IMM - DTU

02405 Probability
2003-11-21
BFN/bfn

Solution for exercise 3.1.16 in Pitman

Question a) Using the law of averaged conditional probabilities we get

$$P(X+Y=n) = \sum_{i=0}^{n} P(X=i)P(X+Y=n|X=i) = \sum_{i=0}^{n} P(X=i)P(Y=n-i)$$

where the last equality is due to the independence of X and Y.

Question b) The marginal distribution of X and Y is

$$P(X=2) = \frac{1}{36}, \qquad P(X=3) = \frac{1}{18}, \qquad P(X=4) = \frac{1}{12}$$

$$P(X=5) = \frac{1}{9}, \qquad P(X=6) = \frac{5}{36}, \qquad P(X=7) = \frac{1}{6}$$

We get

$$P(X+Y=8) = 2\left(\cdot\frac{1}{36}\cdot\frac{5}{36} + \frac{1}{18}\frac{1}{9}\right) + \frac{1}{12}\cdot\frac{1}{12} = \frac{35}{16\cdot 81}$$