(A3|A) = \frac{P(A3 \cap A)}{P(A)} = \frac{1}{1 + 3q + 6q^2}$$

using the general formula for conditional probability p.36.

Question d)

$$\frac{3}{8}$$

Question e) Pitman suggests no, which is reasonable. However, the way to assess whether we can assume independence or not would be to analyze the distribution of the number of sets played in a large number of matches.