

1 PRG270: Analyse Zufallsdaten der Klasse PTG.3

2 Basistest

Basic statistical test of bit sequences

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Date/Time: 12.05.2019, 9:09 hour

file: PRG270.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	40412	40075	40097	39903	40036	39794	40376	39735
08	39871	39886	40034	40117	39946	40282	40053	39954
10	39874	40114	40041	40046	39771	40284	39946	40180
18	40113	40470	39849	40091	39829	40189	39827	40171
20	40101	39770	40122	39908	40123	39687	40170	40133
28	40277	40119	39894	39824	39855	39993	39814	40261
30	39867	40295	40216	39861	40031	39945	39881	39890
38	40011	40071	40095	40009	40117	39773	39723	39651
40	40164	39960	40042	39962	39766	39978	40277	39951
48	39930	40095	39729	39559	40189	40298	39936	39857
50	40234	40058	40122	39901	39849	39985	40177	39938
58	39959	39953	40050	39791	39765	39786	40260	39504
60	40252	40369	39865	40262	40259	39781	39681	40342
68	40076	40218	40213	40146	40230	40038	40176	40176
70	40115	39848	39793	40201	40216	40017	39525	40107
78	40121	39844	39815	40005	40028	40123	39841	39837
80	39626	40131	39896	39945	40126	39968	39954	39819
88	40008	40113	39805	40191	40255	39648	40010	39860
90	39976	39678	40286	40014	39744	40137	40241	39830
98	40151	40049	40171	39962	40204	39627	40135	40147
a0	39739	40211	40242	40233	39924	39994	39796	39807
a8	40137	40117	40007	39918	39754	40079	39926	39753
b0	40125	40078	39854	40075	40165	39941	40007	39715
b8	40115	40062	40177	40169	40216	39823	40240	39978
c0	39918	39965	39976	39791	40200	40200	40004	39840
c8	39992	40004	39993	39790	39768	40021	39792	40157
d0	39602	39751	39935	40226	40038	40307	39774	39896
d8	39748	39839	40022	40042	39893	39688	40142	39848
e0	40045	39773	40186	40240	40341	40177	40080	39830
e8	40031	39805	40278	39891	40089	40275	40060	39740
f0	40203	39923	39671	40168	39991	39914	39954	40000
f8	39715	40332	39963	39622	39932	39922	40070	40135

Evaluation of count of 10240000 Bytes = 81920000 Bits:

Theoretical average of byte-frequencies: 40000
'5f' = 39504 (minimum) '19' = 40470 (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: 4 greater: 2 summary: 6

Test 2:

Evaluation of byte-frequencies
Chi-square non-overlapping:
Theoretical maximum chi-square = 293.25
Chi-square value = 223.54

Chi-square overlapping:
Theoretical maximum chi-square = 155.40
Chi-square value = 113.43

Test 3:
r = 0.49990046 (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 (0.49990046, 0.50009954) is $w = 0.07156699$.
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: 20488279 tuples 01: 20479875
tuples 10: 20479875 tuples 11: 20471971

Check size: Chi-square of 2-bit patterns minus chi square of 1-bit patterns
Theoretical maximum chi-square = 5.99
Chi-square value = 3.25

Test 5:
Frequencies of 2-tuples on even places:
tuples 00: 10242373 tuples 01: 10239970
tuples 10: 10243438 tuples 11: 10234219

Theoretical maximum chi-square = 7.81
Chi-square value = 4.97

Test 6:
Frequencies of 2-tuples on odd places:
tuples 00: 10245906 tuples 01: 10239905
tuples 10: 10236437 tuples 11: 10237752

Theoretical maximum chi-square = 7.81
Chi-square value = 5.14

Result of statistical analysis of file PRG270.rnd:
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The tests: 1 2 3 4 5 6 were fulfilled!

The null-hypothesis is accepted!

3 NIST-Test

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#####  
THE NIST STATISTICAL TEST SUITE  
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1. FREQUENCY TEST

Computational information:
(a) The nth partial sum = -1348
(b) S_n/n = -0.001348

p_value = 0.177658, SUCCESS

2. BLOCK FREQUENCY TEST

Computational information:
(a) Chi^2 = 125101.000000
(b) # of substrings = 125000
(c) block length = 8

p_value = 0.419459, SUCCESS

3. CUMULATIVE SUMS TEST

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

p_value = 0.143091, SUCCESS

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

p_value = 0.215668, SUCCESS

4. RUNS TEST

Computational information:
(a) Pi = 0.499326
(b) V_n_obs (Total # of runs) = 500744
(c) V_n_obs - 2 n pi (1-pi)
----- = 1.053462
2 sqrt(2n) pi (1-pi)

p_value = 0.136272, SUCCESS

5. LONGEST RUNS OF ONES TEST

Computational information:
(a) N (# of substrings) = 100
(b) M (Substring Length) = 10000
(c) Chi^2 = 5.713488

Frequency

<=10 11 12 13 14 15 >=16

9 23 22 24 12 8 2

p_value = 0.456038, 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 = 246
(e) F_31 = 588
(f) F_30 = 142
(g) # of matrices = 976
(h) Chi^2 = 6.634545
(i) NOTE: 576 BITS WERE DISCARDED.

p_value = 0.036252, SUCCESS

7. DFT TEST

Computational information:

(a) Percentile = 95.034400
(b) N_l = 475172.000000
(c) N_o = 475000.000000
(d) d = 1.116083

p_value = 0.264386, 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 121 114 116 131 129 119 115 134

chi2_value = 3.611368
p_value = 0.890377, 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

583 162 89 55 32 47 2.2700

p_value = 0.810665, SUCCESS

10. UNIVERSAL TEST

Computational information:

(a) L = 7
(b) Q = 1280
(c) K = 141577
(d) sum = 877356.866869
(e) sigma = 0.002768
(f) variance = 3.125000
(g) exp_value = 6.196251
(h) phi = 6.197030
(i) WARNING: 1 bits were discarded.

p_value = 0.778427, SUCCESS

11. APPROXIMATE ENTROPY TEST

Computational information:

(a) m (block length) = 5
(b) n (sequence length) = 1000000
(c) Chi^2 = 32.457756
(d) Phi(m) = -3.465709

(e) $\Phi(m+1)$ = -4.158840
(f) ApEn = 0.693131
(g) $\text{Log}(2)$ = 0.693147

p_value = 0.444209, SUCCESS

12. RANDOM EXCURSIONS TEST

Computational information:

(a) Number Of Cycles (J) = 0622
(b) Sequence Length (n) = 1000000
(c) Rejection Constraint = 500.000000

x = -4 χ^2 = 3.485399 p_value = 0.625598, SUCCESS
x = -3 χ^2 = 2.759450 p_value = 0.737012, SUCCESS
x = -2 χ^2 = 6.210631 p_value = 0.286260, SUCCESS
x = -1 χ^2 = 4.643087 p_value = 0.460970, SUCCESS
x = 1 χ^2 = 2.807074 p_value = 0.729699, SUCCESS
x = 2 χ^2 = 9.997142 p_value = 0.075316, SUCCESS
x = 3 χ^2 = 10.376077 p_value = 0.065254, SUCCESS
x = 4 χ^2 = 2.268157 p_value = 0.810932, SUCCESS

13. RANDOM EXCURSIONS VARIANT TEST

Computational information:

(a) Number Of Cycles (J) = 622
(b) Sequence Length (n) = 1000000

(x = -9) Total visits = 536; p-value = 0.554268
SUCCESS
(x = -8) Total visits = 564; p-value = 0.671134
SUCCESS
(x = -7) Total visits = 581; p-value = 0.747146
SUCCESS
(x = -6) Total visits = 524; p-value = 0.402166
SUCCESS
(x = -5) Total visits = 507; p-value = 0.277107
SUCCESS
(x = -4) Total visits = 537; p-value = 0.362360
SUCCESS
(x = -3) Total visits = 536; p-value = 0.275518
SUCCESS
(x = -2) Total visits = 546; p-value = 0.213476
SUCCESS
(x = -1) Total visits = 594; p-value = 0.427273
SUCCESS
(x = 1) Total visits = 609; p-value = 0.712440
SUCCESS
(x = 2) Total visits = 531; p-value = 0.136329
SUCCESS
(x = 3) Total visits = 464; p-value = 0.045137
SUCCESS
(x = 4) Total visits = 449; p-value = 0.063753
SUCCESS
(x = 5) Total visits = 445; p-value = 0.094368
SUCCESS
(x = 6) Total visits = 476; p-value = 0.211998
SUCCESS
(x = 7) Total visits = 512; p-value = 0.387045
SUCCESS
(x = 8) Total visits = 534; p-value = 0.519440
SUCCESS
(x = 9) Total visits = 541; p-value = 0.577532
SUCCESS

14. SERIAL TEST

Computational information:
 (a) Block length (m) = 5
 (b) Sequence length (n) = 1000000
 (c) Psi_m = 54.382272
 (d) Psi_m-1 = 32.745280
 (e) Psi_m-2 = 15.802304
 (f) Del_1 = 21.636992
 (g) Del_2 = 4.694016

p_value1 = 0.155304, SUCCESS
 p_value2 = 0.789723, SUCCESS

15. LEMPEL-ZIV COMPRESSION TEST

Computational information:

(a) W (# of words) = 69605
 p_value = 0.975170, SUCCESS

4 Diehard-Test

BIRTHDAY SPACINGS TEST, M= 512 N=2**24 LAMBDA= 2.0000

AES+20.rnd using bits 1 to 24 p-value= .392210
 AES+20.rnd using bits 2 to 25 p-value= .978305
 AES+20.rnd using bits 3 to 26 p-value= .930539
 AES+20.rnd using bits 4 to 27 p-value= .912837
 AES+20.rnd using bits 5 to 28 p-value= .792283
 AES+20.rnd using bits 6 to 29 p-value= .496442
 AES+20.rnd using bits 7 to 30 p-value= .145987
 AES+20.rnd using bits 8 to 31 p-value= .195408
 AES+20.rnd using bits 9 to 32 p-value= .696817

The 9 p-values were

.392210 .978305 .930539 .912837 .792283
 .496442 .145987 .195408 .696817

A KSTEST for the 9 p-values yields .675551

OPERM5 test for file AES+20.rnd

chisquare for 99 degrees of freedom= 83.470; p-value= .131442

OPERM5 test for file PRG270.rnd

chisquare for 99 degrees of freedom=110.131; p-value= .791178

Binary rank test for PRG270.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

28 179 211.4 4.970852 4.971

29 5216 5134.0 1.309370 6.280

30 23029 23103.0 .237325 6.518

31 11576 11551.5 .051859 6.569

chisquare= 6.569 for 3 d. of f.; p-value= .918222

Binary rank test for PRG270.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

29 208 211.4 .055259 .055

30 5125 5134.0 .015813 .071

31 23070 23103.0 .047271 .118

32 11597 11551.5 .179026 .297

chisquare= .297 for 3 d. of f.; p-value= .332246

b-rank test for bits 1 to 8 p=1-exp(-SUM/2)= .59075

b-rank test for bits 2 to 9 p=1-exp(-SUM/2)= .97054

b-rank test for bits 3 to 10 p=1-exp(-SUM/2)= .92320

b-rank test for bits 4 to 11 p=1-exp(-SUM/2)= .05506

b-rank test for bits 5 to 12 p=1-exp(-SUM/2)= .13861

b-rank test for bits 6 to 13 $p=1-\exp(-\text{SUM}/2)=.36810$
 b-rank test for bits 7 to 14 $p=1-\exp(-\text{SUM}/2)=.36643$
 b-rank test for bits 8 to 15 $p=1-\exp(-\text{SUM}/2)=.31640$
 b-rank test for bits 9 to 16 $p=1-\exp(-\text{SUM}/2)=.53682$
 b-rank test for bits 10 to 17 $p=1-\exp(-\text{SUM}/2)=.14334$
 b-rank test for bits 11 to 18 $p=1-\exp(-\text{SUM}/2)=.99493$
 b-rank test for bits 12 to 19 $p=1-\exp(-\text{SUM}/2)=.99641$
 b-rank test for bits 13 to 20 $p=1-\exp(-\text{SUM}/2)=.75493$
 b-rank test for bits 14 to 21 $p=1-\exp(-\text{SUM}/2)=.35030$
 b-rank test for bits 15 to 22 $p=1-\exp(-\text{SUM}/2)=.10964$
 b-rank test for bits 16 to 23 $p=1-\exp(-\text{SUM}/2)=.68489$
 b-rank test for bits 17 to 24 $p=1-\exp(-\text{SUM}/2)=.17341$
 b-rank test for bits 18 to 25 $p=1-\exp(-\text{SUM}/2)=.81321$
 b-rank test for bits 19 to 26 $p=1-\exp(-\text{SUM}/2)=.50320$
 b-rank test for bits 20 to 27 $p=1-\exp(-\text{SUM}/2)=.82443$
 b-rank test for bits 21 to 28 $p=1-\exp(-\text{SUM}/2)=.10705$
 b-rank test for bits 22 to 29 $p=1-\exp(-\text{SUM}/2)=.81898$
 b-rank test for bits 23 to 30 $p=1-\exp(-\text{SUM}/2)=.06772$
 b-rank test for bits 24 to 31 $p=1-\exp(-\text{SUM}/2)=.86794$
 b-rank test for bits 25 to 32 $p=1-\exp(-\text{SUM}/2)=.09037$

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

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

.590752	.970541	.923204	.055055	.138606
.368098	.366435	.316397	.536819	.143340
.994927	.996406	.754934	.350300	.109643
.684886	.173412	.813214	.503196	.824434
.107050	.818978	.067720	.867939	.090365

brank test summary for PRG270.rnd

The KS test for those 25 supposed UNI's yields

KS p-value= .644919

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

tst no 1:	141799 missing words,	-.26 sigmas from mean,	p-value= .39829
tst no 2:	142105 missing words,	.46 sigmas from mean,	p-value= .67623
tst no 3:	142961 missing words,	2.46 sigmas from mean,	p-value= .99300
tst no 4:	142008 missing words,	.23 sigmas from mean,	p-value= .59116
tst no 5:	141492 missing words,	-.98 sigmas from mean,	p-value= .16476
tst no 6:	142340 missing words,	1.01 sigmas from mean,	p-value= .84285
tst no 7:	141784 missing words,	-.29 sigmas from mean,	p-value= .38483
tst no 8:	141839 missing words,	-.16 sigmas from mean,	p-value= .43474
tst no 9:	142189 missing words,	.65 sigmas from mean,	p-value= .74326
tst no 10:	142088 missing words,	.42 sigmas from mean,	p-value= .66183
tst no 11:	142280 missing words,	.87 sigmas from mean,	p-value= .80677
tst no 12:	141875 missing words,	-.08 sigmas from mean,	p-value= .46804
tst no 13:	141931 missing words,	.05 sigmas from mean,	p-value= .52019
tst no 14:	142022 missing words,	.26 sigmas from mean,	p-value= .60382
tst no 15:	142251 missing words,	.80 sigmas from mean,	p-value= .78765
tst no 16:	141851 missing words,	-.14 sigmas from mean,	p-value= .44580
tst no 17:	141534 missing words,	-.88 sigmas from mean,	p-value= .19026
tst no 18:	142202 missing words,	.68 sigmas from mean,	p-value= .75295
tst no 19:	141608 missing words,	-.70 sigmas from mean,	p-value= .24070
tst no 20:	141284 missing words,	-1.46 sigmas from mean,	p-value= .07200

OPSO for PRG270.rnd	using bits 23 to 32	141819	-.311	.3777
OPSO for PRG270.rnd	using bits 22 to 31	141736	-.598	.2750
OPSO for PRG270.rnd	using bits 21 to 30	142186	.954	.8300
OPSO for PRG270.rnd	using bits 20 to 29	141610	-1.032	.1510
OPSO for PRG270.rnd	using bits 19 to 28	141883	-.091	.4638
OPSO for PRG270.rnd	using bits 18 to 27	141642	-.922	.1783
OPSO for PRG270.rnd	using bits 17 to 26	141697	-.732	.2320
OPSO for PRG270.rnd	using bits 16 to 25	141628	-.970	.1660
OPSO for PRG270.rnd	using bits 15 to 24	141883	-.091	.4638
OPSO for PRG270.rnd	using bits 14 to 23	142291	1.316	.9059
OPSO for PRG270.rnd	using bits 13 to 22	141495	-1.429	.0765
OPSO for PRG270.rnd	using bits 12 to 21	141853	-.194	.4230
OPSO for PRG270.rnd	using bits 11 to 20	142346	1.506	.9339
OPSO for PRG270.rnd	using bits 10 to 19	141993	.289	.6135
OPSO for PRG270.rnd	using bits 9 to 18	141426	-1.667	.0478
OPSO for PRG270.rnd	using bits 8 to 17	142085	.606	.7277
OPSO for PRG270.rnd	using bits 7 to 16	142136	.782	.7828
OPSO for PRG270.rnd	using bits 6 to 15	141902	-.025	.4899
OPSO for PRG270.rnd	using bits 5 to 14	142191	.971	.8343

OPSO for PRG270.rnd	using bits 4 to 13	142484	1.982	.9762
OPSO for PRG270.rnd	using bits 3 to 12	142413	1.737	.9588
OPSO for PRG270.rnd	using bits 2 to 11	142418	1.754	.9603
OPSO for PRG270.rnd	using bits 1 to 10	142316	1.402	.9196
OQSO for PRG270.rnd	using bits 28 to 32	142050	.477	.6833
OQSO for PRG270.rnd	using bits 27 to 31	141985	.257	.6012
OQSO for PRG270.rnd	using bits 26 to 30	142124	.728	.7666
OQSO for PRG270.rnd	using bits 25 to 29	142298	1.318	.9062
OQSO for PRG270.rnd	using bits 24 to 28	141803	-.360	.3593
OQSO for PRG270.rnd	using bits 23 to 27	142162	.857	.8041
OQSO for PRG270.rnd	using bits 22 to 26	142038	.436	.6686
OQSO for PRG270.rnd	using bits 21 to 25	141645	-.896	.1851
OQSO for PRG270.rnd	using bits 20 to 24	141684	-.764	.2225
OQSO for PRG270.rnd	using bits 19 to 23	142125	.731	.7676
OQSO for PRG270.rnd	using bits 18 to 22	141698	-.716	.2369
OQSO for PRG270.rnd	using bits 17 to 21	141534	-1.272	.1016
OQSO for PRG270.rnd	using bits 16 to 20	142021	.379	.6475
OQSO for PRG270.rnd	using bits 15 to 19	142134	.762	.7769
OQSO for PRG270.rnd	using bits 14 to 18	142029	.406	.6575
OQSO for PRG270.rnd	using bits 13 to 17	142294	1.304	.9039
OQSO for PRG270.rnd	using bits 12 to 16	142010	.341	.6335
OQSO for PRG270.rnd	using bits 11 to 15	141863	-.157	.4376
OQSO for PRG270.rnd	using bits 10 to 14	141518	-1.327	.0923
OQSO for PRG270.rnd	using bits 9 to 13	142078	.572	.7163
OQSO for PRG270.rnd	using bits 8 to 12	141388	-1.767	.0386
OQSO for PRG270.rnd	using bits 7 to 11	142305	1.341	.9101
OQSO for PRG270.rnd	using bits 6 to 10	142367	1.551	.9396
OQSO for PRG270.rnd	using bits 5 to 9	142016	.362	.6412
OQSO for PRG270.rnd	using bits 4 to 8	141974	.219	.5868
OQSO for PRG270.rnd	using bits 3 to 7	141406	-1.706	.0440
OQSO for PRG270.rnd	using bits 2 to 6	141956	.158	.5629
OQSO for PRG270.rnd	using bits 1 to 5	141833	-.259	.3979
DNA for PRG270.rnd	using bits 31 to 32	142070	.474	.6822
DNA for PRG270.rnd	using bits 30 to 31	141811	-.290	.3859
DNA for PRG270.rnd	using bits 29 to 30	141825	-.249	.4018
DNA for PRG270.rnd	using bits 28 to 29	141987	.229	.5906
DNA for PRG270.rnd	using bits 27 to 28	142244	.987	.8382
DNA for PRG270.rnd	using bits 26 to 27	141360	-1.620	.0526
DNA for PRG270.rnd	using bits 25 to 26	141944	.102	.5407
DNA for PRG270.rnd	using bits 24 to 25	142521	1.804	.9644
DNA for PRG270.rnd	using bits 23 to 24	142074	.486	.6864
DNA for PRG270.rnd	using bits 22 to 23	142024	.338	.6324
DNA for PRG270.rnd	using bits 21 to 22	142617	2.088	.9816
DNA for PRG270.rnd	using bits 20 to 21	142220	.916	.8203
DNA for PRG270.rnd	using bits 19 to 20	142453	1.604	.9456
DNA for PRG270.rnd	using bits 18 to 19	142295	1.138	.8724
DNA for PRG270.rnd	using bits 17 to 18	142092	.539	.7050
DNA for PRG270.rnd	using bits 16 to 17	141673	-.697	.2429
DNA for PRG270.rnd	using bits 15 to 16	141385	-1.547	.0610
DNA for PRG270.rnd	using bits 14 to 15	142030	.356	.6391
DNA for PRG270.rnd	using bits 13 to 14	142300	1.152	.8754
DNA for PRG270.rnd	using bits 12 to 13	141365	-1.606	.0542
DNA for PRG270.rnd	using bits 11 to 12	141955	.135	.5536
DNA for PRG270.rnd	using bits 10 to 11	141839	-.207	.4178
DNA for PRG270.rnd	using bits 9 to 10	142026	.344	.6346
DNA for PRG270.rnd	using bits 8 to 9	141671	-.703	.2410
DNA for PRG270.rnd	using bits 7 to 8	142336	1.259	.8959
DNA for PRG270.rnd	using bits 6 to 7	141806	-.305	.3803
DNA for PRG270.rnd	using bits 5 to 6	141442	-1.379	.0840
DNA for PRG270.rnd	using bits 4 to 5	142173	.778	.7817
DNA for PRG270.rnd	using bits 3 to 4	142223	.925	.8226

DNA for PRG270.rnd	using bits 2 to 3	142285	1.108	.8661
DNA for PRG270.rnd	using bits 1 to 2	141623	-.845	.1992

Test results for PRG270.rnd

Chi-square with $5^5-5^4=2500$ d.of f. for sample size:2560000
 chisquare equiv normal p-value

Results fo COUNT-THE-1's in successive bytes:

byte stream for PRG270.rnd	2530.64	.433	.667609
byte stream for PRG270.rnd	2576.76	1.085	.861147

Chi-square with $5^5-5^4=2500$ 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	2462.21	-.535	.296498
bits 2 to 9	2533.69	.476	.683138
bits 3 to 10	2484.95	-.213	.415747
bits 4 to 11	2490.27	-.138	.445301
bits 5 to 12	2616.15	1.643	.949765
bits 6 to 13	2487.92	-.171	.432162
bits 7 to 14	2467.46	-.460	.322670
bits 8 to 15	2582.78	1.171	.879139
bits 9 to 16	2598.97	1.400	.919189
bits 10 to 17	2556.87	.804	.789387
bits 11 to 18	2549.46	.699	.757874
bits 12 to 19	2348.65	-2.140	.016158
bits 13 to 20	2503.31	.047	.518678
bits 14 to 21	2485.77	-.201	.420245
bits 15 to 22	2481.92	-.256	.399100
bits 16 to 23	2383.11	-1.653	.049158
bits 17 to 24	2702.38	2.862	.997895
bits 18 to 25	2502.37	.033	.513346
bits 19 to 26	2512.48	.177	.570068
bits 20 to 27	2546.22	.654	.743329
bits 21 to 28	2547.37	.670	.748548
bits 22 to 29	2570.14	.992	.839382
bits 23 to 30	2615.83	1.638	.949304
bits 24 to 31	2538.12	.539	.705094
bits 25 to 32	2584.83	1.200	.884881

CDPARK: result of ten tests on file PRG270.rnd

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

Successes: 3534	z-score: .502	p-value: .692266
Successes: 3493	z-score: -1.370	p-value: .085365
Successes: 3551	z-score: 1.279	p-value: .899470
Successes: 3544	z-score: .959	p-value: .831196
Successes: 3553	z-score: 1.370	p-value: .914635
Successes: 3546	z-score: 1.050	p-value: .853193
Successes: 3558	z-score: 1.598	p-value: .944998
Successes: 3531	z-score: .365	p-value: .642555
Successes: 3556	z-score: 1.507	p-value: .934075
Successes: 3512	z-score: -.502	p-value: .307734

square size	avg. no. parked	sample sigma
100.	3537.800	19.939

KSTEST for the above 10: p= .983019

This is the MINIMUM DISTANCE test
for random integers in the file PRG270.rnd

Sample no.	d^2	avg	equiv uni
5	.2689	.4775	.236822
10	2.6897	.8473	.933008
15	.0632	.8739	.061526
20	2.1224	.9870	.881530
25	.4071	1.0298	.335782
30	.5903	1.0974	.447489
35	.0466	1.0705	.045745
40	1.2830	1.1191	.724567
45	.0654	1.1173	.063636
50	.0561	1.0559	.054791
55	.0978	1.0292	.093635
60	.6478	.9975	.478496
65	5.9314	1.0198	.997423
70	2.0422	1.0174	.871581
75	.3412	1.0082	.290289
80	2.1494	1.0167	.884702
85	2.0614	1.0140	.874030
90	1.4074	1.0087	.756940
95	1.1372	.9964	.681121
100	3.3518	1.0094	.965564

MINIMUM DISTANCE TEST for PRG270.rnd

Result of KS test on 20 transformed mindist^2's:
p-value= .323575

The 3DSPHERES test for file PRG270.rnd

sample no: 1	r^3=	.565	p-value=	.01865
sample no: 2	r^3=	4.931	p-value=	.15156
sample no: 3	r^3=	8.825	p-value=	.25485
sample no: 4	r^3=	43.530	p-value=	.76566
sample no: 5	r^3=	37.323	p-value=	.71180
sample no: 6	r^3=	72.960	p-value=	.91214
sample no: 7	r^3=	2.962	p-value=	.09401
sample no: 8	r^3=	8.420	p-value=	.24472
sample no: 9	r^3=	200.796	p-value=	.99876
sample no: 10	r^3=	.494	p-value=	.01635
sample no: 11	r^3=	7.368	p-value=	.21778
sample no: 12	r^3=	30.325	p-value=	.63608
sample no: 13	r^3=	15.357	p-value=	.40065
sample no: 14	r^3=	47.294	p-value=	.79329
sample no: 15	r^3=	80.440	p-value=	.93153
sample no: 16	r^3=	16.271	p-value=	.41863
sample no: 17	r^3=	29.481	p-value=	.62571
sample no: 18	r^3=	43.102	p-value=	.76230
sample no: 19	r^3=	10.085	p-value=	.28550
sample no: 20	r^3=	15.140	p-value=	.39630

3DSPHERES test for file PRG270.rnd p-value= .203980

RESULTS OF SQUEEZE TEST FOR PRG270.rnd

Table of standardized frequency counts
((obs-exp)/sqrt(exp))^2
for j taking values <=6,7,8,...,47,>=48:
-.1 .5 -.8 -.8 -.2 .2

```

-.1  -.8  -.8  1.1  -.1  1.5
-.4  -.9  .0  -1.7  1.9  .2
.4   .5  -.7  -.6  .5  -.1
-1.1 1.6  -.7  -.5  .3  -.3
-1.3 .6   .3  1.4  -.1  .2
.7   -.1  .1  -.7  .9  1.0
-1.1

```

Chi-square with 42 degrees of freedom: 28.301
z-score= -1.495 p-value= .052358

```

-----
Test no. 1  p-value .485526
Test no. 2  p-value .150962
Test no. 3  p-value .494284
Test no. 4  p-value .529517
Test no. 5  p-value .164083
Test no. 6  p-value .289497
Test no. 7  p-value .655572
Test no. 8  p-value .518252
Test no. 9  p-value .084622
Test no. 10 p-value .224347

```

Results of the OSUM test for PRG270.rnd

KSTEST on the above 10 p-values: .856562

The RUNS test for file PRG270.rnd

Up and down runs in a sample of 10000

```

-----
Run test for PRG270.rnd  :
runs up; ks test for 10 p's: .925765
runs down; ks test for 10 p's: .345532
Run test for PRG270.rnd  :
runs up; ks test for 10 p's: .593279
runs down; ks test for 10 p's: .968862

```

Results of craps test for PRG270.rnd

No. of wins: Observed Expected

98784 98585.86

Chisq= 38.54 for 20 degrees of freedom, p= .99239

Throws Observed Expected Chisq Sum

SUMMARY FOR PRG270.rnd

p-value for no. of wins: .812245

p-value for throws/game: .992395

Test completed. File PRG270.rnd

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