

Solution for exercise 3.2.14 in Pitman

The event B_i that at least one person gets off at floor i . Using indicators I_{B_i} we introduce the random variable N as the number of stops. We have

$$N = I_{B_1} + \cdots + I_{B_{10}} \quad E(N) = E(I_{B_1} + \cdots + I_{B_{10}})$$

$$E(N) = E(I_{B_1} + \cdots + I_{B_{10}}) = E(I_{B_1}) + \cdots + E(I_{B_{10}}) = P(B_1) + \cdots + P(B_{10}) = 10P(B_1)$$

We find $P(B_1) = 1 - P(B_1^c) = 1 - \left(\frac{9}{10}\right)^{12}$ thus $E(N) = 10 \left(1 - \left(\frac{9}{10}\right)^{12}\right) = 7.18$