

Solution for exercise 3.5.4 in Pitman

We define the stochastic variables X_i as the number of misprints on page i . We assume that the number of characters on each page are approximately the same and that misprints occur independently of each other with a fixed probability for each character. We will evaluate probabilities using the Poisson distribution.

$$\begin{aligned} P(X_i < 5) &= P(X_i = 0) + P(X_i = 1) + P(X_i = 2) + P(X_i = 3) + P(X_i = 4) \\ &= e^{-1} \left(1 + 1 + \frac{1}{2} + \frac{1}{6} + \frac{1}{24} \right) = \frac{65}{24} e^{-1} = 0.9963 \end{aligned}$$

The event that at least one page has at least 5 misprints is complementary to the event that all pages has at most 4 misprints.

$$P(\max(X)_i \geq 5) = 1 - P(X_i \leq 4)^{300} = 0.6671$$