Assignment 1

Angela Zhai

September 14, 2018

Document assignment

Consider the following situation:

A sloppy printer produces books with an average of 2 misprints per page. You want to know how many pages have more than k misprints in a book of n pages. Make an n x k table that shows the relationship between the total number of pages in a book and the number of pages with k misprints.

Show and explain your work. Include equations and calculations to teach the reader how to solve the problem. Include an image of a book.

Push your solution to a github repository and submit the url for repository on blackboard. Be sure your repo includes your document as a pdf file and as an RMD file. Include other files needed to recompile your document.

Result

Table 1: Probability of pages with k misprints

	Least Misprints					
n	0	1	2	3	4	5
5	0.0e+00	0.0000000	0.0002221	0.2624659	0.9533530	0.9998243
10	0.0e+00	0.0000000	0.0393399	0.9076959	0.9999525	1.0000000
15	0.0e+00	0.0000250	0.4271040	0.9988426	1.0000000	1.0000000
20	0.0e+00	0.0043677	0.9032285	0.9999982	1.0000000	1.0000000
25	0.0e+00	0.1138421	0.9969101	1.0000000	1.0000000	1.0000000
30	3.3e-06	0.5876265	0.9999842	1.0000000	1.0000000	1.0000000

For this question, the result should be the conditional probability. This situation is to find out n pages have more than k misprints. We can assume there is a 50 pages book which needs to be printed.

First, we should calculate a cumulative probability for more than k misprints which follows poisson distribution.

The equation to get CDF of poisson distribution is: $e^{-\lambda} \sum_{i=0}^{k} \frac{\lambda^i}{i!}$

Like if we want to know the probability of more than 2 misprints, the equation should look like: $e^{-2} \sum_{i=2}^{n} \frac{2^i}{i!}$

Then, we need to calculate the conditional probability of pages which have more than k misprints. This is a binomial distribution situation because we will get pages which have no more than k misprints and pages have more than k misprints.

Through these process, we can get the final table as above.

Image