MA615 - Assignment 1

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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.

The printer produces books with an average of 2 misprints per page. The misprints follow a poisson distribution. Therefore, the probability that a page will have more than k misprints is given by:

$$P(X > k) = 1 - P(X \le k) = 1 - \sum_{x=0}^{k} \frac{\lambda^x e^{-\lambda}}{x!}$$

Since λ is 2, we have

$$P(X > k) = 1 - \sum_{x=0}^{k} \frac{2^x e^{-2}}{x!}$$

The probability that n or fewer pages in the 50 page book will have more than k misprints is given by

$$P(Y \le n) = \binom{50}{k} \sum_{j=0}^{n} (1 - \sum_{x=0}^{k} \frac{2^x e^{-2}}{x!})^j (\sum_{x=0}^{k} \frac{2^x e^{-2}}{x!})^{n-j}$$

The n x k table for the probabilities of fewer than n pages having more than k misprints is as follows:

	k > 0	1	2	3	4	5	6	7	8	9
n<=1	0.00000	0.00000	0.00419	0.25283	0.79916	0.97820	0.99858	0.99993	1	0
2	0.00000	0.00000	0.01947	0.50600	0.94991	0.99844	0.99998	1.00000	1	0
3	0.00000	0.00001	0.06023	0.73114	0.99054	0.99992	1.00000	1.00000	1	0
4	0.00000	0.00005	0.14005	0.87817	0.99858	1.00000	1.00000	1.00000	1	0
5	0.00000	0.00022	0.26247	0.95335	0.99982	1.00000	1.00000	1.00000	1	0
6	0.00000	0.00085	0.41551	0.98469	0.99998	1.00000	1.00000	1.00000	1	0
7	0.00000	0.00272	0.57587	0.99564	1.00000	1.00000	1.00000	1.00000	1	0
8	0.00000	0.00754	0.71954	0.99891	1.00000	1.00000	1.00000	1.00000	1	0
9	0.00000	0.01829	0.83131	0.99976	1.00000	1.00000	1.00000	1.00000	1	0
10	0.00000	0.03934	0.90770	0.99995	1.00000	1.00000	1.00000	1.00000	1	0
11	0.00000	0.07592	0.95400	0.99999	1.00000	1.00000	1.00000	1.00000	1	0
12	0.00000	0.13272	0.97908	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
13	0.00000	0.21205	0.99130	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
14	0.00001	0.31223	0.99669	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
15	0.00002	0.42710	0.99884	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
16	0.00008	0.54718	0.99963	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
17	0.00025	0.66192	0.99989	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
18	0.00071	0.76244	0.99997	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
19	0.00183	0.84332	0.99999	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
20	0.00437	0.90323	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
21	0.00968	0.94412	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
22	0.01992	0.96987	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
23	0.03815	0.98486	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
24	0.06817	0.99291	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
25	0.11384	0.99691	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
26	0.17809	0.99875	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
27	0.26164	0.99953	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
28	0.36205	0.99984	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
29	0.47350	0.99995	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
30	0.58763	0.99998	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
31	0.69535	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
32	0.78893	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
33	0.86361	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
34	0.91823	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
35	0.95477	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
36	0.97704	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
37	0.98937	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
38	0.99554	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
39	0.99831	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
40	0.99943	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
41	0.99983	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
42	0.99996	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
43	0.99999	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
44	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
45	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
46	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
47	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
48	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
49	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0
50	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1	0