

CSE 107 LAB 3

Simulation Results for Lottery Play and Wins

The simulation was conducted over 100,000 trials to estimate the joint and conditional probability mass functions (PMFs) for Joe Lucky's lottery plays and wins over a period of 7 weeks. The probabilities of playing in any given week and winning when playing were set to $p = 0.6$ and $q = 0.7$, respectively.

Joint PMF of X and Y

The joint PMF $p_{X,Y}(x,y)$ represents the probability of Joe playing x times and winning y times within the 7-week period. The table below shows the experimentally derived probabilities:

y:	0	1	2	3	4	5	6	7
x	-----							
0	0.0015							
1	0.0050	0.0116						
2	0.0067	0.0324	0.0376					
3	0.0050	0.0360	0.0859	0.0657				
4	0.0024	0.0220	0.0759	0.1210	0.0707			
5	0.0006	0.0071	0.0351	0.0809	0.0946	0.0439		
6	0.0001	0.0015	0.0076	0.0250	0.0403	0.0401	0.0155	
7	0.0000	0.0001	0.0007	0.0026	0.0067	0.0092	0.0067	0.0022

Conditional PMF of X given Y

The conditional PMF $p_{X|Y}(x|y)$ represents the probability of Joe playing x times given that he won y times. The table below summarizes these probabilities:

y:	0	1	2	3	4	5	6	7
x	-----							
0	0.0703							
1	0.0455	0.1049						
2	0.0278	0.1333	0.1548					
3	0.0171	0.1219	0.2911	0.2226				
4	0.0112	0.1034	0.3574	0.5697	0.3331			
5	0.0064	0.0764	0.3762	0.8674	1.0148	0.4704		
6	0.0063	0.0669	0.3420	1.1203	1.8110	1.8012	0.6970	
7	0.0044	0.0667	0.3156	1.1556	2.9644	4.1022	3.0000	1.0000

Conditional PMF of Y given X

The conditional PMF $p_{Y|X}(y|x)$ describes the probability of Joe winning y times given that he played x times. The probabilities are as follows:

y:	0	1	2	3	4	5	6	7
x	-----							
0	1.0000							
1	0.3027	0.6973						
2	0.0880	0.4221	0.4899					
3	0.0262	0.1868	0.4460	0.3410				
4	0.0081	0.0752	0.2600	0.4144	0.2423			
5	0.0023	0.0272	0.1341	0.3084	0.3601	0.1679		
6	0.0006	0.0081	0.0413	0.1076	0.2174	0.2726	0.3524	
7	0.0000	0.0011	0.0048	0.0178	0.0458	0.0629	0.0458	0.8218

These tables provide a comprehensive view of the distributions of playing and winning probabilities over the 7-week period, based on the given parameters $n = 7$, $p = 0.6$, and $q = 0.7$.