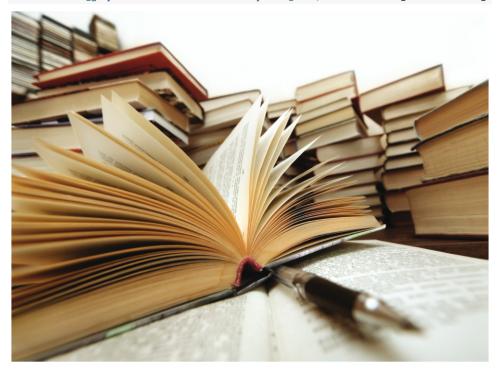# Assignment 1

ningze zu

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Document assignment

```
cover_url = 'https://elgarblog.files.wordpress.com/2013/10/books1.jpg'
if (!file.exists(cover_file <- 'cover.jpg'))
  download.file(cover_url, cover_file, mode = 'wb')
knitr::include_graphics(if (identical(knitr:::pandoc_to(), 'html')) cover_url else cover_file)
```


Consider the following situation:

A sloppy printer produces books with an average of 2 misprints per page. You want to know how many pages in a 50 page book will have more than k misprints. Make an n x k table that shows the probability that n or fewer pages in a 50 page book will have more than 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.

Please keep in mind that the purpose of this assignment is to produce a document. The problem was SUPPOSED to be easy.

Given that the stated mean value of 2 misprints per page, assume the distribution of X, the number of misprints of per page is a Poisson distribution $P(\lambda)$ with $\lambda = 2$. The PDF of poisson distribution is

$$P(X > k) = \frac{e^{-\lambda}\lambda^x}{x!}$$

Conditioned on k, the probability p_k of or more than k misprints on a page is:

$$p_k = P(X > k) = 1 - P(X \leqslant k) = 1 - ppois(k, \lambda = 2)$$

Then we have the table of the probability that n or fewer pages in a 50 page book will have more than k misprints.

```
library(knitr)
n=50
k=10
prob <-matrix(ncol = k+1, nrow=n)
for (i in 1:n){
  for (j in 0:k){
    p = ppois(j, 2, lower.tail = TRUE)
    prob[i,j+1]=dbinom(i,50, prob = (1-p))
  }
  prob
}
prob = as.data.frame(prob)
colnames(prob)=paste0("k=", c(0:10))
rownames(prob)=paste0("n=", c(1:50))
kable(prob)
```

	k=0	k=1	k=2	k=3	k=4	k=5	k=6	k=7	k=8	k=9
n=1	0.0000000	0.0000000	0.0000001	0.0037416	0.1859251	0.3653360	0.1814396	0.0519654	0.0117350	0.00
n=2	0.0000000	0.0000000	0.0000009	0.0152806	0.2531735	0.1507534	0.0202458	0.0013978	0.0000683	0.00
n=3	0.0000000	0.0000000	0.0000071	0.0407547	0.2251399	0.0406252	0.0014753	0.0000246	0.0000003	0.00
n=4	0.0000000	0.0000000	0.0000397	0.0798240	0.1470295	0.0080397	0.0000790	0.0000003	0.0000000	0.00
n=5	0.0000000	0.0000000	0.0001743	0.1224161	0.0751807	0.0012458	0.0000033	0.0000000	0.0000000	0.00
n=6	0.0000000	0.0000000	0.0006248	0.1530444	0.0313388	0.0001574	0.0000001	0.0000000	0.0000000	0.00
n=7	0.0000000	0.0000000	0.0018765	0.1603576	0.0109484	0.0000167	0.0000000	0.0000000	0.0000000	0.00
n=8	0.0000000	0.0000000	0.0048192	0.1436764	0.0032707	0.0000015	0.0000000	0.0000000	0.0000000	0.00
n=9	0.0000000	0.0000000	0.0107459	0.1117660	0.0008483	0.0000001	0.0000000	0.0000000	0.0000000	0.00
n=10	0.0000000	0.0000000	0.0210515	0.0763856	0.0001933	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=11	0.0000000	0.0000001	0.0365768	0.0463016	0.0000391	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=12	0.0000000	0.0000003	0.0567996	0.0250840	0.0000071	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=13	0.0000000	0.0000013	0.0793309	0.0122224	0.0000011	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=14	0.0000000	0.0000052	0.1001780	0.0053845	0.0000002	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=15	0.0000000	0.0000181	0.1148788	0.0021541	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=16	0.0000000	0.0000579	0.1200727	0.0007855	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=17	0.0000000	0.0001695	0.1147441	0.0002619	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=18	0.0000000	0.0004546	0.1005144	0.0000800	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=19	0.0000000	0.0011203	0.0808874	0.0000225	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=20	0.0000000	0.0025404	0.0599058	0.0000058	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=21	0.0000000	0.0053095	0.0408910	0.0000014	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=22	0.0000000	0.0102395	0.0257549	0.0000003	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00
n=23	0.0000000	0.0182373	0.0149812	0.0000001	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00

	k=0	k=1	k=2	k=3	k=4	k=5	k=6	k=7	k=8	
n=24	0.0000000	0.0300166	0.0080529	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=25	0.0000000	0.0456715	0.0040017	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=26	0.0000000	0.0642483	0.0018385	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=27	0.0000000	0.0835524	0.0007809	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=28	0.0000001	0.1004104	0.0003065	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=29	0.0000006	0.1114431	0.0001111	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=30	0.0000026	0.1141303	0.0000372	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=31	0.0000105	0.1077257	0.0000115	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=32	0.0000399	0.0935778	0.0000032	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=33	0.0001391	0.0746760	0.0000008	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=34	0.0004443	0.0546262	0.0000002	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=35	0.0012977	0.0365345	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=36	0.0034547	0.0222711	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=37	0.0083516	0.0123287	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=38	0.0182542	0.0061706	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=39	0.0358854	0.0027778	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=40	0.0630502	0.0011176	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=41	0.0982516	0.0003988	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=42	0.1345146	0.0001250	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=43	0.1598923	0.0000340	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=44	0.1625211	0.0000079	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=45	0.1384475	0.0000015	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=46	0.0961466	0.0000002	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=47	0.0522797	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=48	0.0208761	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=49	0.0054440	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0
n=50	0.0006956	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0