BAN 602

Homework Assignment 2

Group 2

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Problem 1 a) : Data analysis of appeal and case reversal in the three courts handled by 38 judges

Below is a tabular summary showing the probability of cases being appealed and reversed in three different courts

	Common Pleas Court	Domestic Court	Municipal Court
Appealed	0.04009557	0.003475524	0.004609824
Reversed	0.004528388	0.0005573953	0.0009588435

Problem 1 (b,c,d) :

Below are the probabilities of a

- case being appealed for each judge (Appealed Probability)
- case being reversed for each judge (Reversed Probability)
- probability of reversal given an appeal for each judge (Reversal Probability When Appealed).

Common Court:

Rank	Judge	Disposed	Appealed	Reversed	Appealed Probability	Reversed Probability	Reversal Probability When Appealed
1	Ralph Winkler	3089	88	6	0.02848818	0.00194238	0.06818182
2	Thomas Nurre	3000	121	6	0.04033333	0.002	0.04958678
3	Robert Kraft	3138	127	7	0.04047164	0.00223072	0.05511811
4	Thomas Crush	3372	119	10	0.03529063	0.0029656	0.08403361
5	Timothy Hogan	1954	60	7	0.03070624	0.0035824	0.11666667
6	Fred Cartolan	3037	137	12	0.04511031	0.00395127	0.08759124

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7	John O'Connor	2969	129	12	0.04344897	0.00404176	0.09302326
8	Ann Marie Tracey	3141	127	13	0.04043298	0.00413881	0.1023622
9	Arthur Ney Jr.	3219	125	14	0.03883194	0.00434918	0.112
10	Richard Niehaus	3353	137	16	0.04085893	0.00477185	0.11678832
11	Robert Ruehlman	3205	145	18	0.04524181	0.00561622	0.12413793
12	Patrick Dinkelacker	1258	44	8	0.03497615	0.0063593	0.18181818
13	Norbert Nadel	2959	131	20	0.04427171	0.00675904	0.15267176
14	William Morrissey	3032	121	22	0.03990765	0.00725594	0.18181818
15	William Mathews	2264	91	18	0.04019435	0.00795053	0.1978022
16	J. Howard Sundermann Jr.	955	60	10	0.06282723	0.0104712	0.16666667

Domestic Court:

Rank	Judge	Disposed	Appealed	Reversed	Appealed Probability	Reversed Probability	Reversal Probability When Appealed
1	Ronald Panioto	12970	32	3	0.00246723	0.0002313	0.09375
2	Penelope Cunningham	2729	7	1	0.00256504	0.00036643	0.14285714
3	Patrick Dinkelacker	6001	19	4	0.00316614	0.00066656	0.21052632
4	Deborah Gaines	8799	48	9	0.00545517	0.00102284	0.1875

Municipal Court:

Rank	Judge	Disposed	Appealed	Reversed	Appealed Probability	Reversed Probability	Reversal Probability When Appealed
1	Karla Grady	5253	6	0	0.0011422	0	0
2	Deidra Hair	2532	5	0	0.00197472	0	0
3	Beth Mattingly	2971	13	1	0.00437563	0.00033659	0.07692308
4	James Patrick Kenney	2798	6	1	0.00214439	0.0003574	0.16666667
5	Dennis Helmick	7900	29	5	0.00367089	0.00063291	0.17241379
6	David Davis	7736	43	5	0.00555843	0.00064633	0.11627907

7	Mike Allen	6149	43	4	0.00699301	0.00065051	0.09302326
8	John A. West	2797	4	2	0.0014301	0.00071505	0.5
9	David Stockdale	5371	22	4	0.00409607	0.00074474	0.18181818
10	Timothy Black	7954	41	6	0.00515464	0.00075434	0.14634146
11	Nadine Allen	7812	34	6	0.00435228	0.00076805	0.17647059
12	Melba Marsh	8219	34	7	0.00413676	0.00085169	0.20588235
13	Timothy Hogan	2308	13	2	0.00563258	0.00086655	0.15384615
14	William Mallory	8277	38	9	0.00459104	0.00108735	0.23684211
15	Mark Schweikert	5403	33	6	0.00610772	0.00111049	0.18181818
16	Mark Painter	2239	7	3	0.0031264	0.00133988	0.42857143
17	Jack Rosen	7790	41	13	0.00526316	0.00166881	0.31707317
18	Joseph Luebbers	4698	25	8	0.00532141	0.00170285	0.32
19	Albert Mestemaker	4975	28	9	0.00562814	0.00180905	0.32142857
20	Leslie Isaiah Gaines	5282	35	13	0.00662628	0.00246119	0.37142857

Problem 1 e)

The ranking of the judges are listed in the above tables.

Criteria :

- Probability of a case being reversed across all the disposed cases.
- When the probability of the reversal is the same , we use the probability of a case being appealed across all the disposed cases.

Rationale :

- When the probability of a case being reversed is low , it indicates that the original judgements were accurate.
- We did not choose the probability of reversal when appealed as it does not take into consideration the number of disposed cases.
    - For example, a judge that has disposed 100 cases with 50 appeals and 30 reversals will be treated the same as a judge that has disposed 1000 cases with 50 appeals and 30 reversals if we take the probability of reversal when appealed as the main criteria.
- When the probability of reversal is the same among the judges, we take into consideration the probability of a case being appealed across all disposed cases as that indicates dissatisfaction with the judgement.

Problem 2:

Let P(A1) be the probability that any particular cardholder will default

P(A1) = 0.05

Let P(A2) be the prior probability probability that any particular cardholder will not default

P(A2) = 0.95

Let P(B | A1) be the probability of missing a monthly payment for those who default

P(B | A1) = 1

P(A2) = 0.05 and

Let P(B | A2) be the probability of missing a monthly payment for customers who do not default

P(B | A2) = 0.20

a. Posterior probability that the customer will default , given that a customer missed one or more monthly payments

A1 = The customer will default

B = The customer missed one or more monthly payments

By using Bayer's theorm,

$$P(A1 \mid B) = \frac{P(A1)\,P(B \mid A1)}{P(A1)\,P(B \mid A1) + P(A2)\,P(B \mid A2)}$$

= 0.05*1 / (0.05*1) + (0.95*0.20)

= 0.20833

Based on the obtained probability which is greater than .20 , It is better to recall its card.

Problem 3:

a) As mentioned in the question,Tina Finkel, VP of Production for GGG, has suggested that the company will the weight of banana flavored marshmallows in a random sample of 25 boxes of Go Bananas! on a weekly basis. Each week, GGG can count the number of boxes out of the 25 boxes in the sample that contain less than 1.6 ounces or more than 2.4 ounces of banana flavored marshmallows.GGG management has designed the production that each box has only probability of .08 to get failed .The management has decided to shut down the production if atleast 5 boxes failed to meet the standard of banana flavoured marshmallows weight .

Let 's consider the below table for a weekly sample of 25 count of GGG cereal boxes -

Good production boxes	Bad production boxes	Production stopped(Y or N)
25	0	no
24	1	No
23	2	No
22	3	No
21	4	No

If the Bad boxes count will be 5 or more then GGG has to shut down production.

So it is a cumulative binomial probability case which can be solved using pbinom in R script.

So the probability of weekly sample resulted in shut down is

1-pbinom(4,size =25,prob=.08) which comes around **0.04514354.**

So the probability that the weekly sample results in shutdown is 4.5 percent.

While going through the case study we observe that GGG management has decided about boxes count to be at least 5 to suspend the production .there is no clear picture on why they have chosen the count 5 .Shutting down a production based on a weekly sample is normally not a good idea . GGG company might have thought that having more than 5 boxes with bad marshmallow weight will impact the sell and continuation of production might cause them loss in business.Again while designing the production line ,there is no datapoint or information to support their decision that make GGG management to design the production to have only 8% of failure .

b) Now GGG management wants to shut down production of Go Bananas! no more than 1% of the time when the production process is working properly.So now the probability that weekly sample will result in shut down if production line is working properly is .01.

While using the following R script

1-pbinom(6,size =25,prob=.08) we found the value to be .002.

So, **at least 7 boxes** in the weekly sample must fail to meet the standard weight in order for production to be shutdown so that the probability that a weekly sample will result in a shutdown of production is less than 1%.

c) For this question we have to find the probability that a sample will fail to meet the standard weight of banana-flavored marshmallows if the production process is working,such that the probability that a weekly sample will result in a shutdown of production if the production process is working properly is less than 1% or Probability that at least 5 boxes out of 25 samples fail to meet the standard weight .

Using pbinom function of Rscript

Here we know total size is =25., Chosen from sample is =5 , Pbinom =.01 or less

We need to find out Probability value.After calculation we find the value to be 0.054

Hence Ms Finkel must reduce the percentage of 16 ounces boxes of Go bananas to **5.4 %.**

Problem 4 (R functions used are specified below)

a) The probability that a household views television more than 3 hours a day : **0.9838226**

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1-pnorm(3 ,8.35 ,2.5)
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b) The probability that a household spends 5 – 10 hours watching television more a day : **0.6552504**

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pnorm(10 ,8.35 ,2.5) - pnorm(5 ,8.35 ,2.5)
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c) Number of hours of television a household must view in order to be in the top 3% of all television viewing households : **13.05198**

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qnorm(0.97, 8.35, 2.5)
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