

Basic statistical test of bit sequences

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file: PRG420_p85.rnd size: 10240000 Bytes

Test of null-hypothesis:

 Bit stream ist a stream of truly randomly
 drawn number 0,1 with same probability $p = 0.5$

Non-overlapping byte count:

00	39845	39895	39851	40135	39857	40042	40233	40001
08	40366	40151	39808	39980	39964	39997	39951	39864
10	39847	40228	39915	40105	40131	40303	40287	40190
18	39977	40035	40214	39822	39791	39739	40165	39940
20	39894	40020	40443	40019	40020	40043	40063	39828
28	39879	40143	39937	40005	39914	39911	40181	39818
30	40021	39932	39812	39851	40324	40367	39995	40149
38	40177	39885	40033	40255	40092	39885	40239	39929
40	40030	39716	39767	39794	40226	40026	40024	39459
48	39956	40152	40011	39925	40006	39711	39961	40084
50	39888	40146	39918	39871	39728	39989	40315	39929
58	39956	40097	39731	40240	40107	39735	39985	39692
60	40104	40122	40207	40151	39869	40101	39959	40119
68	40100	40013	39764	40065	39901	39579	40275	39942
70	39958	39896	39425	39935	40291	40096	40113	40101
78	40078	40230	39903	40043	40073	39940	39945	40219
80	40313	40352	40207	39970	39741	39840	39677	39991
88	39892	40086	40335	39812	39697	39985	40068	39568
90	40093	39936	39972	39876	39838	40162	40179	39665
98	40196	40046	39692	39767	39893	39908	39911	40125
a0	40072	40267	40013	40073	40321	39763	40167	39965
a8	39746	40047	40170	40002	40023	40130	40028	39677
b0	39596	40280	39852	40077	40170	40428	39947	40178
b8	40444	40287	40474	39779	39815	40059	40203	40083
c0	39833	40060	40068	39991	39899	39716	39812	39994
c8	40183	39624	40275	40002	40001	39787	39994	39570
d0	40143	39848	39784	40012	40187	40113	40180	39868
d8	39413	39926	39965	40080	39944	39721	39908	39900
e0	39851	40072	40226	40415	39714	40303	39680	40147
e8	39919	40053	39944	40134	40318	40237	40018	39629
f0	39928	39978	40028	39990	40107	40160	39905	39899
f8	40101	39614	40234	40421	39907	39897	40113	39943

Evaluation of count of 10240000 Bytes = 81920000 Bits:

Theoretical average of byte-frequencies: 40000
 'd8' = 39413 (minimum) 'ba' = 40474 (maximum)

Theoretical interval I of byte-frequencies:
 I = (39609 to 40391) (for 95 % of 256 frequency)

Test 1:

The theoretical permissible number of the 5% outliers (average 13)
 from the interval I is between 6 and 20

The real number of the outliers from interval I:
 smaller: 7 greater: 6 summary: 13

Test 2:

Evaluation of byte-frequencies

Chi-square non-overlapping:
Theoretical maximum chi-square = 293.25
Chi-square value = 243.15

Chi-square overlapping:
Theoretical maximum chi-square = 155.40
Chi-square value = 134.65

Test 3:

$r = 0.49997589$ (relative frequency of bit 1 in the bit stream)

For a truly random sequence, the probability for r to have values in the complement of the open interval $(0.49997589, 0.50002408)$ is $w = 0.66290975$.
If w is very small (e.g., $w < 0.05$), the null-hypothesis is rejected.
If more sequences can be tested, the probability w has to be ≥ 0.05 for about 95% of the tested bit sequences.

Test 4:

Frequencies of overlapping 2-tuples:
tuples 00: 20480336 tuples 01: 20481640
tuples 10: 20481640 tuples 11: 20476384

Check size: Chi-square of 2-bit patterns minus chi square of 1-bit patterns
Theoretical maximum chi-square = 5.99
Chi-square value = 0.72

Test 5:

Frequencies of 2-tuples on even places:
tuples 00: 10238409 tuples 01: 10239663
tuples 10: 10245495 tuples 11: 10236433

Theoretical maximum chi-square = 7.81
Chi-square value = 4.45

Test 6:

Frequencies of 2-tuples on odd places:
tuples 00: 10241927 tuples 01: 10241977
tuples 10: 10236145 tuples 11: 10239951

Theoretical maximum chi-square = 7.81
Chi-square value = 2.20

Result of statistical analysis of file PRG420_p85.rnd:

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The tests: 1 2 3 4 5 6 were fulfilled!

The null-hypothesis is accepted!

 THE NIST STATISTICAL TEST SUITE
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 1. FREQUENCY TEST

Computational information:
 (a) The nth partial sum = 344
 (b) S_n/n = 0.000344

p_value = 0.730846, SUCCESS

 2. BLOCK FREQUENCY TEST

Computational information:
 (a) χ^2 = 125164.000000
 (b) # of substrings = 125000
 (c) block length = 8

p_value = 0.371006, SUCCESS

 3. CUMULATIVE SUMS TEST

Cumulative sums forward test:
 Computational information:
 (a) The maximum partial sum =

p_value = 0.951727, SUCCESS

Cumulative sums reverse test:
 Computational information:
 (a) The maximum partial sum =

p_value = 0.716748, SUCCESS

 4. RUNS TEST

Computational information:
 (a) π = 0.500172
 (b) V_{n_obs} (Total # of runs) = 499921
 (c) $V_{n_obs} - 2 n \pi (1-\pi)$
 ----- = 0.111639
 $2 \sqrt{2n} \pi (1-\pi)$

p_value = 0.874550, SUCCESS

 5. LONGEST RUNS OF ONES TEST

Computational information:
 (a) N (# of substrings) = 100
 (b) M (Substring Length) = 10000
 (c) χ^2 = 12.285416

Frequency

<=10	11	12	13	14	15	>=16
6	25	19	17	22	6	5

p_value = 0.055896, SUCCESS

 6. RANK TEST

Computational information:
 (a) Probability P_{32} = 0.288788
 (b) P_{31} = 0.577576
 (c) P_{30} = 0.133636
 (d) Frequency F_{32} = 290
 (e) F_{31} = 554
 (f) F_{30} = 132

(g) # of matrices = 976
(h) Chi^2 = 0.421586
(i) NOTE: 576 BITS WERE DISCARDED.

p_value = 0.809942, SUCCESS

7. DFT TEST

Computational information:
(a) Percentile = 95.009000
(b) N_l = 475045.000000
(c) N_o = 475000.000000
(d) d = 0.291999

p_value = 0.770288, SUCCESS

8. NONOVERLAPPING TEMPLATES TEST

Computational information:
LAMBDA = 122.061523
M = 125000, N = 8, m = 10, n = 1000000

Template	W_1	W_2	W_3	W_4	W_5	W_6	W_7	W_8
1100100100	148	122	120	101	111	109	107	113

chi2_value = 14.378052
p_value = 0.072428, SUCCESS

9. OVERLAPPING TEMPLATE OF ALL ONES TEST

Computational information:
(a) n (sequence_length) = 1000000
(b) m (block length of 1s) = 10
(c) M (length of substring) = 1032
(d) N (number of substrings) = 968
(e) lambda [(M-m+1)/2^m] = 0.999023
(f) eta = 0.499512

Frequency:

0	1	2	3	4	>=5	Chi^2
553	148	107	67	32	61	8.5729

p_value = 0.127360, SUCCESS

10. UNIVERSAL TEST

Computational information:
(a) L = 7
(b) Q = 1280
(c) K = 141577
(d) sum = 877331.728066
(e) sigma = 0.002768
(f) variance = 3.125000
(g) exp_value = 6.196251
(h) phi = 6.196852
(i) WARNING: 1 bits were discarded.

p_value = 0.828029, SUCCESS

11. APPROXIMATE ENTROPY TEST

Computational information:
(a) m (block length) = 5
(b) n (sequence length) = 1000000
(c) Chi^2 = 33.944668
(d) Phi(m) = -3.465724
(e) Phi(m+1) = -4.158855
(f) ApEn = 0.693130
(g) Log(2) = 0.693147

p_value = 0.373965, SUCCESS

12. RANDOM EXCURSIONS TEST

Computational information:

- (a) Number Of Cycles (J) = 1247
- (b) Sequence Length (n) = 1000000
- (c) Rejection Constraint = 500.000000

x = -4 chi^2 = 8.181533 p_value = 0.146511, SUCCESS
x = -3 chi^2 = 3.995277 p_value = 0.550096, SUCCESS
x = -2 chi^2 = 6.180789 p_value = 0.289023, SUCCESS
x = -1 chi^2 = 13.246993 p_value = 0.021171, SUCCESS
x = 1 chi^2 = 5.173216 p_value = 0.395109, SUCCESS
x = 2 chi^2 = 4.121962 p_value = 0.531994, SUCCESS
x = 3 chi^2 = 11.262369 p_value = 0.046419, SUCCESS
x = 4 chi^2 = 4.297412 p_value = 0.507437, SUCCESS

13. RANDOM EXCURSIONS VARIANT TEST

Computational information:

- (a) Number Of Cycles (J) = 1247
- (b) Sequence Length (n) = 1000000

(x = -9) Total visits = 1149; p-value = 0.634116
SUCCESS
(x = -8) Total visits = 1151; p-value = 0.619656
SUCCESS
(x = -7) Total visits = 1147; p-value = 0.578644
SUCCESS
(x = -6) Total visits = 1183; p-value = 0.699202
SUCCESS
(x = -5) Total visits = 1241; p-value = 0.968055
SUCCESS
(x = -4) Total visits = 1250; p-value = 0.981885
SUCCESS
(x = -3) Total visits = 1240; p-value = 0.950017
SUCCESS
(x = -2) Total visits = 1225; p-value = 0.799233
SUCCESS
(x = -1) Total visits = 1266; p-value = 0.703606
SUCCESS
(x = 1) Total visits = 1206; p-value = 0.411654
SUCCESS
(x = 2) Total visits = 1213; p-value = 0.694268
SUCCESS
(x = 3) Total visits = 1170; p-value = 0.490485
SUCCESS
(x = 4) Total visits = 1103; p-value = 0.275781
SUCCESS
(x = 5) Total visits = 1049; p-value = 0.186306
SUCCESS
(x = 6) Total visits = 1051; p-value = 0.236672
SUCCESS
(x = 7) Total visits = 1054; p-value = 0.283784
SUCCESS
(x = 8) Total visits = 1020; p-value = 0.240542
SUCCESS
(x = 9) Total visits = 1006; p-value = 0.241829
SUCCESS

14. SERIAL TEST

Computational information:

- (a) Block length (m) = 5
- (b) Sequence length (n) = 1000000
- (c) Psi_m = 23.167680
- (d) Psi_m-1 = 8.049280
- (e) Psi_m-2 = 2.344128
- (f) Del_1 = 15.118400
- (g) Del_2 = 9.413248

p_value1 = 0.515984, SUCCESS

p_value2 = 0.308642, SUCCESS

15. LEMPEL-ZIV COMPRESSION TEST

Computational information:
(a) W (# of words) = 69587

p_value = 0.444155, SUCCESS

 Diehard Test-Suite
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BIRTHDAY SPACINGS TEST, M= 512 N=2**24 LAMBDA= 2.0000
 PRG420_p85.rnd using bits 1 to 24 p-value= .974616
 PRG420_p85.rnd using bits 2 to 25 p-value= .530830
 PRG420_p85.rnd using bits 3 to 26 p-value= .106341
 PRG420_p85.rnd using bits 4 to 27 p-value= .643851
 PRG420_p85.rnd using bits 5 to 28 p-value= .559136
 PRG420_p85.rnd using bits 6 to 29 p-value= .538668
 PRG420_p85.rnd using bits 7 to 30 p-value= .236140
 PRG420_p85.rnd using bits 8 to 31 p-value= .530495
 PRG420_p85.rnd using bits 9 to 32 p-value= .888962

The 9 p-values were
 .974616 .530830 .106341 .643851 .559136
 .538668 .236140 .530495 .888962

A KSTEST for the 9 p-values yields .340855

 OPERM5 test for file PRG420_p85.rnd
 chisquare for 99 degrees of freedom= 93.277; p-value= .356654
 OPERM5 test for file PRG420_p85.rnd
 chisquare for 99 degrees of freedom=124.619; p-value= .958212

Binary rank test for PRG420_p85.rnd
 Rank test for 31x31 binary matrices:
 rows from leftmost 31 bits of each 32-bit integer

rank	observed	expected	(o-e)^2/e	sum
28	237	211.4	3.095469	3.095
29	5128	5134.0	.007036	3.103
30	23067	23103.0	.056243	3.159
31	11568	11551.5	.023499	3.182

chisquare= 3.182 for 3 d. of f.; p-value= .672851

Binary rank test for PRG420_p85.rnd
 Rank test for 32x32 binary matrices:
 rows from leftmost 32 bits of each 32-bit integer

rank	observed	expected	(o-e)^2/e	sum
29	230	211.4	1.633211	1.633
30	5103	5134.0	.187307	1.821
31	23018	23103.0	.313074	2.134
32	11649	11551.5	.822531	2.956

chisquare= 2.956 for 3 d. of f.; p-value= .644337

 b-rank test for bits 1 to 8 p=1-exp(-SUM/2)= .93752
 b-rank test for bits 2 to 9 p=1-exp(-SUM/2)= .95862
 b-rank test for bits 3 to 10 p=1-exp(-SUM/2)= .99329
 b-rank test for bits 4 to 11 p=1-exp(-SUM/2)= .44085
 b-rank test for bits 5 to 12 p=1-exp(-SUM/2)= .25466
 b-rank test for bits 6 to 13 p=1-exp(-SUM/2)= .35600
 b-rank test for bits 7 to 14 p=1-exp(-SUM/2)= .03032
 b-rank test for bits 8 to 15 p=1-exp(-SUM/2)= .28784
 b-rank test for bits 9 to 16 p=1-exp(-SUM/2)= .12366
 b-rank test for bits 10 to 17 p=1-exp(-SUM/2)= .83837
 b-rank test for bits 11 to 18 p=1-exp(-SUM/2)= .40684
 b-rank test for bits 12 to 19 p=1-exp(-SUM/2)= .29449
 b-rank test for bits 13 to 20 p=1-exp(-SUM/2)= .26484
 b-rank test for bits 14 to 21 p=1-exp(-SUM/2)= .80844
 b-rank test for bits 15 to 22 p=1-exp(-SUM/2)= .99249
 b-rank test for bits 16 to 23 p=1-exp(-SUM/2)= .50281
 b-rank test for bits 17 to 24 p=1-exp(-SUM/2)= .16445
 b-rank test for bits 18 to 25 p=1-exp(-SUM/2)= .03990
 b-rank test for bits 19 to 26 p=1-exp(-SUM/2)= .19979
 b-rank test for bits 20 to 27 p=1-exp(-SUM/2)= .64096
 b-rank test for bits 21 to 28 p=1-exp(-SUM/2)= .55525
 b-rank test for bits 22 to 29 p=1-exp(-SUM/2)= .10899
 b-rank test for bits 23 to 30 p=1-exp(-SUM/2)= .72864
 b-rank test for bits 24 to 31 p=1-exp(-SUM/2)= .68512

b-rank test for bits 25 to 32 $p=1-\exp(-\text{SUM}/2)=.68883$

TEST SUMMARY, 25 tests on 100,000 random 6x8 matrices

These should be 25 uniform [0,1] random variables:

.937524	.958622	.993289	.440855	.254665
.356003	.030323	.287842	.123659	.838374
.406838	.294491	.264835	.808438	.992489
.502810	.164452	.039897	.199789	.640960
.555248	.108990	.728637	.685122	.688832

brank test summary for PRG420_p85.rnd

The KS test for those 25 supposed UNI's yields

KS p-value= .232399

No. missing words should average 141909. with sigma=428.

tst no 1:	141921 missing words,	.03 sigmas from mean,	p-value= .51088
tst no 2:	142047 missing words,	.32 sigmas from mean,	p-value= .62615
tst no 3:	142109 missing words,	.47 sigmas from mean,	p-value= .67958
tst no 4:	142068 missing words,	.37 sigmas from mean,	p-value= .64458
tst no 5:	141992 missing words,	.19 sigmas from mean,	p-value= .57658
tst no 6:	141474 missing words,	-1.02 sigmas from mean,	p-value= .15455
tst no 7:	142319 missing words,	.96 sigmas from mean,	p-value= .83076
tst no 8:	142207 missing words,	.70 sigmas from mean,	p-value= .75663
tst no 9:	141943 missing words,	.08 sigmas from mean,	p-value= .53135
tst no 10:	142307 missing words,	.93 sigmas from mean,	p-value= .82359
tst no 11:	142275 missing words,	.85 sigmas from mean,	p-value= .80355
tst no 12:	141919 missing words,	.02 sigmas from mean,	p-value= .50901
tst no 13:	142330 missing words,	.98 sigmas from mean,	p-value= .83717
tst no 14:	141241 missing words,	-1.56 sigmas from mean,	p-value= .05920
tst no 15:	141769 missing words,	-.33 sigmas from mean,	p-value= .37151
tst no 16:	142007 missing words,	.23 sigmas from mean,	p-value= .59026
tst no 17:	141533 missing words,	-.88 sigmas from mean,	p-value= .18963
tst no 18:	142576 missing words,	1.56 sigmas from mean,	p-value= .94034
tst no 19:	140882 missing words,	-2.40 sigmas from mean,	p-value= .00819
tst no 20:	142112 missing words,	.47 sigmas from mean,	p-value= .68208

OPSO for PRG420_p85.rnd	using bits 23 to 32	142052	.492	.6886
OPSO for PRG420_p85.rnd	using bits 22 to 31	141547	-1.249	.1058
OPSO for PRG420_p85.rnd	using bits 21 to 30	141772	-.474	.3179
OPSO for PRG420_p85.rnd	using bits 20 to 29	141961	.178	.5707
OPSO for PRG420_p85.rnd	using bits 19 to 28	142129	.757	.7756
OPSO for PRG420_p85.rnd	using bits 18 to 27	141869	-.139	.4447
OPSO for PRG420_p85.rnd	using bits 17 to 26	142164	.878	.8101
OPSO for PRG420_p85.rnd	using bits 16 to 25	141929	.068	.5270
OPSO for PRG420_p85.rnd	using bits 15 to 24	142236	1.126	.8700
OPSO for PRG420_p85.rnd	using bits 14 to 23	141467	-1.525	.0636
OPSO for PRG420_p85.rnd	using bits 13 to 22	142105	.675	.7501
OPSO for PRG420_p85.rnd	using bits 12 to 21	142407	1.716	.9569
OPSO for PRG420_p85.rnd	using bits 11 to 20	142480	1.968	.9755
OPSO for PRG420_p85.rnd	using bits 10 to 19	141919	.033	.5133
OPSO for PRG420_p85.rnd	using bits 9 to 18	141819	-.311	.3777
OPSO for PRG420_p85.rnd	using bits 8 to 17	142006	.333	.6306
OPSO for PRG420_p85.rnd	using bits 7 to 16	142081	.592	.7231
OPSO for PRG420_p85.rnd	using bits 6 to 15	142430	1.795	.9637
OPSO for PRG420_p85.rnd	using bits 5 to 14	141997	.302	.6188
OPSO for PRG420_p85.rnd	using bits 4 to 13	141973	.220	.5869
OPSO for PRG420_p85.rnd	using bits 3 to 12	141805	-.360	.3595
OPSO for PRG420_p85.rnd	using bits 2 to 11	142056	.506	.6935
OPSO for PRG420_p85.rnd	using bits 1 to 10	142305	1.364	.9138
OQSO for PRG420_p85.rnd	using bits 28 to 32	141418	-1.666	.0479
OQSO for PRG420_p85.rnd	using bits 27 to 31	141212	-2.364	.0090
OQSO for PRG420_p85.rnd	using bits 26 to 30	141930	.070	.5279
OQSO for PRG420_p85.rnd	using bits 25 to 29	141133	-2.632	.0042
OQSO for PRG420_p85.rnd	using bits 24 to 28	142077	.568	.7151
OQSO for PRG420_p85.rnd	using bits 23 to 27	141772	-.466	.3208
OQSO for PRG420_p85.rnd	using bits 22 to 26	141803	-.360	.3593
OQSO for PRG420_p85.rnd	using bits 21 to 25	141859	-.171	.4323
OQSO for PRG420_p85.rnd	using bits 20 to 24	142441	1.802	.9642
OQSO for PRG420_p85.rnd	using bits 19 to 23	141823	-.293	.3849
OQSO for PRG420_p85.rnd	using bits 18 to 22	141936	.090	.5360

OQSO for PRG420_p85.rnd	using bits 17 to 21	142076	.565	.7140
OQSO for PRG420_p85.rnd	using bits 16 to 20	141169	-2.510	.0060
OQSO for PRG420_p85.rnd	using bits 15 to 19	141849	-.205	.4190
OQSO for PRG420_p85.rnd	using bits 14 to 18	142366	1.548	.9392
OQSO for PRG420_p85.rnd	using bits 13 to 17	142110	.680	.7518
OQSO for PRG420_p85.rnd	using bits 12 to 16	141993	.284	.6117
OQSO for PRG420_p85.rnd	using bits 11 to 15	141948	.131	.5521
OQSO for PRG420_p85.rnd	using bits 10 to 14	141977	.229	.5907
OQSO for PRG420_p85.rnd	using bits 9 to 13	142086	.599	.7254
OQSO for PRG420_p85.rnd	using bits 8 to 12	141608	-1.021	.1535
OQSO for PRG420_p85.rnd	using bits 7 to 11	141937	.094	.5374
OQSO for PRG420_p85.rnd	using bits 6 to 10	142124	.728	.7666
OQSO for PRG420_p85.rnd	using bits 5 to 9	141543	-1.242	.1072
OQSO for PRG420_p85.rnd	using bits 4 to 8	141780	-.438	.3305
OQSO for PRG420_p85.rnd	using bits 3 to 7	141994	.287	.6130
OQSO for PRG420_p85.rnd	using bits 2 to 6	141883	-.089	.4644
OQSO for PRG420_p85.rnd	using bits 1 to 5	142216	1.040	.8507
DNA for PRG420_p85.rnd	using bits 31 to 32	141930	.061	.5243
DNA for PRG420_p85.rnd	using bits 30 to 31	141876	-.098	.4608
DNA for PRG420_p85.rnd	using bits 29 to 30	141945	.105	.5419
DNA for PRG420_p85.rnd	using bits 28 to 29	141604	-.901	.1839
DNA for PRG420_p85.rnd	using bits 27 to 28	141880	-.087	.4655
DNA for PRG420_p85.rnd	using bits 26 to 27	142395	1.433	.9240
DNA for PRG420_p85.rnd	using bits 25 to 26	142111	.595	.7240
DNA for PRG420_p85.rnd	using bits 24 to 25	141929	.058	.5231
DNA for PRG420_p85.rnd	using bits 23 to 24	141860	-.146	.4422
DNA for PRG420_p85.rnd	using bits 22 to 23	141907	-.007	.4973
DNA for PRG420_p85.rnd	using bits 21 to 22	141868	-.122	.4515
DNA for PRG420_p85.rnd	using bits 20 to 21	141526	-1.131	.1291
DNA for PRG420_p85.rnd	using bits 19 to 20	141364	-1.609	.0538
DNA for PRG420_p85.rnd	using bits 18 to 19	141373	-1.582	.0568
DNA for PRG420_p85.rnd	using bits 17 to 18	141412	-1.467	.0712
DNA for PRG420_p85.rnd	using bits 16 to 17	141564	-1.019	.1542
DNA for PRG420_p85.rnd	using bits 15 to 16	142239	.972	.8346
DNA for PRG420_p85.rnd	using bits 14 to 15	141855	-.160	.4363
DNA for PRG420_p85.rnd	using bits 13 to 14	141594	-.930	.1761
DNA for PRG420_p85.rnd	using bits 12 to 13	141981	.211	.5837
DNA for PRG420_p85.rnd	using bits 11 to 12	141932	.067	.5267
DNA for PRG420_p85.rnd	using bits 10 to 11	142486	1.701	.9555
DNA for PRG420_p85.rnd	using bits 9 to 10	142138	.675	.7500
DNA for PRG420_p85.rnd	using bits 8 to 9	142056	.433	.6674
DNA for PRG420_p85.rnd	using bits 7 to 8	141754	-.458	.3234
DNA for PRG420_p85.rnd	using bits 6 to 7	141468	-1.302	.0965
DNA for PRG420_p85.rnd	using bits 5 to 6	142173	.778	.7817
DNA for PRG420_p85.rnd	using bits 4 to 5	141702	-.612	.2704
DNA for PRG420_p85.rnd	using bits 3 to 4	141658	-.741	.2292
DNA for PRG420_p85.rnd	using bits 2 to 3	142081	.506	.6937
DNA for PRG420_p85.rnd	using bits 1 to 2	141913	.011	.5043

Test results for PRG420_p85.rnd
Chi-square with 5⁵-5⁴=2500 d.of f. for sample size:2560000
chisquare equiv normal p-value

Results fo COUNT-THE-1's in successive bytes:
byte stream for PRG420_p85.rnd 2418.90 -1.147 .125718
byte stream for PRG420_p85.rnd 2538.64 .546 .707626

Chi-square with 5⁵-5⁴=2500 d.of f. for sample size: 256000
chisquare equiv normal p value

Results for COUNT-THE-1's in specified bytes:

bits 1 to 8	2428.67	-1.009	.156531
bits 2 to 9	2460.68	-.556	.289076
bits 3 to 10	2527.84	.394	.653095
bits 4 to 11	2475.26	-.350	.363204
bits 5 to 12	2390.89	-1.543	.061416
bits 6 to 13	2395.63	-1.476	.069968
bits 7 to 14	2579.83	1.129	.870552
bits 8 to 15	2550.12	.709	.760772
bits 9 to 16	2452.24	-.675	.249685

bits 10 to 17	2481.38	-.263	.396171
bits 11 to 18	2510.38	.147	.558373
bits 12 to 19	2544.47	.629	.735312
bits 13 to 20	2575.88	1.073	.858374
bits 14 to 21	2322.55	-2.510	.006044
bits 15 to 22	2589.92	1.272	.898242
bits 16 to 23	2417.72	-1.164	.122301
bits 17 to 24	2426.12	-1.045	.148053
bits 18 to 25	2412.20	-1.242	.107169
bits 19 to 26	2426.02	-1.046	.147736
bits 20 to 27	2486.76	-.187	.425735
bits 21 to 28	2566.54	.941	.826654
bits 22 to 29	2461.90	-.539	.295028
bits 23 to 30	2592.50	1.308	.904593
bits 24 to 31	2510.55	.149	.559278
bits 25 to 32	2566.87	.946	.827851

CDPARK: result of ten tests on file PRG420_p85.rnd

Of 12,000 tries, the average no. of successes
should be 3523 with sigma=21.9

Successes: 3529	z-score: .274	p-value: .607947
Successes: 3514	z-score: -.411	p-value: .340551
Successes: 3552	z-score: 1.324	p-value: .907282
Successes: 3541	z-score: .822	p-value: .794438
Successes: 3554	z-score: 1.416	p-value: .921543
Successes: 3536	z-score: .594	p-value: .723613
Successes: 3521	z-score: -.091	p-value: .463618
Successes: 3521	z-score: -.091	p-value: .463618
Successes: 3482	z-score: -1.872	p-value: .030593
Successes: 3493	z-score: -1.370	p-value: .085365

square size	avg. no. parked	sample sigma
100.	3524.300	22.305

KSTEST for the above 10: p= .078729

This is the MINIMUM DISTANCE test
for random integers in the file PRG420_p85.rnd

Sample no.	d^2	avg	equiv uni
5	1.2337	1.2748	.710582
10	.5025	.9953	.396537
15	1.3802	.9264	.750199
20	.1695	.7793	.156595
25	.7477	.9276	.528313
30	.4640	.9193	.372681
35	.1394	.8691	.130753
40	2.5166	.9192	.920277
45	.7736	.8796	.540445
50	3.5694	.9020	.972327
55	.4422	.8868	.358806
60	1.5643	.9104	.792397
65	.4716	.8886	.377503
70	1.8764	.8876	.848300
75	1.1674	.8876	.690632
80	1.1168	.8998	.674517
85	.2382	.9146	.212909
90	1.6209	.9060	.803880
95	.9204	.9255	.603492
100	3.6312	.9545	.973995

MINIMUM DISTANCE TEST for PRG420_p85.rnd

Result of KS test on 20 transformed mindist^2's:
p-value= .458298

The 3DSPHERES test for file PRG420_p85.rnd

sample no: 1	r^3= 31.125	p-value= .64566
sample no: 2	r^3= 24.810	p-value= .56264
sample no: 3	r^3= 42.039	p-value= .75372
sample no: 4	r^3= 21.626	p-value= .51367
sample no: 5	r^3= 23.223	p-value= .53888

```

sample no: 6      r^3= 6.906      p-value= .20563
sample no: 7      r^3= 39.044     p-value= .72786
sample no: 8      r^3= .390       p-value= .01292
sample no: 9      r^3= 82.715     p-value= .93653
sample no: 10     r^3= 30.631     p-value= .63978
sample no: 11     r^3= 45.170     p-value= .77813
sample no: 12     r^3= 19.823     p-value= .48354
sample no: 13     r^3= 31.174     p-value= .64624
sample no: 14     r^3= 21.724     p-value= .51525
sample no: 15     r^3= 3.185      p-value= .10073
sample no: 16     r^3= 4.797      p-value= .14778
sample no: 17     r^3= 96.000     p-value= .95924
sample no: 18     r^3= 5.530      p-value= .16835
sample no: 19     r^3= 74.333     p-value= .91607
sample no: 20     r^3= 14.197     p-value= .37701

3DSPHERES test for file PRG420_p85.rnd      p-value= .169116

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RESULTS OF SQUEEZE TEST FOR PRG420_p85.rnd
Table of standardized frequency counts
( (obs-exp)/sqrt(exp) )^2
for j taking values <=6,7,8,...,47,>=48:
-1.5   .1   -1.8   -.7   -.1   -.8
-1.5   1.7   .1   -.5   .4   -1.4
-.7    .5   -.5   .8   -.7   -.2
-.2    .3   .9   .4   .3   1.9
-.9   -.4   -.8   .5   -.2   -.2
.6    .7   .2   .2   -1.2  -1.6
.0    .2   -.8   1.5   -.6   1.0
-.1

Chi-square with 42 degrees of freedom: 31.953
z-score= -1.096  p-value= .130337

```

```

-----
Test no. 1      p-value .007588
Test no. 2      p-value .229246
Test no. 3      p-value .310259
Test no. 4      p-value .112965
Test no. 5      p-value .416947
Test no. 6      p-value .259145
Test no. 7      p-value .845274
Test no. 8      p-value .464507
Test no. 9      p-value .010705
Test no. 10     p-value .926030

Results of the OSUM test for PRG420_p85.rnd
KSTEST on the above 10 p-values: .898315

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The RUNS test for file PRG420_p85.rnd
Up and down runs in a sample of 10000

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```

Run test for PRG420_p85.rnd :
runs up; ks test for 10 p's: .267331
runs down; ks test for 10 p's: .190546
Run test for PRG420_p85.rnd :
runs up; ks test for 10 p's: .492054
runs down; ks test for 10 p's: .185542

```

```

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Results of craps test for PRG420_p85.rnd
No. of wins:  Observed Expected
                98403    98585.86
Chisq= 15.33 for 20 degrees of freedom, p= .24297
Throws Observed Expected Chisq    Sum
SUMMARY FOR PRG420_p85.rnd
p-value for no. of wins: .206720
p-value for throws/game: .242972
Test completed. File PRG420_p85.rnd

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