Assignment 1

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September 12, 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.

Instruction for this assignment: 1.From the first two sentences of these questions, we can know that each page with more than k misprints is under a poison distribution that $Poisson(\lambda = 2)$ 2.Then the probability p_k of more than k misprints on a page is $p_k = P(M > k) = 1 - P(M \leq k) = 1$ - ppois(k, lambda = 2). 3.Then we have 50 pages in binomial distribution with p_k, calculated above. 4.Finally, we output the n by k table with probability of T no more than n pages with more than k misprints:$P(T \leq n)$ = pbinom(n, 50, p_k).

{r setup, include=FALSE}

library(knitr) opts_chunk$set(echo = TRUE)

```
library(knitr)
library(httr)
library(numbers)


set.seed(2018)
# set max num of page
n=50
# max num of misprints
k=8
# set up a initial matrix to store the value
resultTable<- matrix(0, nrow=n+1, ncol=k+2)

# use two for loops to build the matrix
for (i in 0:n){
  # build the first column of table from 1 to n
   resultTable[i+1,1]=i
  for(j in 0:k){
    # set up poisson distribution for misprints>k with different n page number
```

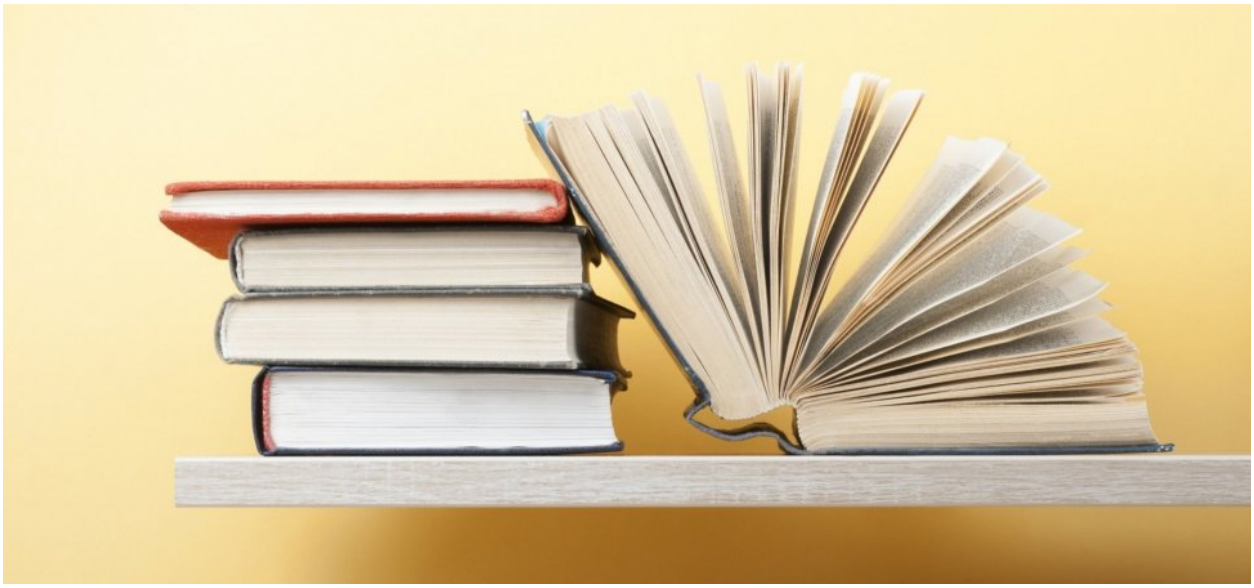

Figure 1: a book.

```
    book<- 1-ppois(j,2)
    # set up binomial distribution for each page number in all pages
    resultTable[i+1,j+2]<- pbinom(i,size=50,book )
  }
}
 tab1 = as.data.frame(resultTable)
 #set the column of the table
 colnames(tab1) <- c("n", "k=0", "k=1","k=2","k=3","k=4","k=5","k=6","k=7","k=8")
  kable(tab1)
```

n	k=0	k=1	k=2	k=3	k=4	k=5	k=6	k=7	k=8
0	0.0000000	0.0000000	0.0000000	0.0004489	0.0669043	0.4338242	0.7967569	0.9466119	0.9881964
1	0.0000000	0.0000000	0.0000001	0.0041905	0.2528294	0.7991602	0.9781965	0.9985773	0.9999315
2	0.0000000	0.0000000	0.0000010	0.0194711	0.5060029	0.9499136	0.9984423	0.9999751	0.9999997
3	0.0000000	0.0000000	0.0000081	0.0602258	0.7311428	0.9905388	0.9999176	0.9999997	1.0000000
4	0.0000000	0.0000000	0.0000477	0.1400498	0.8781723	0.9985786	0.9999966	1.0000000	1.0000000
5	0.0000000	0.0000000	0.0002221	0.2624659	0.9533530	0.9998243	0.9999999	1.0000000	1.0000000
6	0.0000000	0.0000000	0.0008469	0.4155103	0.9846918	0.9999817	1.0000000	1.0000000	1.0000000
7	0.0000000	0.0000000	0.0027233	0.5758679	0.9956402	0.9999984	1.0000000	1.0000000	1.0000000
8	0.0000000	0.0000000	0.0075426	0.7195443	0.9989109	0.9999999	1.0000000	1.0000000	1.0000000
9	0.0000000	0.0000000	0.0182885	0.8313104	0.9997592	1.0000000	1.0000000	1.0000000	1.0000000
10	0.0000000	0.0000000	0.0393399	0.9076959	0.9999525	1.0000000	1.0000000	1.0000000	1.0000000
11	0.0000000	0.0000001	0.0759167	0.9539976	0.9999916	1.0000000	1.0000000	1.0000000	1.0000000
12	0.0000000	0.0000004	0.1327164	0.9790816	0.9999987	1.0000000	1.0000000	1.0000000	1.0000000
13	0.0000000	0.0000017	0.2120473	0.9913039	0.9999998	1.0000000	1.0000000	1.0000000	1.0000000
14	0.0000000	0.0000069	0.3122252	0.9966884	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
15	0.0000000	0.0000250	0.4271040	0.9988426	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
16	0.0000000	0.0000829	0.5471767	0.9996281	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
17	0.0000000	0.0002524	0.6619208	0.9998899	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
18	0.0000000	0.0007071	0.7624352	0.9999700	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
19	0.0000000	0.0018273	0.8433227	0.9999924	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000

n	k=0	k=1	k=2	k=3	k=4	k=5	k=6	k=7	k=8
20	0.0000000	0.0043677	0.9032285	0.9999982	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
21	0.0000000	0.0096772	0.9441194	0.9999996	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
22	0.0000000	0.0199167	0.9698743	0.9999999	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
23	0.0000000	0.0381540	0.9848555	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
24	0.0000000	0.0681706	0.9929084	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
25	0.0000000	0.1138421	0.9969101	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
26	0.0000000	0.1780904	0.9987486	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
27	0.0000000	0.2616428	0.9995295	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
28	0.0000001	0.3620531	0.9998359	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
29	0.0000007	0.4734962	0.9999470	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
30	0.0000033	0.5876265	0.9999842	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
31	0.0000138	0.6953522	0.9999956	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
32	0.0000537	0.7889300	0.9999989	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
33	0.0001928	0.8636060	0.9999997	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
34	0.0006371	0.9182322	0.9999999	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
35	0.0019348	0.9547667	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
36	0.0053895	0.9770378	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
37	0.0137410	0.9893665	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
38	0.0319953	0.9955371	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
39	0.0678806	0.9983148	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
40	0.1309308	0.9994324	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
41	0.2291824	0.9998312	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
42	0.3636970	0.9999562	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
43	0.5235893	0.9999903	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
44	0.6861104	0.9999982	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
45	0.8245579	0.9999997	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
46	0.9207045	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
47	0.9729842	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
48	0.9938603	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
49	0.9993044	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
50	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000