Poisson Q4 (20/2/24)

The probability of there being a typographical error on a particular page of a 500 page book is assumed to be 0.09. Using a suitable approximation, what is the probability that at least one book out of 10 (each having 500 pages) contains more than 60 errors in total?

Solution

Let X be the number of errors per book, so that $X \sim B(500, 0.09)$,

and as an approximation $X \sim Po(45)$.

Then $P(X > 60) = 1 - P(X \leq 60) = 1 - 0.98671 = 0.01329$

Let Y be the number of books with more than 60 errors,

so that $Y \sim B(10, 0.01329)$

Then $P(Y \geq 1) = 1 - P(Y = 0) = 1 - 0.98671^{10}$

$= 1 - 0.87477 = 0.12523 = 0.125$ (3sf)