Assignment 1

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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.

1 Calculate p_k

In this situation, the misprints in a page are distributed in Poisson Distribution.

Given the stated mean value of 2 misprints per page, assume the distribution of M, the number of misprints on a page, is $Poisson(\lambda = 2)$

Therefore, conditioned on k, a limit to be determined, 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).

2 Calculate $P(T \leq n|k)$

Probability of T no more than n pages with more than k misprints is:

$P(T \leq n) =$ pbinom(n, 50, p_k).

3 Make an n x k table

Take n=50, k=10 for example.

A table of $p_k = P(M > k)$

```
prob<-1 - ppois(0:10,lambda = 2)
prob <- as.data.frame(prob)
k <- 0:10
prob <- cbind(k, prob)
library(knitr)
library(kableExtra)
p.tab <- kable(prob)
kable_styling(p.tab, bootstrap_options = "striped", full_width = FALSE, position = "center")
```

k	prob
0	0.8646647
1	0.5939942
2	0.3233236
3	0.1428765
4	0.0526530
5	0.0165636
6	0.0045338
7	0.0010967
8	0.0002374
9	0.0000465
10	0.0000083

A table of n x k

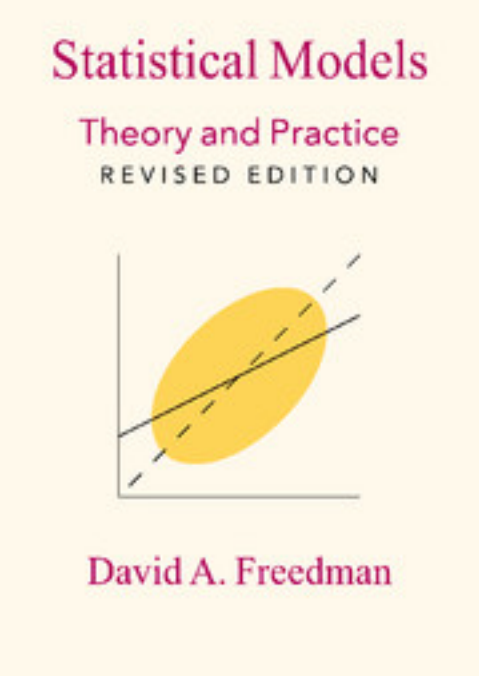
the input in the table represent the value of $P(T \leq n|K = k)$. The row represents the number of pages whose misprints are more than k.

```
prob<- as.vector(prob[,2])
col_k<-vector(mode = "numeric",length = 0)
result<-rep(NULL,51)
for(i in 1:11){
  for(j in 1:51){
    b<-prob[i]
    col_k[j]<-pbinom(j-1, size = 50, b)
  }
  result<-cbind(result,col_k)
}
table<-as.data.frame(result)
rownames(table)=paste(0:50,"pages",sep="")
colnames(table)=0:10
library(knitr)
library(kableExtra)
nk.tab <- kable(table)
kable_styling(nk.tab, bootstrap_options = "striped", full_width = FALSE, position = "left", font_size =
```

	0	1	2	3	4	5	6	7	8	9	1
0pages	0.0000000	0.0000000	0.0000000	0.0004489	0.0669043	0.4338242	0.7967569	0.9466119	0.9881964	0.9976777	0.999584
1pages	0.0000000	0.0000000	0.0000001	0.0041905	0.2528294	0.7991602	0.9781965	0.9985773	0.9999315	0.9999974	0.999999
2pages	0.0000000	0.0000000	0.0000010	0.0194711	0.5060029	0.9499136	0.9984423	0.9999751	0.9999997	1.0000000	1.000000
3pages	0.0000000	0.0000000	0.0000081	0.0602258	0.7311428	0.9905388	0.9999176	0.9999997	1.0000000	1.0000000	1.000000
4pages	0.0000000	0.0000000	0.0000477	0.1400498	0.8781723	0.9985786	0.9999966	1.0000000	1.0000000	1.0000000	1.000000
5pages	0.0000000	0.0000000	0.0002221	0.2624659	0.9533530	0.9998243	0.9999999	1.0000000	1.0000000	1.0000000	1.000000
6pages	0.0000000	0.0000000	0.0008469	0.4155103	0.9846918	0.9999817	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
7pages	0.0000000	0.0000000	0.0027233	0.5758679	0.9956402	0.9999984	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
8pages	0.0000000	0.0000000	0.0075426	0.7195443	0.9989109	0.9999999	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
9pages	0.0000000	0.0000000	0.0182885	0.8313104	0.9997592	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
10pages	0.0000000	0.0000000	0.0393399	0.9076959	0.9999525	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
11pages	0.0000000	0.0000001	0.0759167	0.9539976	0.9999916	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
12pages	0.0000000	0.0000004	0.1327164	0.9790816	0.9999987	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
13pages	0.0000000	0.0000017	0.2120473	0.9913039	0.9999998	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
14pages	0.0000000	0.0000069	0.3122252	0.9966884	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
15pages	0.0000000	0.0000250	0.4271040	0.9988426	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
16pages	0.0000000	0.0000829	0.5471767	0.9996281	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
17pages	0.0000000	0.0002524	0.6619208	0.9998899	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
18pages	0.0000000	0.0007071	0.7624352	0.9999700	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
19pages	0.0000000	0.0018273	0.8433227	0.9999924	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
20pages	0.0000000	0.0043677	0.9032285	0.9999982	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
21pages	0.0000000	0.0096772	0.9441194	0.9999996	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
22pages	0.0000000	0.0199167	0.9698743	0.9999999	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
23pages	0.0000000	0.0381540	0.9848555	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
24pages	0.0000000	0.0681706	0.9929084	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
25pages	0.0000000	0.1138421	0.9969101	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
26pages	0.0000000	0.1780904	0.9987486	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
27pages	0.0000000	0.2616428	0.9995295	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
28pages	0.0000001	0.3620531	0.9998359	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
29pages	0.0000007	0.4734962	0.9999470	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
30pages	0.0000033	0.5876265	0.9999842	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
31pages	0.0000138	0.6953522	0.9999956	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
32pages	0.0000537	0.7889300	0.9999989	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
33pages	0.0001928	0.8636060	0.9999997	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
34pages	0.0006371	0.9182322	0.9999999	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
35pages	0.0019348	0.9547667	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
36pages	0.0053895	0.9770378	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
37pages	0.0137410	0.9893665	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
38pages	0.0319953	0.9955371	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
39pages	0.0678806	0.9983148	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
40pages	0.1309308	0.9994324	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
41pages	0.2291824	0.9998312	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
42pages	0.3636970	0.9999562	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
43pages	0.5235893	0.9999903	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
44pages	0.6861104	0.9999982	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
45pages	0.8245579	0.9999997	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
46pages	0.9207045	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
47pages	0.9729842	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
48pages	0.9938603	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
49pages	0.9993044	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000
50pages	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.000000

Book Picture

```
download.file(url = "http://assets.cambridge.org/97805211/12437/cover/9780521112437.jpg",
          destfile = "book.jpg",
          mode = 'wb')
knitr::include_graphics(path = "book.jpg")
```


Statistical Models
Theory and Practice
REVISED EDITION
David A. Freedman