

MA615_Assignment_1

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1 Calculate the probability

Base the information in the assignment, this is a poisson distribution called M. And the lambda is 2, k is the misprints in a page ranging from 0 to 10. Therefore the probability that k misprints occur is $P(M > k) = 1 - P(M \leq k) = 1 - \text{ppois}(k, \text{lambda} = 2)$. The following table shows the p.d.f of M as dprob, the C.D.F of M as cprob and the probability of $P(M > k)$ as tailprob.

```
k = 0
result1 = matrix(character(), nrow = 0, ncol = 4, byrow = TRUE)
for (k in 0:10){
  dprob = dpois(k, lambda = 2)
  cprob = ppois(k, lambda = 2)
  tailprob = 1 - ppois(k, lambda = 2)
  result1 = rbind(result1, c(k, dprob, cprob, tailprob))
  next
}
colnames(result1) <- c("k", "prob", "cprob", "tailprob")
print(result1)
```

```
##      k      prob      cprob
## [1,] "0" "0.135335283236613" "0.135335283236613"
## [2,] "1" "0.270670566473225" "0.406005849709838"
## [3,] "2" "0.270670566473225" "0.676676416183063"
## [4,] "3" "0.180447044315484" "0.857123460498547"
## [5,] "4" "0.0902235221577418" "0.947346982656289"
## [6,] "5" "0.0360894088630967" "0.983436391519386"
## [7,] "6" "0.0120298029543656" "0.995466194473751"
## [8,] "7" "0.00343708655839016" "0.998903281032141"
## [9,] "8" "0.000859271639597541" "0.999762552671739"
## [10,] "9" "0.000190949253243898" "0.999953501924983"
## [11,] "10" "3.81898506487796e-05" "0.999991691775632"
##      tailprob
## [1,] "0.864664716763387"
## [2,] "0.593994150290162"
## [3,] "0.323323583816937"
## [4,] "0.142876539501453"
## [5,] "0.0526530173437111"
## [6,] "0.0165636084806144"
## [7,] "0.00453380552624882"
## [8,] "0.00109671896785868"
## [9,] "0.000237447328261142"
## [10,] "4.64980750172206e-05"
## [11,] "8.30822436848067e-06"
```

2 The full table of $n \times k$

First, we should calculate the probability that among 50 pages n pages have the k misprints. The probability is $P(T \leq n) = \text{pbinom}(n, 50, P_k)$.

```
k = 10
n = 50
result2 = matrix(character(), nrow = 10, ncol = 50)
for (n in 1:50){
  for (k in 1:10){
    result2[k,n] = pbinom(n ,50, 1 - ppois(k, lambda = 2))
  }
}
print(result2)
```

```
##      [,1]      [,2]      [,3]
## [1,] "1.98030086490985e-18" "7.20048608618277e-17" "1.71116071221867e-15"
## [2,] "8.22406835663262e-08" "1.00630202591393e-06" "8.07073206022307e-06"
## [3,] "0.00419051422221681" "0.0194711101327286" "0.060225820805454"
## [4,] "0.25282935689842" "0.506002873867792" "0.731142761558435"
## [5,] "0.79916015422266" "0.949913585295363" "0.990538818706377"
## [6,] "0.978196500977891" "0.998442286931162" "0.999917623118331"
## [7,] "0.99857730268561" "0.999975124778562" "0.999999679996784"
## [8,] "0.999931455591713" "0.999999739790259" "0.99999999274281"
## [9,] "0.999997355400681" "0.99999998032797" "0.9999999998925"
## [10,] "0.99999915464902" "0.99999999988763" "0.99999999999999"
##      [,4]      [,5]      [,6]
## [1,] "2.988901974266e-14" "4.09156578775248e-13" "4.57072306152156e-12"
## [2,] "4.77324332587204e-05" "0.000222079846880433" "0.000846868474649041"
## [3,] "0.140049772076724" "0.262465886165012" "0.415510268621681"
## [4,] "0.87817226804681" "0.953352993938667" "0.984691765292518"
## [5,] "0.998578566351332" "0.999824339385038" "0.999981704647529"
## [6,] "0.99996575499535" "0.99999883681819" "0.99999996684062"
## [7,] "0.99999996773739" "0.99999999973469" "0.99999999999817"
## [8,] "0.99999999998415" "0.99999999999997" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
##      [,7]      [,8]      [,9]
## [1,] "4.28409775899472e-11" "3.43787754421673e-10" "2.3984779775656e-09"
## [2,] "0.00272334914880266" "0.00754259306784827" "0.0182884742064099"
## [3,] "0.575867876961757" "0.719544323877644" "0.83131037348024"
## [4,] "0.995640168672951" "0.998910889274282" "0.999759218472845"
## [5,] "0.99998364539782" "0.99999872741177" "0.99999991283873"
## [6,] "0.99999999919091" "0.99999999998285" "0.99999999999968"
## [7,] "0.99999999999999" "1" "1"
## [8,] "1" "1" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
##      [,10]      [,11]      [,12]
## [1,] "1.47232838731464e-08" "8.02920893084615e-08" "3.9205935182022e-07"
## [2,] "0.0393399347618309" "0.0759167494755229" "0.132716389951804"
## [3,] "0.90769593899245" "0.95399755457576" "0.979081569267262"
## [4,] "0.999952532095598" "0.999991602144397" "0.999998659491898"
## [5,] "0.9999999946979" "0.99999999971143" "0.99999999998586"
```

##	[6,]	"0.9999999999999999"	"1"	"1"
##	[7,]	"1"	"1"	"1"
##	[8,]	"1"	"1"	"1"
##	[9,]	"1"	"1"	"1"
##	[10,]	"1"	"1"	"1"
##	[,13]	[,14]	[,15]	
##	[1,]	"1.72533710025657e-06"	"6.88052140582067e-06"	"2.4981635899779e-05"
##	[2,]	"0.212047252180778"	"0.312225217451315"	"0.427103991327173"
##	[3,]	"0.991303922511445"	"0.99668843092936"	"0.998842575479469"
##	[4,]	"0.99999806049649"	"0.99999974465828"	"0.99999996930974"
##	[5,]	"0.999999999999937"	"0.99999999999998"	"1"
##	[6,]	"1"	"1"	"1"
##	[7,]	"1"	"1"	"1"
##	[8,]	"1"	"1"	"1"
##	[9,]	"1"	"1"	"1"
##	[10,]	"1"	"1"	"1"
##	[,16]	[,17]	[,18]	
##	[1,]	"8.29115993133251e-05"	"0.000252416838800695"	"0.000707063953072924"
##	[2,]	"0.54717666929971"	"0.661920814749798"	"0.762435221601309"
##	[3,]	"0.999628065089348"	"0.99988993643565"	"0.999969965355688"
##	[4,]	"0.999999999662287"	"0.999999999965897"	"0.99999999996833"
##	[5,]	"1"	"1"	"1"
##	[6,]	"1"	"1"	"1"
##	[7,]	"1"	"1"	"1"
##	[8,]	"1"	"1"	"1"
##	[9,]	"1"	"1"	"1"
##	[10,]	"1"	"1"	"1"
##	[,19]	[,20]	[,21]	
##	[1,]	"0.00182732876135797"	"0.00436772972412212"	"0.00967723560000268"
##	[2,]	"0.843322651232972"	"0.903228479430359"	"0.944119446349347"
##	[3,]	"0.999992433172497"	"0.999998238277944"	"0.999999620664856"
##	[4,]	"0.99999999999729"	"0.99999999999979"	"0.99999999999998"
##	[5,]	"1"	"1"	"1"
##	[6,]	"1"	"1"	"1"
##	[7,]	"1"	"1"	"1"
##	[8,]	"1"	"1"	"1"
##	[9,]	"1"	"1"	"1"
##	[10,]	"1"	"1"	"1"
##	[,22]	[,23]	[,24]	
##	[1,]	"0.0199167485584634"	"0.0381539994339928"	"0.0681706183776068"
##	[2,]	"0.969874297288988"	"0.98485546201945"	"0.992908401687339"
##	[3,]	"0.999999924419182"	"0.999999986060257"	"0.999999997619789"
##	[4,]	"1"	"1"	"1"
##	[5,]	"1"	"1"	"1"
##	[6,]	"1"	"1"	"1"
##	[7,]	"1"	"1"	"1"
##	[8,]	"1"	"1"	"1"
##	[9,]	"1"	"1"	"1"
##	[10,]	"1"	"1"	"1"
##	[,25]	[,26]	[,27]	
##	[1,]	"0.113842088184772"	"0.17809037123101"	"0.261642761912468"
##	[2,]	"0.996910098009941"	"0.998748612818706"	"0.999529468821702"
##	[3,]	"0.999999999623759"	"0.99999999944959"	"0.99999999992552"
##	[4,]	"1"	"1"	"1"

```

## [5,] "1" "1" "1"
## [6,] "1" "1" "1"
## [7,] "1" "1" "1"
## [8,] "1" "1" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
## [,28] [,29] [,30]
## [1,] "0.362053130813846" "0.473496215003435" "0.587626536284162"
## [2,] "0.999835945266816" "0.999947036075425" "0.999984192379763"
## [3,] "0.999999999999068" "0.999999999999892" "0.999999999999988"
## [4,] "1" "1" "1"
## [5,] "1" "1" "1"
## [6,] "1" "1" "1"
## [7,] "1" "1" "1"
## [8,] "1" "1" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
## [,31] [,32] [,33]
## [1,] "0.695352209980953" "0.788929985791953" "0.86360600536425"
## [2,] "0.999995646379181" "0.99998895883533" "0.99999742783335"
## [3,] "0.999999999999999" "1" "1"
## [4,] "1" "1" "1"
## [5,] "1" "1" "1"
## [6,] "1" "1" "1"
## [7,] "1" "1" "1"
## [8,] "1" "1" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
## [,34] [,35] [,36]
## [1,] "0.918232211888859" "0.954766685779645" "0.977037776814586"
## [2,] "0.999999945112449" "0.99999998930679" "0.999999998105353"
## [3,] "1" "1" "1"
## [4,] "1" "1" "1"
## [5,] "1" "1" "1"
## [6,] "1" "1" "1"
## [7,] "1" "1" "1"
## [8,] "1" "1" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
## [,37] [,38] [,39]
## [1,] "0.989366488085887" "0.995537086946978" "0.998314841261371"
## [2,] "0.999999999696075" "0.99999999956098" "0.99999999994326"
## [3,] "1" "1" "1"
## [4,] "1" "1" "1"
## [5,] "1" "1" "1"
## [6,] "1" "1" "1"
## [7,] "1" "1" "1"
## [8,] "1" "1" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
## [,40] [,41] [,42]
## [1,] "0.999432415550238" "0.999831203863129" "0.999956225597192"
## [2,] "0.999999999999349" "0.99999999999934" "0.99999999999994"
## [3,] "1" "1" "1"

```

```

## [4,] "1" "1" "1"
## [5,] "1" "1" "1"
## [6,] "1" "1" "1"
## [7,] "1" "1" "1"
## [8,] "1" "1" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
## [,43] [,44] [,45]
## [1,] "0.999990255203665" "0.999998175695808" "0.999999720739557"
## [2,] "1" "1" "1"
## [3,] "1" "1" "1"
## [4,] "1" "1" "1"
## [5,] "1" "1" "1"
## [6,] "1" "1" "1"
## [7,] "1" "1" "1"
## [8,] "1" "1" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
## [,46] [,47] [,48]
## [1,] "0.999999966438242" "0.999999997030733" "0.999999999828069"
## [2,] "1" "1" "1"
## [3,] "1" "1" "1"
## [4,] "1" "1" "1"
## [5,] "1" "1" "1"
## [6,] "1" "1" "1"
## [7,] "1" "1" "1"
## [8,] "1" "1" "1"
## [9,] "1" "1" "1"
## [10,] "1" "1" "1"
## [,49] [,50]
## [1,] "0.999999999995112" "1"
## [2,] "1" "1"
## [3,] "1" "1"
## [4,] "1" "1"
## [5,] "1" "1"
## [6,] "1" "1"
## [7,] "1" "1"
## [8,] "1" "1"
## [9,] "1" "1"
## [10,] "1" "1"

```

3 The book is here

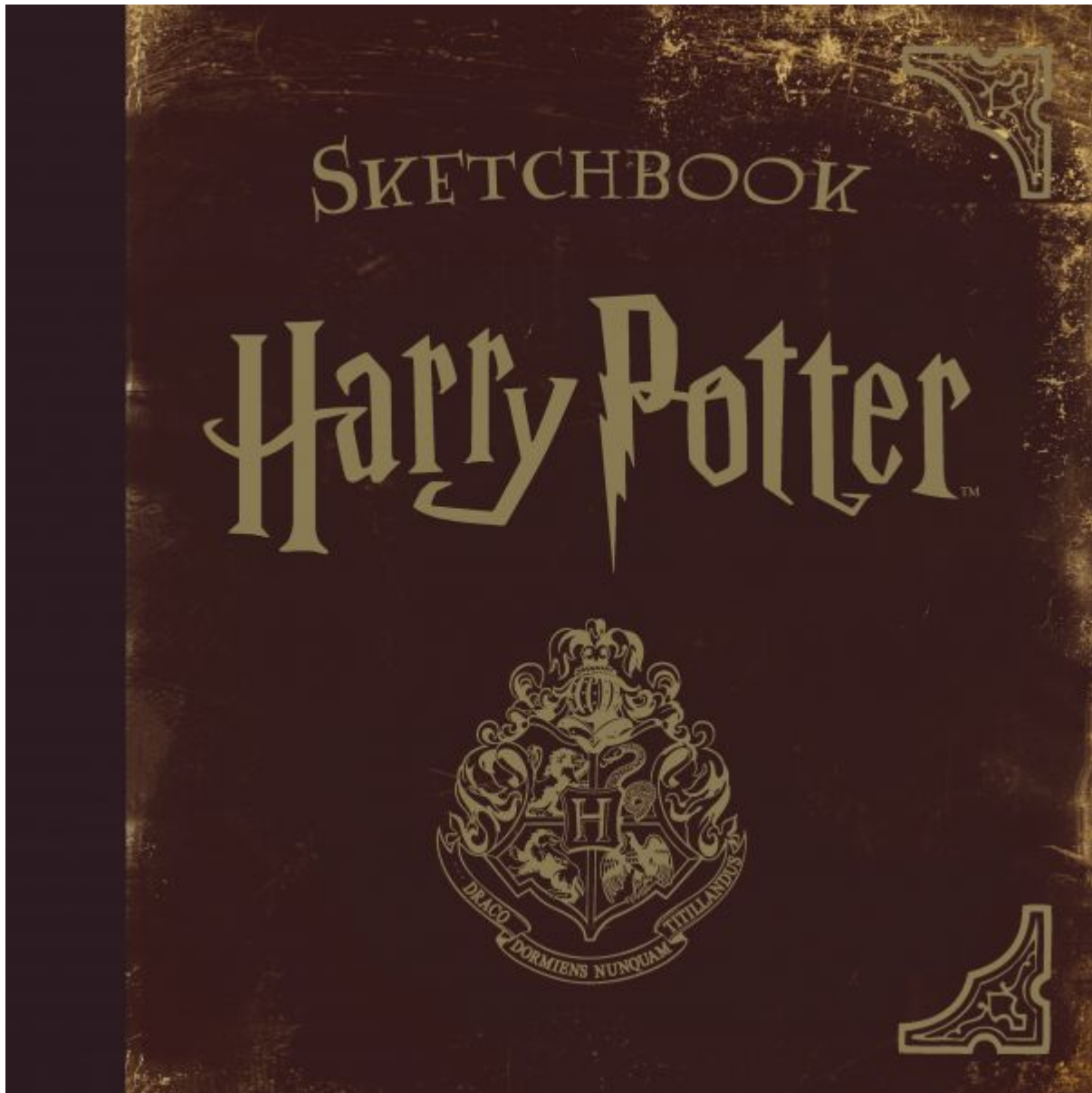


Figure 1: All statistics magic and secrets are in the book.