Probability for Computing

Practical File

BSC CS

SUBMITTEED BY
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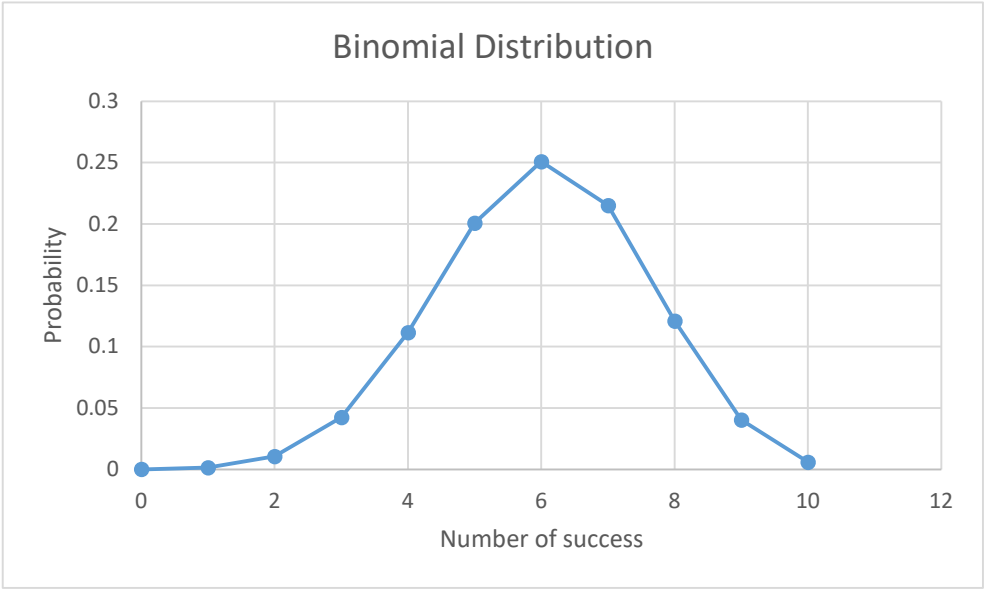
1. Plotting and fitting of Binomial distribution and graphical representation of probabilities

Number of Trials 10 **Probability of Success** 0.6

X	P(X)
0	0.000105
1	0.001573
2	0.010617
3	0.042467
4	0.111477
5	0.200658
6	0.250823
7	0.214991
8	0.120932
9	0.040311
10	0.006047



2. Plotting and fitting of multinomial distribution and graphical representation of probabilities.

Multinomial Distribution : It describes the probability of obtaining a specific no. of counts for k differnet outcomes has a fixed probability of occurrence. P = n!p1^x1 p2^x2 ... pk^xk/x1!x2!...xk!

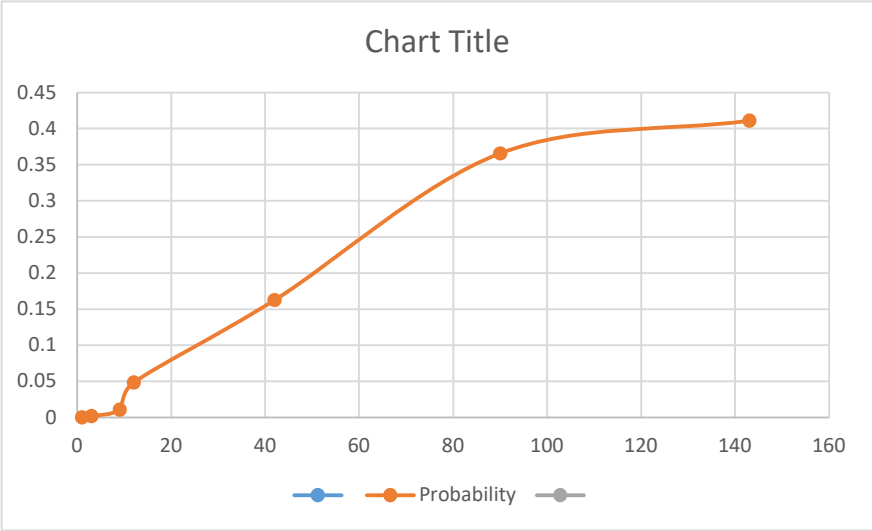
Ques: If a bag contains 8 balls, 3 red, 1 green, 4 blue. Two balls are drawn and experiment is repeated for 10 times. What is the probability that 4 red and 6 blue balls are drawn.

x1	4	210	p1^x1	0.02
x2	0		p2^x2	1.00
x3	6		p3^x3	0.02
p1	3/8			
p2	1/8			
p3	1/2	Probability	0.064888	

3. Plotting and fitting of Poisson distribution and graphical representation of probabilities.

Mistakes	No of Days	fi*xi	Probability	Theoritical Frequency
0	143	0	0.410655753	123.1967258
1	90	90	0.36548362	109.645086
2	42	84	0.162640211	48.79206326
3	12	36	0.048249929	14.47497877
4	9	36	0.010735609	3.220682776
5	3	15	0.001910938	0.573281534
6	1	6	0.000283456	0.085036761
sigma(fi)	300	Sigma(fi*x	267	

mean	0.89



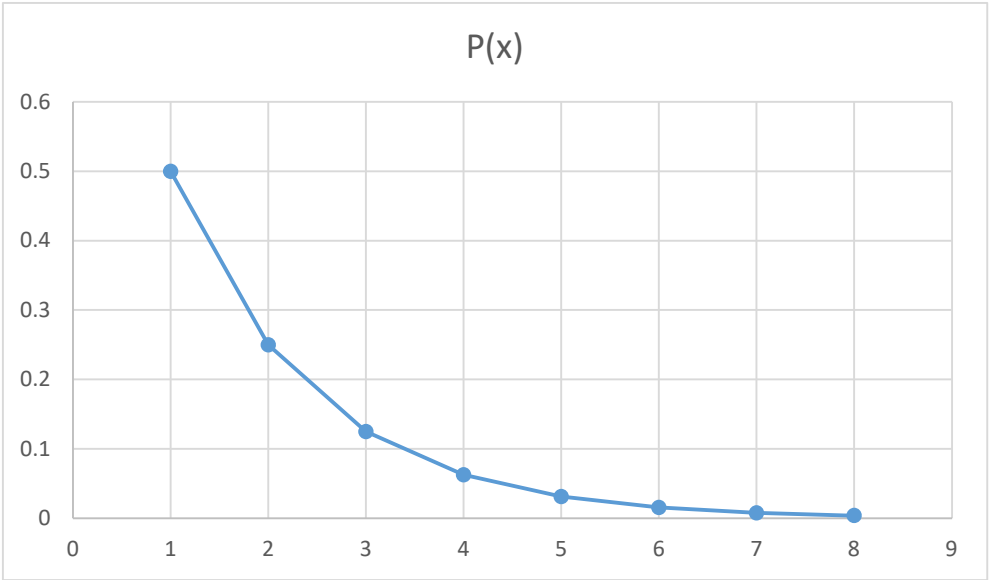
4. Plotting and fitting of Geometric distribution and graphical representation of probabilities.

n	10

p	0.5

q 0.5

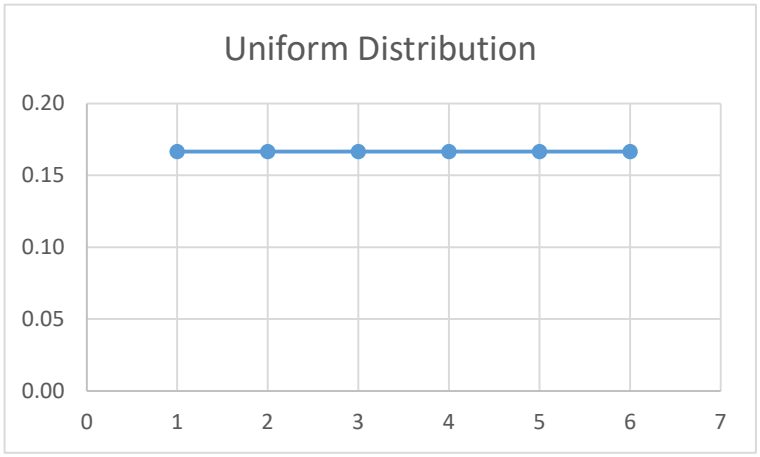
x	P(x)
1	0.5
2	0.25
3	0.125
4	0.0625
5	0.03125
6	0.015625
7	0.007813
8	0.003906
9	0.001953
10	0.000977



5. Plotting and fitting of Uniform distribution and graphical representation of probabilities.

Throwing of a die

Outcome	Probability
1	0.17
2	0.17
3	0.17
4	0.17
5	0.17
6	0.17

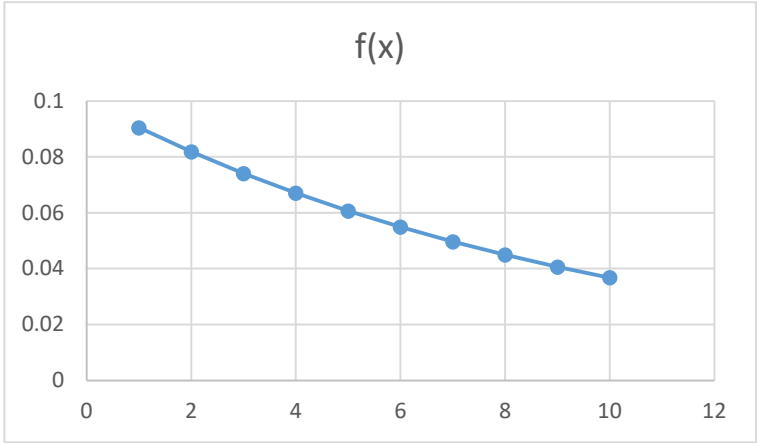


6. Plotting and fitting of exponential distribution and graphical representation of probabilities.

$$f(x) = \lambda * e^{(-\lambda * x)}$$

λ	0.1
f(1)	0.090484

x	f(x)
1	0.090484
2	0.081873
3	0.074082
4	0.067032
5	0.060653
6	0.054881
7	0.049659
8	0.044933
9	0.040657
10	0.036788

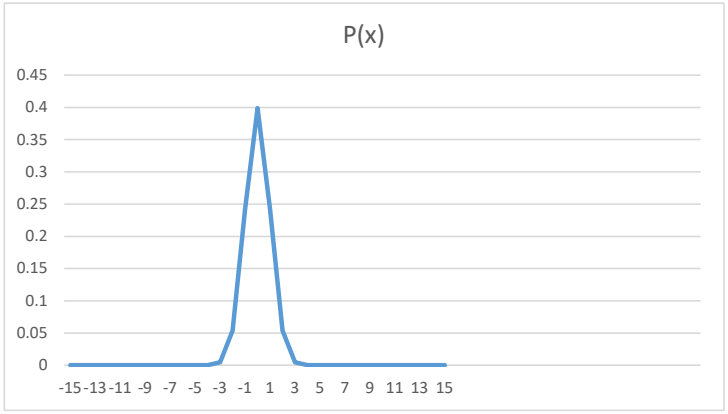


7. Plotting and fitting of Normal distribution and graphical representation of probabilities.

$$f(x) = (1 / (\sigma * \sqrt{(2\pi)})) * e^{((-1/2) * ((x - \mu) / \sigma)^2)}$$

σ	1
μ	0

x	P(x)
-15	5.53E-50
-14	1.1E-43
-13	8E-38
-12	2.15E-32
-11	2.12E-27
-10	7.69E-23
-9	1.03E-18
-8	5.05E-15
-7	9.13E-12
-6	6.08E-09
-5	1.49E-06
-4	0.000134
-3	0.004432
-2	0.053991
-1	0.241971
0	0.398942
1	0.241971
2	0.053991
3	0.004432
4	0.000134
5	1.49E-06
6	6.08E-09
7	9.13E-12
8	5.05E-15
9	1.03E-18
10	7.69E-23
11	2.12E-27
12	2.15E-32
13	8E-38
14	1.1E-43
15	5.53E-50

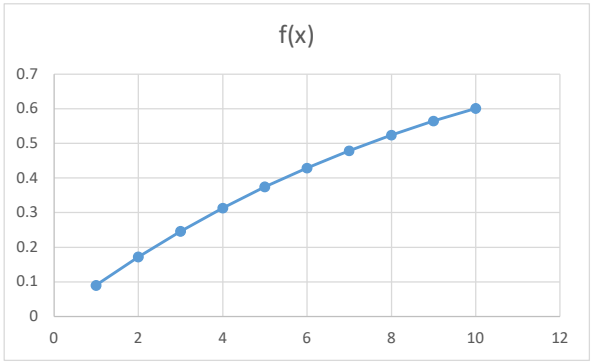


8.1 . Calculation of cumulative distribution functions for Exponential distribution.

$f(x) = \lambda * e^{(-\lambda * x)}$

λ	0.1
f(1)	0.090484

x	f(x)
1	0.090484
2	0.172357
3	0.246439
4	0.313471
5	0.374124
6	0.429005
7	0.478663
8	0.523596
9	0.564253
10	0.601041

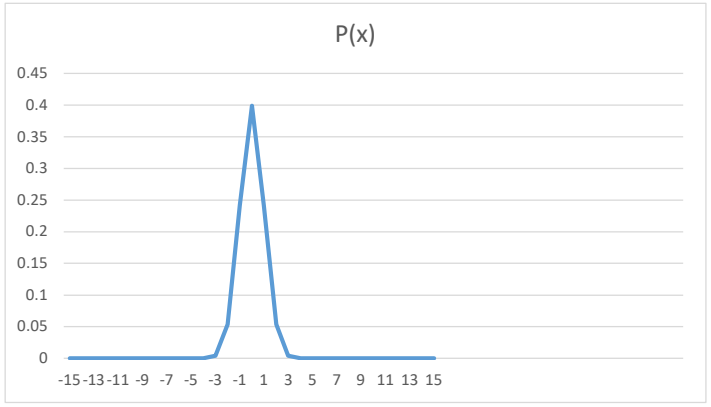


8.2 . Calculation of cumulative distribution functions for Uniform distribution.

$$f(x) = (1 / (\sigma * \sqrt{(2\pi)})) * e^{((-1/2) * ((x - \mu) / \sigma)^2)}$$

σ	1
μ	0

x	P(x)
-15	3.67097E-51
-14	7.79354E-45
-13	6.11716E-39
-12	1.77648E-33
-11	1.91066E-28
-10	7.61985E-24
-9	1.12859E-19
-8	6.22096E-16
-7	1.27981E-12
-6	9.86588E-10
-5	2.86652E-07
-4	3.16712E-05
-3	0.001349898
-2	0.022750132
-1	0.158655254
0	0.5
1	0.841344746
2	0.977249868
3	0.998650102
4	0.999968329
5	0.999999713
6	0.999999999
7	1
8	1
9	1
10	1
11	1
12	1
13	1
14	1
15	1



9. Application problems based on the Binomial distribution

Q1 A manufacturing company produces light bulbs, and the probability of a bulb being defective is 0.05. If they produce a batch of 1000 light bulbs, what is the probability that exactly 50 bulbs are defective?

p	0.05
n	1000
r	50
Required Probability	0.057788

Q2 In a local election, a candidate has a 60% chance of winning each vote. If there are 5000 voters, what is the probability that the candidate will win at least 3000 votes?

p	0.06
n	5000
r	3000
Required Probability	0.0000

Q3 A call center receives an average of 10 customer complaints per hour. What is the probability that they will receive exactly 3 complaints in a given hour?

p	0.5
n	10
r	3
Required Probability	0.1172

Q4 A website has a conversion rate of 2%. If 1000 visitors land on the website, what is the probability that exactly 20 of them will make a purchase?

p	0.02
n	1000
r	20
Required Probability	0.0897

Q5 A new drug claims to have a success rate of 75% in treating a certain condition. If 80 patients are randomly selected and treated with the drug, what is the probability that at least 60 of them will be successfully treated?

p	0.75
n	80
r	60
Required Probability	0.1025

10. Application problems based on the Poisson distribution

Q1 Suppose the number of errors on a single page of a book has a poissin distribution with lamda is equal to 1. Calculate that there is atleat 1 error on the page.

		lambda	1
		x	0
Req Prob =	1 - P(x=0)	=	0.632121

Q2 If the number of accidents occuring on the road each day is a poisson distribution with lambda = 3. What is the probability that (a) There is exactly three accident. (b) at most 2 student © No accident occur today

a)There is exactly three accident

		lambda	3
		x	3
Req Prob =	P(x=3)	=	0.224042

b) at most 2 student

	lambda	3
	x (Cumulative)	2
Req Prob =	P(x=0)+P(x=1)+P(x=2)	0.42319

c) No accident occur today

	lambda	3
	x	0
Req Prob =	P(x=0)	0.049787

11. Application problems based on the Normal distribution

Q1 What is the probability of a randomly selected adult male having a height between 170 cm and 180 cm, given that the height distribution follows a normal distribution with a mean of 175 cm and a standard deviation of 7 cm?

lower value	170	upper value	180
	mean	175	
	sd	7	
Req Prob =		0.524949476	

Q2 What is the probability of observing 10 or fewer defects in a production process that has a mean of 8 defects and a standard deviation of 2 defects?

mean	8	
sd	2	
Req Prob =		0.841345

Q2 What is the probability of observing 10 or fewer defects in a production process that has a mean of 8 defects and a standard deviation of 2 defects?

mean	8	
sd	2	
Req Prob =		0.841345

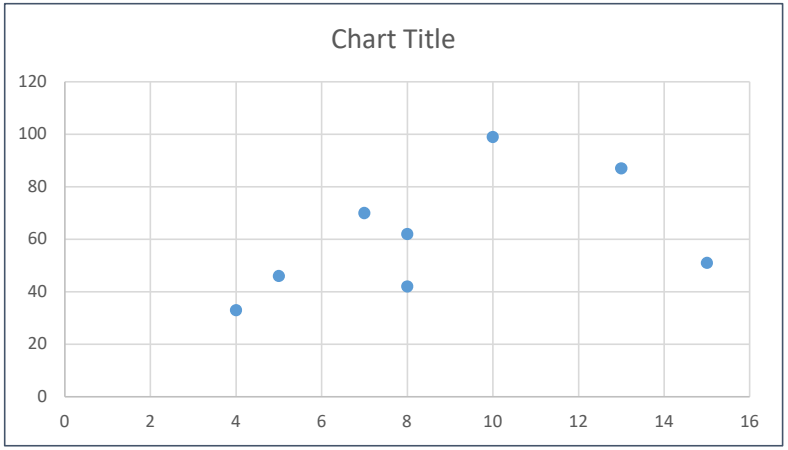
Q3 What is the probability that the time it takes for a customer to complete a transaction at a bank falls between 2.5 and 3.5 minutes, given that the average transaction time is 3 minutes and the standard deviation is 0.5 minutes?

lower value	2.5	upper value	3.5
	mean	3	
	sd	0.5	
Req Prob =		0.682689492	

12. Presentation of bi variant data through scatter diagram and calculation of co variance

(x)Study hours		(y)Marks(100)	x-x'	y-y'	(x-x')(y-y')
	10	99	1.25	37.75	47.1875
	13	87	4.25	25.75	109.4375
	15	51	6.25	-10.25	-64.0625
	8	62	-0.75	0.75	-0.5625
	7	70	-1.75	8.75	-15.3125
	5	46	-3.75	-15.25	57.1875
	4	33	-4.75	-28.25	134.1875
	8	42	-0.75	-19.25	14.4375
average	8.75	61.25		sumation=	282.5

covariance=
35.3125



13. Calculation of karl 's pearson correlation coefficient

X	Y	x = X-x '	y= Y-y'	x^2	y^2	x*y
92	7	56	1.571429	3136	2.469388	88
16	2	-20	-3.42857	400	11.7551	68.57143
19	1	-17	-4.42857	289	19.61224	75.28571
62	8	26	2.571429	676	6.612245	66.85714
83	4	47	-1.42857	2209	2.040816	-67.1429
47	2	11	-3.42857	121	11.7551	-37.7143
15	7	-21	1.571429	441	2.469388	-33
36	8	0	2.571429	0	6.612245	0
26	4	-10	-1.42857	100	2.040816	14.28571
40	7	4	1.571429	16	2.469388	6.285714
0	10	-36	4.571429	1296	20.89796	-164.571
25	1	-11	-4.42857	121	19.61224	48.71429
40	5	4	-0.42857	16	0.183673	-1.71429
3	10	-33	4.571429	1089	20.89796	-150.857
36	5.428571	0	0	9910	129.4286	-87

correlation coefficient
-0.07682

14. Calculate the correlation coefficient of bi variate frequency distribution

(x)Study hours	(y)Marks(100)
10	99
13	87
15	51
8	62
7	70
5	46
4	33
8	42

correlation=
0.467396

15. Generating Random numbers from discrete (Bernoulli, Binomial, Poisson) distributions.

using Poisson

no. of var. 4
no. of random var. 75
lambda 0.1

a	b	c	d
1	0	1	0
1	1	1	0
1	1	0	1
1	0	1	1
1	1	1	0
1	1	0	0
1	0	1	1
1	0	0	1
0	1	0	1
1	1	1	0
1	0	0	1
1	0	0	1
1	1	1	0
1	1	1	1
0	1	0	0
1	0	0	1
1	1	0	1
1	1	1	1
0	1	1	0
1	1	1	1
1	0	1	1
0	1	0	0
0	1	0	1
0	1	0	0
1	1	0	1
0	1	1	1
0	1	1	0
1	0	1	0
1	1	1	1
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0	0	0	0
1	1	1	1
1	1	1	0
0	1	0	0
1	0	1	1
1	0	0	1
1	0	0	1
1	0	0	0
1	0	0	1
1	0	0	0
1	1	1	1
0	0	1	0
1	1	1	0
0	0	0	0
1	0	0	0
0	1	1	0
1	1	1	0
0	1	0	0
0	1	0	1
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1	1	0	1
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1	1	1	1
0	1	1	1
0	1	0	1
0	1	0	0
1	0	0	0
0	1	1	1
1	1	1	1
0	0	1	0

Using Binomial

no. of var. 4
no. of random var. 100

a	b	c	d
9	14	10	13
11	10	11	10
10	10	8	13
7	6	13	8
9	6	11	7
11	12	11	8
12	10	7	13
13	12	12	8
5	15	11	12
10	13	8	11
7	5	10	8
11	13	13	12
4	11	10	9
10	10	12	8
12	10	11	11
13	10	10	12
9	10	11	9
12	9	9	10
9	11	12	12
11	10	12	9
12	9	10	14
6	10	7	7
10	9	9	11
13	10	10	7
10	13	9	10
10	14	11	11
9	9	12	14
6	16	12	10
8	8	12	10
9	12	11	9
10	7	11	6
9	8	8	9
11	10	12	11
8	11	9	11
9	6	10	9
9	7	8	12
8	11	9	8
15	10	13	7
13	10	9	11
9	8	9	11
6	6	9	11
7	8	10	10
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10	13	7	7
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10	12	9	7
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10	11	10	9
10	13	10	12
9	12	7	11
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9	13	6	10
8	10	10	11
6	7	13	12
8	15	7	9
11	10	6	7
6	10	8	10
11	9	8	5
10	10	10	6
14	6	11	9
7	10	9	12
9	7	7	14
8	8	11	8
12	13	6	12

Using Bernoulli

no. of var. 4
no. of random var. 100
p 0.6

a	b	c	d
1	0	0	1
0	0	1	1
1	1	0	0
0	0	0	1
1	0	1	1
1	1	0	1
1	1	0	1
1	0	0	1
1	1	1	1
0	1	1	1
0	1	0	0
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0	0	0	0
1	0	1	1

1	0	1	0
0	0	1	1
1	0	0	1
0	1	0	1

11	6	12	9
9	11	7	13
8	12	7	16
13	12	11	7
10	9	6	9
10	9	8	11
7	13	8	9
7	9	7	7
7	8	12	9
9	6	11	13
10	15	8	11
9	13	12	12
9	9	8	9
15	11	14	8
8	11	8	11
13	10	11	8
11	11	11	10
10	9	6	7
10	8	10	8
11	13	9	10
15	10	12	7
9	9	8	12
10	11	10	11
9	6	6	11
9	10	9	10
17	10	8	10
12	14	7	11
12	11	14	10

0	1	1	1
0	1	0	1
1	1	1	0
0	1	1	0
0	1	0	0
0	1	1	1
0	0	0	1
1	0	0	1
0	1	0	0
0	1	1	1
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0	0	1	1
0	1	1	1
0	0	0	1
0	1	1	0
1	1	1	0
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0	1	1	0
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0	1	1	0
1	1	1	1
0	0	1	1
0	1	0	0
1	1	0	0
0	1	1	0
1	1	1	0
1	1	1	0

16.Generating Random numbers from continuous (Uniform, Normal) distributions.

Using Normal

no. of var.	4
no. of random var.	80
mean	30
S.D.	5

a	b	c	d
30.48481	30.55326	33.10946	29.64763
22.75947	23.71828	24.26389	28.13732
28.6407	34.08638	29.69822	42.97467
30.99859	28.29062	43.07708	34.4886
32.5547	24.81714	32.1123	30.05871
27.2311	24.72462	20.9624	26.15821
37.07014	23.07049	25.92909	27.60827
23.75348	25.80202	31.28207	31.49476
31.20553	21.14623	32.77381	34.19145
28.62482	19.57728	29.7955	35.6462
28.78187	23.61936	29.79818	27.6237
24.88087	27.23601	29.87816	37.07327
29.16827	27.07047	32.55077	34.14058
27.89397	17.54756	24.86405	32.12653
30.4606	28.9158	31.72276	36.81155
26.74393	25.44345	30.70825	29.40786
34.48288	32.87205	23.94344	36.88681
24.76184	25.77366	27.41344	26.22009
26.42413	37.28337	39.99844	22.24144
34.8305	34.0015	31.07715	26.78355
28.41178	23.54791	33.50607	32.35406
30.44063	31.49996	28.74953	30.71868
26.90955	18.0094	29.23646	35.87572
34.12389	30.26155	35.89638	34.93711
28.86288	25.68331	28.06951	35.05177
30.32516	27.95525	33.29969	25.37583
35.4765	31.42849	25.52855	33.94956
25.55132	28.82831	36.11028	26.70981
29.96692	37.20254	24.89893	30.1161
23.14858	31.64504	23.18845	26.41474
28.09462	28.84167	26.49687	31.32995
34.25044	26.14226	34.65417	27.02494
24.2171	29.85789	31.41734	26.80093
33.26648	21.64056	26.73494	31.85858
33.91414	36.47944	24.12428	32.75064
34.45152	31.27969	27.2587	29.8422
27.50527	29.77215	38.91123	27.18596
26.12265	31.19451	34.09012	25.74846
30.67272	30.80576	29.29213	24.44123
28.64625	25.5274	36.90561	29.04468
26.31812	20.37873	35.64257	30.02506
21.60632	34.67367	30.79181	32.6159
20.53475	38.2307	30.916	32.68899
27.97395	33.0452	39.01418	32.52337
35.19005	36.34368	21.64365	32.28335
25.77803	39.84505	28.57629	23.31401
25.27158	34.78798	26.27281	25.15485
32.82346	26.30053	39.37944	23.53381
30.46444	31.81643	35.86201	30.71443
32.83558	23.26031	32.2072	30.88413
25.13401	27.5795	24.05272	27.40731
29.19696	22.0753	28.19541	33.614
32.5251	32.74085	21.85986	43.11255
27.66302	24.5906	19.52635	32.95226
21.05676	39.47211	30.73995	22.30456
37.81774	22.67886	22.86799	26.90584
28.468	30.89578	25.2889	22.70667
22.10736	25.01281	35.58654	31.81561
27.17744	38.73874	23.81643	32.43513

Using Uniform

no. of var.	4
no. of random var.	80
between	0-1

a	b	c	d
0.521958	0.663747	0.78573	0.214911
0.730766	0.706076	0.912442	0.29429
0.451979	0.650838	0.79397	0.379284
0.377361	0.225929	0.336772	0.979553
0.791162	0.639973	0.232154	0.57036
0.119297	0.558702	0.15125	0.633015
0.934263	0.716544	0.035676	0.407666
0.820582	0.944212	0.14008	0.390667
0.008515	0.893216	0.98291	0.107059
0.181249	0.239265	0.861843	0.189886
0.362102	0.645222	0.089511	0.297159
0.288308	0.265084	0.606708	0.898312
0.17719	0.070406	0.128208	0.460616
0.291269	0.780053	0.478561	0.067751
0.20835	0.674612	0.273171	0.000671
0.203101	0.077273	0.601794	0.313211
0.645924	0.781518	0.869655	0.932554
0.825983	0.207434	0.453536	0.316691
0.104038	0.56801	0.328318	0.199683
0.801965	0.826167	0.320566	0.456038
0.734214	0.724265	0.145085	0.615406
0.788903	0.666982	0.881405	0.058992
0.463363	0.738975	0.045351	0.42909
0.761254	0.638722	0.913327	0.282083
0.35725	0.809381	0.253792	0.517747
0.435621	0.548326	0.124332	0.614368
0.108707	0.376476	0.888607	0.202338
0.821863	0.4485	0.110385	0.0065
0.650929	0.285348	0.481277	0.689199
0.898618	0.61034	0.437178	0.624622
0.895749	0.569994	0.621082	0.136418
0.414136	0.120853	0.847316	0.229163
0.59685	0.863704	0.724448	0.345317
0.81225	0.10593	0.592273	0.1789
0.338237	0.434187	0.929746	0.076815
0.282846	0.577685	0.889584	0.059694
0.647328	0.843776	0.116489	0.992828
0.937956	0.907254	0.504593	0.938627
0.233253	0.234321	0.050295	0.222571
0.112247	0.922483	0.457778	0.242561
0.350322	0.237739	0.651997	0.554247
0.789056	0.630512	0.856624	0.262459
0.28605	0.51091	0.392376	0.251137
0.151006	0.565447	0.852626	0.28193
0.974609	0.89584	0.811762	0.493271
0.255867	0.761101	0.723472	0.331339
0.735008	0.204871	0.164373	0.443617
0.837275	0.34843	0.079867	0.566729
0.134495	0.63097	0.188025	0.939634
0.230598	0.778527	0.197821	0.273507
0.976806	0.782617	0.998535	0.809534
0.423627	0.669912	0.475417	0.495651
0.415235	0.344127	0.109287	0.813929
0.232429	0.281472	0.014985	0.289377
0.191229	0.36082	0.575854	0.211951
0.60213	0.609973	0.330119	0.602222
0.997528	0.149083	0.265419	0.95291
0.032563	0.112735	0.17774	0.776757
0.966399	0.831629	0.251289	0.492447

33.97312	33.47338	25.96468	33.41181
37.78543	35.29009	28.74558	26.14535
36.61651	28.2154	23.94264	22.07798
30.1027	24.86664	25.4504	34.85005
27.13066	27.88979	31.4273	22.29203
31.62124	29.49521	22.50344	28.09462
28.93068	26.83138	32.99013	29.44174
19.55363	26.75433	32.36047	32.63962
24.06512	36.60459	30.3938	35.41559
26.23178	32.42093	27.39505	40.41935
27.61814	34.54207	28.50324	26.00323
29.72428	38.20414	31.56089	24.87376
40.21062	30.70323	26.33114	33.56649
32.32503	28.19337	32.03394	28.12379
25.05416	30.42028	23.36878	32.7542
30.23972	41.12639	33.44762	35.04094
25.50797	29.9015	31.52679	29.38474
32.83019	38.48265	33.21739	30.83173
37.66929	31.2489	34.53977	29.5563
28.33273	27.98433	25.60898	27.99635
27.39067	25.18108	35.66215	34.37809

0.129276	0.05533	0.51503	0.679647
0.282937	0.497543	0.33256	0.23423
0.279092	0.484268	0.58153	0.45555
0.92349	0.987548	0.678549	0.596149
0.451033	0.824488	0.106174	0.905972
0.518693	0.304056	0.598254	0.701743
0.122013	0.102145	0.639332	0.493088
0.34196	0.646443	0.435133	0.696646
0.327769	0.792352	0.009766	0.968932
0.422712	0.071108	0.586352	0.690085
0.838435	0.291604	0.906766	0.628925
0.784539	0.776666	0.64745	0.321055
0.459395	0.015625	0.587024	0.191076
0.808618	0.014069	0.681936	0.950041
0.457198	0.121982	0.7069	0.299783
0.721976	0.621876	0.615711	0.475082
0.110172	0.857692	0.279244	0.654744
0.21073	0.186193	0.756584	0.773431
0.384289	0.531846	0.755516	0.764794
0.158391	0.826136	0.438917	0.767815
0.73394	0.113407	0.232826	0.326945