

5.14

(a) $P(X \geq 4) = 1 - P(X \leq 3) = 1 - \sum_{x=0}^3 b(x; 4, 0.9)$

$$= 1 - 0.3439 = 0.6561 \# \quad \underline{A: 0.6561}$$

(b) $P(4-1) = P(3-1) P(\text{win}) = b(3; 4, 0.9) \times 0.9$

$$= \binom{4}{3} (0.9)^3 (0.1) \times 0.9 = 4 (0.9)^4 (0.1) = 0.2624$$

$$P(4-2) = P(3-2) P(\text{win}) = b(3; 5, 0.9) \times 0.9$$
$$= \binom{5}{3} (0.9)^3 (0.1)^2 \times 0.9 = \frac{5 \times 4 \times 3}{3 \times 2 \times 1} \times (0.9)^4 (0.1)^2 = 0.0656$$

$$P(4-3) = P(3-3) P(\text{win}) = b(3; 6, 0.9) \times 0.9$$
$$= \binom{6}{3} (0.9)^3 (0.1)^3 \times 0.9 = \frac{6 \times 5 \times 4}{3 \times 2 \times 1} \times (0.9)^4 (0.1)^3 = 0.0131$$

$P(\text{Bulls win the initial best-of-7 playoff series})$

$$= 0.6561 + 0.2624 + 0.0656 + 0.0131 = 0.9972 \# \quad \underline{A: 0.9972}$$

(c) Round the 87.7 to 90. #

5.26 $P = \frac{6}{10} = 0.6$

(a) $P(X=6) = b(6; 8, 0.6) = \binom{8}{6} (0.6)^6 (1-0.6)^2 = \frac{8!}{6! 2!} (0.6)^6 (0.4)^2$

$$= 0.2090 \# \quad \underline{A: 0.2090}$$

(b) $P(X=6) = b(6; 8, 0.6) = \sum_{x=0}^6 b(x; 8, 0.6) - \sum_{x=0}^5 b(x; 8, 0.6)$

$$= 0.8936 - 0.6846 = 0.2090 \# \quad \underline{A: 0.2090}$$

$$5.50 \quad p = \frac{1}{2} \quad q = 1 - \frac{1}{2} = \frac{1}{2}$$

$$(a) \quad b^*(7; 3, \frac{1}{2}) = \binom{7-1}{3-1} \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^4 = \binom{6}{2} \left(\frac{1}{2}\right)^7 = \frac{6 \times 5}{2} \left(\frac{1}{2}\right)^7 = 0.1172 \#$$

A: 0.1172

$$(b) \quad b^*(4; 1, \frac{1}{2}) = \binom{4-1}{1-1} \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right)^3 = \binom{3}{0} \left(\frac{1}{2}\right)^4 = \frac{1}{16} = 0.0625 \#$$

A: 0.0625

5.56

$$(a) \quad P(X=5) = p(5; 3) = \frac{e^{-3} (3)^5}{5!} = 0.1008 \#$$

A: 0.1008

$$(b) \quad P(X < 3) = P(X \leq 2) = P(X=0) + P(X=1) + P(X=2)$$

$$= p(0; 3) + p(1; 3) + p(2; 3)$$

$$= \frac{e^{-3} (3)^0}{0!} + \frac{e^{-3} (3)^1}{1!} + \frac{e^{-3} (3)^2}{2!} = 0.4232 \#$$

A: 0.4232

$$(c) \quad P(X \geq 2) = 1 - P(X \leq 1) = 1 - p(0; 3) - p(1; 3)$$

$$= 1 - \frac{e^{-3} (3)^0}{0!} - \frac{e^{-3} (3)^1}{1!} = 0.80085 \#$$

A: 0.80085

5.80

$$(a) \quad P(X \leq 4) = \sum_{x=0}^4 \frac{e^{-2.7} 2.7^x}{x!} = 0.8629 \#$$

A: 0.8629

$$(b) \quad P(X < 2) = \sum_{x=0}^1 \frac{e^{-2.7} 2.7^x}{x!} = 0.2487 \#$$

A: 0.2487

$$(c) \quad 2.7 \times 5 = 13.5$$

$$P(X > 10) = 1 - P(X \leq 10) = 1 - \sum_{x=0}^{10} \frac{e^{-13.5} 13.5^x}{x!} = 1 - 0.2112 = 0.7888 \#$$

A: 0.7888

1.(a)

1.(a)

input x = 2

input n = 4

input p = 0.75

1.(a) Binomial distribution = 0.210938

1.(b)

1.(b)

input x = 6

input l = 4

input t = 1

1.(b) Poisson distribution = 0.104196

1.(c)

Variables - Table_1_c												
Table_1_c												
35x12 table												
1 n	2 r	3 p_0_10	4 p_0_20	5 p_0_25	6 p_0_30	7 p_0_40	8 p_0_50	9 p_0_60	10 p_0_70	11 p_0_80	12 p_0_90	
1	1	0	0.9000	0.8000	0.7500	0.7000	0.6000	0.5000	0.4000	0.3000	0.2000	0.1000
2	1	1	1	1	1	1	1	1	1	1	1	1
3	2	0	0.8100	0.6400	0.5625	0.4900	0.3600	0.2500	0.1600	0.0900	0.0400	0.0100
4	2	1	0.9900	0.9600	0.9375	0.9100	0.8400	0.7500	0.6400	0.5100	0.3600	0.1900
5	2	2	1	1.0000	1	1.0000	1	1	1	1	1	1
6	3	0	0.7290	0.5120	0.4219	0.3430	0.2160	0.1250	0.0640	0.0270	0.0080	1.0000e-...
7	3	1	0.9720	0.8960	0.8438	0.7840	0.6480	0.5000	0.3520	0.2160	0.1040	0.0280
8	3	2	0.9990	0.9920	0.9844	0.9730	0.9360	0.8750	0.7840	0.6570	0.4880	0.2710
9	3	3	1.0000	1.0000	1	1.0000	1	1	1	1	1	1
10	4	0	0.6561	0.4096	0.3164	0.2401	0.1296	0.0625	0.0256	0.0081	0.0016	1.0000e-...
11	4	1	0.9477	0.8192	0.7383	0.6517	0.4752	0.3125	0.1792	0.0837	0.0272	0.0037
12	4	2	0.9963	0.9728	0.9492	0.9163	0.8208	0.6875	0.5248	0.3483	0.1808	0.0523
13	4	3	0.9999	0.9984	0.9961	0.9919	0.9744	0.9375	0.8704	0.7599	0.5904	0.3439
14	4	4	1.0000	1.0000	1	1.0000	1.0000	1	1.0000	1	1	1
15	5	0	0.5905	0.3277	0.2373	0.1681	0.0778	0.0313	0.0102	0.0024	3.2000e-...	1.0000e-...
16	5	1	0.9185	0.7373	0.6328	0.5282	0.3370	0.1875	0.0870	0.0308	0.0067	4.6000e-...
17	5	2	0.9914	0.9421	0.8965	0.8369	0.6826	0.5000	0.3174	0.1631	0.0579	0.0086
18	5	3	0.9995	0.9933	0.9844	0.9692	0.9130	0.8125	0.6630	0.4718	0.2627	0.0815
19	5	4	1.0000	0.9997	0.9990	0.9976	0.9898	0.9688	0.9222	0.8319	0.6723	0.4095
20	5	5	1.0000	1.0000	1	1.0000	1	1	1	1	1	1.0000
21	6	0	0.5314	0.2621	0.1780	0.1176	0.0467	0.0156	0.0041	7.2900e-...	6.4000e-...	1.0000e-...
22	6	1	0.8857	0.6554	0.5339	0.4202	0.2333	0.1094	0.0410	0.0109	0.0016	5.5000e-...
23	6	2	0.9842	0.9011	0.8306	0.7443	0.5443	0.3438	0.1792	0.0705	0.0170	0.0013
24	6	3	0.9987	0.9830	0.9624	0.9295	0.8208	0.6563	0.4557	0.2557	0.0989	0.0158
25	6	4	0.9999	0.9984	0.9954	0.9891	0.9590	0.8906	0.7667	0.5798	0.3446	0.1143
26	6	5	1.0000	0.9999	0.9998	0.9993	0.9959	0.9844	0.9533	0.8824	0.7379	0.4686
27	6	6	1.0000	1.0000	1	1.0000	1.0000	1	1	1	1	1.0000
28	7	0	0.4783	0.2097	0.1335	0.0824	0.0280	0.0078	0.0016	2.1870e-...	1.2800e-...	1.0000e-...
29	7	1	0.8503	0.5767	0.4449	0.3294	0.1586	0.0625	0.0188	0.0038	3.7120e-...	6.4000e-...
30	7	2	0.9743	0.8520	0.7564	0.6471	0.4199	0.2266	0.0963	0.0288	0.0047	1.7650e-...
31	7	3	0.9973	0.9667	0.9294	0.8740	0.7102	0.5000	0.2898	0.1260	0.0333	0.0027
32	7	4	0.9998	0.9953	0.9871	0.9712	0.9037	0.7734	0.5801	0.3529	0.1480	0.0257
33	7	5	1.0000	0.9996	0.9987	0.9962	0.9812	0.9375	0.8414	0.6706	0.4233	0.1497
34	7	6	1.0000	1.0000	0.9999	0.9998	0.9984	0.9922	0.9720	0.9176	0.7903	0.5217
35	7	7	1.0000	1.0000	1	1.0000	1.0000	1	1.0000	1	1	1

1.(d)

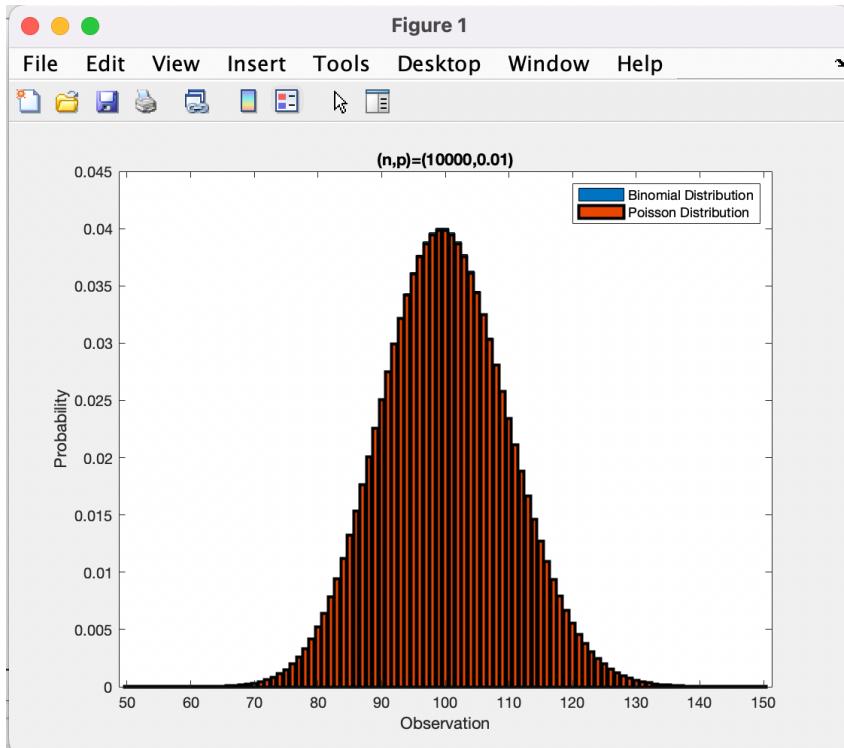
Variables - Table_1_d

Table_1_d 25x10 table

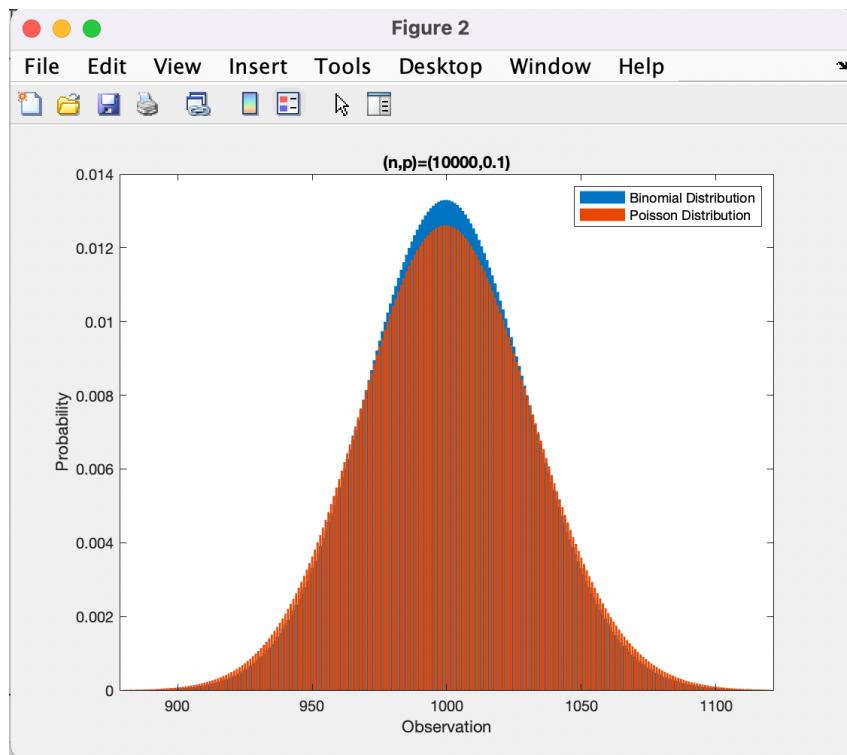
	1 r_d	2 u_5_5	3 u_6_0	4 u_6_5	5 u_7_0	6 u_7_5	7 u_8_0	8 u_8_5	9 u_9_0	10 u_9_5
1	0	0.0041	0.0025	0.0015	9.1188e-04	5.5308e-04	3.3546e-04	2.0347e-04	1.2341e-04	7.4852e-05
2	1	0.0266	0.0174	0.0113	0.0073	0.0047	0.0030	0.0019	0.0012	7.8594e-04
3	2	0.0884	0.0620	0.0430	0.0296	0.0203	0.0138	0.0093	0.0062	0.0042
4	3	0.2017	0.1512	0.1118	0.0818	0.0591	0.0424	0.0301	0.0212	0.0149
5	4	0.3575	0.2851	0.2237	0.1730	0.1321	0.0996	0.0744	0.0550	0.0403
6	5	0.5289	0.4457	0.3690	0.3007	0.2414	0.1912	0.1496	0.1157	0.0885
7	6	0.6860	0.6063	0.5265	0.4497	0.3782	0.3134	0.2562	0.2068	0.1649
8	7	0.8095	0.7440	0.6728	0.5987	0.5246	0.4530	0.3856	0.3239	0.2687
9	8	0.8944	0.8472	0.7916	0.7291	0.6620	0.5925	0.5231	0.4557	0.3918
10	9	0.9462	0.9161	0.8774	0.8305	0.7764	0.7166	0.6530	0.5874	0.5218
11	10	0.9747	0.9574	0.9332	0.9015	0.8622	0.8159	0.7634	0.7060	0.6453
12	11	0.9890	0.9799	0.9661	0.9467	0.9208	0.8881	0.8487	0.8030	0.7520
13	12	0.9955	0.9912	0.9840	0.9730	0.9573	0.9362	0.9091	0.8758	0.8364
14	13	0.9983	0.9964	0.9929	0.9872	0.9784	0.9658	0.9486	0.9261	0.8981
15	14	0.9994	0.9986	0.9970	0.9943	0.9897	0.9827	0.9726	0.9585	0.9400
16	15	0.9998	0.9995	0.9988	0.9976	0.9954	0.9918	0.9862	0.9780	0.9665
17	16	0.9999	0.9998	0.9996	0.9990	0.9980	0.9963	0.9934	0.9889	0.9823
18	17	1.0000	0.9999	0.9998	0.9996	0.9992	0.9984	0.9970	0.9947	0.9911
19	18	1.0000	1.0000	0.9999	0.9999	0.9997	0.9993	0.9987	0.9976	0.9957
20	19	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9995	0.9989	0.9980
21	20	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9991
22	21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996
23	22	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999
24	23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999
25	24	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

1.(e)

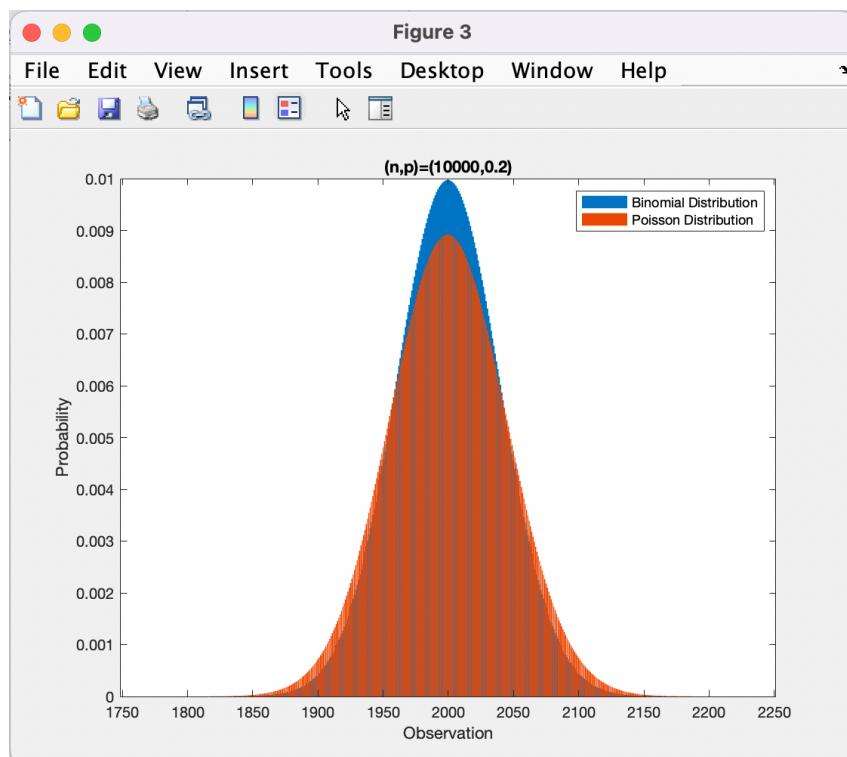
$$(n, p) = (10^4, 0.01)$$



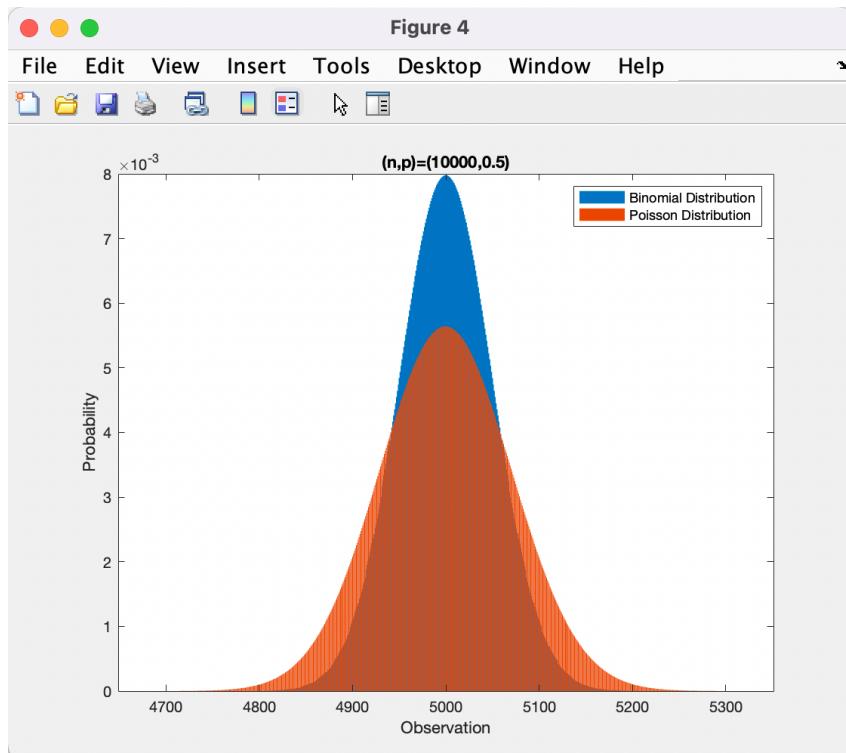
$$(n, p) = (10^4, 0.1)$$



$$(n, p) = (10^4, 0.2)$$

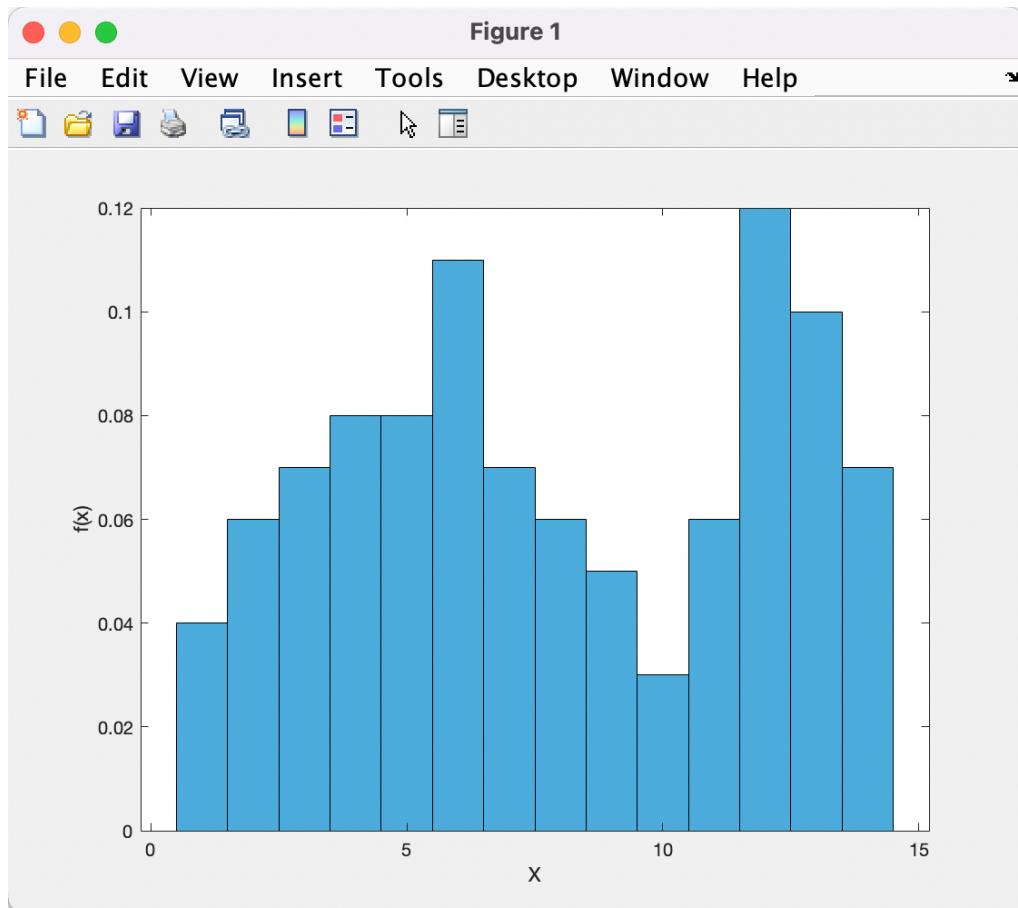


$$(n, p) = (10^4, 0.5)$$

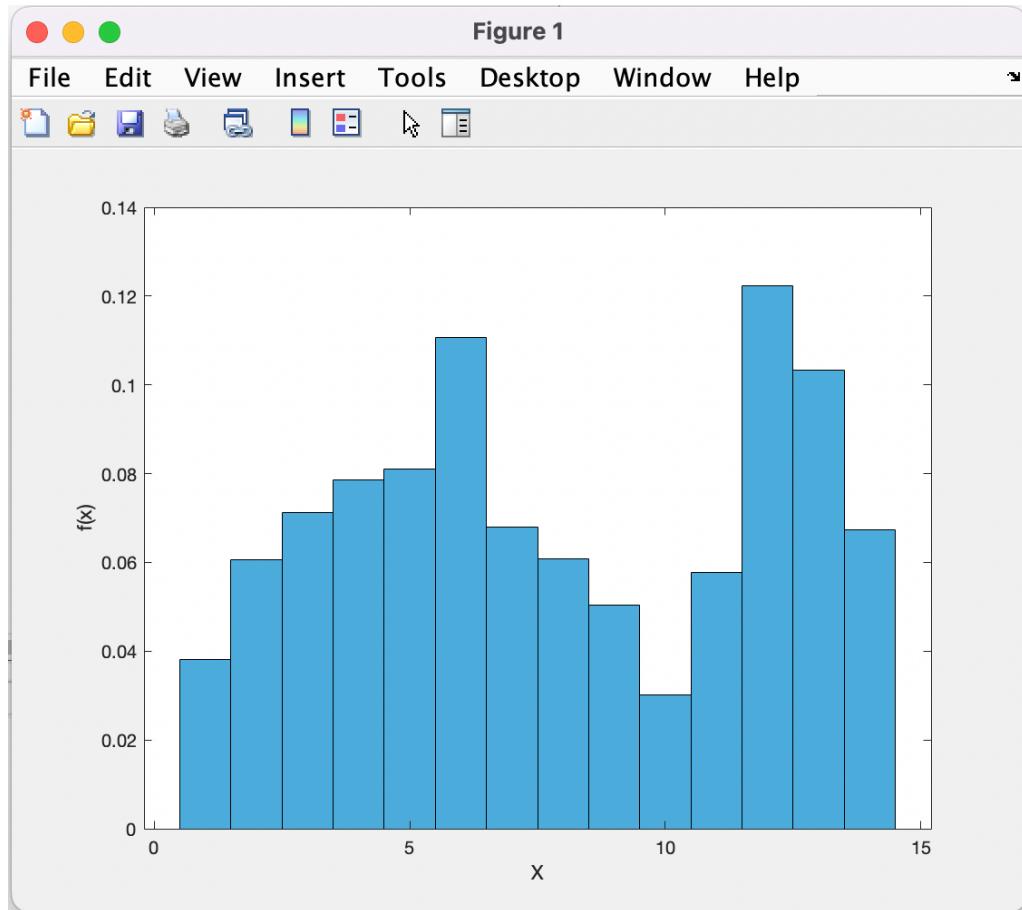


上面的四張圖分別代表不同的 p 值， n 值皆為 10000，藍色代表 Binomial Distribution，紅色代表 Poisson Distribution，Poisson Distribution 的 λ 是由 $n \cdot p$ 所得出，綜合上面的四張圖，我們可以發現， p 越小與 $1-p$ 越大時，Binomial Distribution 和 Poisson Distribution 之間的誤差也越小，當 $p=0.5$ 時，誤差會是最大。

2.(a)



2.(b)



在比較 2.(a)和 2.(b)的 relative frequency plot 後，我們可以發現，因為 2.(b)所畫出來的圖是隨機的，造成兩者的結果有些許誤差，但這個誤差並不大， $f(x)$ 的結果大致相同，非常接近 2.(a)的值。