

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

|          |            |         |          |         |
|----------|------------|---------|----------|---------|
| test.dat | using bits | 1 to 24 | p-value= | .776418 |
| test.dat | using bits | 2 to 25 | p-value= | .055062 |
| test.dat | using bits | 3 to 26 | p-value= | .396264 |
| test.dat | using bits | 4 to 27 | p-value= | .553828 |
| test.dat | using bits | 5 to 28 | p-value= | .071625 |
| test.dat | using bits | 6 to 29 | p-value= | .691512 |
| test.dat | using bits | 7 to 30 | p-value= | .614116 |
| test.dat | using bits | 8 to 31 | p-value= | .906165 |
| test.dat | using bits | 9 to 32 | p-value= | .164458 |

The 9 p-values were  
 .776418 .055062 .396264 .553828 .071625  
 .691512 .614116 .906165 .164458  
 A KSTEST for the 9 p-values yields .078967

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OPERM5 test for file test.dat  
 chisquare for 99 degrees of freedom=107.559; p-value= .738560  
 OPERM5 test for file test.dat  
 chisquare for 99 degrees of freedom= 77.399; p-value= .053124

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Binary rank test for test.dat  
 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   | 230      | 211.4    | 1.633211  | 1.633 |
| 29   | 5102     | 5134.0   | .199582   | 1.833 |
| 30   | 23071    | 23103.0  | .044453   | 1.877 |
| 31   | 11597    | 11551.5  | .179026   | 2.056 |

chisquare= 2.056 for 3 d. of f.; p-value= .514981

Binary rank test for test.dat  
 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   | 214      | 211.4    | .031533   | .032 |
| 30   | 5107     | 5134.0   | .142102   | .174 |
| 31   | 23096    | 23103.0  | .002149   | .176 |
| 32   | 11583    | 11551.5  | .085765   | .262 |

chisquare= .262 for 3 d. of f.; p-value= .337439

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|                      |          |                  |        |
|----------------------|----------|------------------|--------|
| b-rank test for bits | 1 to 8   | p=1-exp(-SUM/2)= | .14688 |
| b-rank test for bits | 2 to 9   | p=1-exp(-SUM/2)= | .26194 |
| b-rank test for bits | 3 to 10  | p=1-exp(-SUM/2)= | .75892 |
| b-rank test for bits | 4 to 11  | p=1-exp(-SUM/2)= | .90162 |
| b-rank test for bits | 5 to 12  | p=1-exp(-SUM/2)= | .62130 |
| b-rank test for bits | 6 to 13  | p=1-exp(-SUM/2)= | .55840 |
| b-rank test for bits | 7 to 14  | p=1-exp(-SUM/2)= | .71047 |
| b-rank test for bits | 8 to 15  | p=1-exp(-SUM/2)= | .28075 |
| b-rank test for bits | 9 to 16  | p=1-exp(-SUM/2)= | .10587 |
| b-rank test for bits | 10 to 17 | p=1-exp(-SUM/2)= | .67700 |
| b-rank test for bits | 11 to 18 | p=1-exp(-SUM/2)= | .44221 |
| b-rank test for bits | 12 to 19 | p=1-exp(-SUM/2)= | .28658 |
| b-rank test for bits | 13 to 20 | p=1-exp(-SUM/2)= | .51407 |
| b-rank test for bits | 14 to 21 | p=1-exp(-SUM/2)= | .36146 |
| b-rank test for bits | 15 to 22 | p=1-exp(-SUM/2)= | .98313 |
| b-rank test for bits | 16 to 23 | p=1-exp(-SUM/2)= | .79416 |
| b-rank test for bits | 17 to 24 | p=1-exp(-SUM/2)= | .09561 |
| b-rank test for bits | 18 to 25 | p=1-exp(-SUM/2)= | .19909 |
| b-rank test for bits | 19 to 26 | p=1-exp(-SUM/2)= | .27745 |
| b-rank test for bits | 20 to 27 | p=1-exp(-SUM/2)= | .82798 |
| b-rank test for bits | 21 to 28 | p=1-exp(-SUM/2)= | .44518 |
| b-rank test for bits | 22 to 29 | p=1-exp(-SUM/2)= | .16516 |
| b-rank test for bits | 23 to 30 | p=1-exp(-SUM/2)= | .14990 |
| b-rank test for bits | 24 to 31 | p=1-exp(-SUM/2)= | .58745 |
| b-rank test for bits | 25 to 32 | p=1-exp(-SUM/2)= | .75391 |

TEST SUMMARY, 25 tests on 100,000 random 6x8 matrices  
 These should be 25 uniform [0,1] random variables:

|         |         |         |         |         |
|---------|---------|---------|---------|---------|
| .146877 | .261942 | .758917 | .901619 | .621296 |
| .558397 | .710470 | .280747 | .105870 | .677004 |
| .442212 | .286577 | .514066 | .361464 | .983131 |
| .794161 | .095612 | .199093 | .277452 | .827977 |
| .445179 | .165159 | .149898 | .587447 | .753907 |

brank test summary for test.dat

The KS test for those 25 supposed UNI's yields  
 KS p-value= .158770

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

|            |                       |                         |                 |
|------------|-----------------------|-------------------------|-----------------|
| tst no 1:  | 141583 missing words, | -.76 sigmas from mean,  | p-value= .22290 |
| tst no 2:  | 141571 missing words, | -.79 sigmas from mean,  | p-value= .21462 |
| tst no 3:  | 142367 missing words, | 1.07 sigmas from mean,  | p-value= .85754 |
| tst no 4:  | 141789 missing words, | -.28 sigmas from mean,  | p-value= .38930 |
| tst no 5:  | 142096 missing words, | .44 sigmas from mean,   | p-value= .66864 |
| tst no 6:  | 141527 missing words, | -.89 sigmas from mean,  | p-value= .18585 |
| tst no 7:  | 141474 missing words, | -1.02 sigmas from mean, | p-value= .15455 |
| tst no 8:  | 142415 missing words, | 1.18 sigmas from mean,  | p-value= .88129 |
| tst no 9:  | 141658 missing words, | -.59 sigmas from mean,  | p-value= .27853 |
| tst no 10: | 141382 missing words, | -1.23 sigmas from mean, | p-value= .10896 |
| tst no 11: | 142065 missing words, | .36 sigmas from mean,   | p-value= .64197 |
| tst no 12: | 141863 missing words, | -.11 sigmas from mean,  | p-value= .45690 |
| tst no 13: | 142090 missing words, | .42 sigmas from mean,   | p-value= .66354 |
| tst no 14: | 141829 missing words, | -.19 sigmas from mean,  | p-value= .42556 |
| tst no 15: | 141622 missing words, | -.67 sigmas from mean,  | p-value= .25101 |
| tst no 16: | 141529 missing words, | -.89 sigmas from mean,  | p-value= .18710 |
| tst no 17: | 142099 missing words, | .44 sigmas from mean,   | p-value= .67117 |
| tst no 18: | 141775 missing words, | -.31 sigmas from mean,  | p-value= .37682 |
| tst no 19: | 142110 missing words, | .47 sigmas from mean,   | p-value= .68041 |
| tst no 20: | 140974 missing words, | -2.19 sigmas from mean, | p-value= .01443 |

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|                   |                     |        |        |       |
|-------------------|---------------------|--------|--------|-------|
| OPSO for test.dat | using bits 23 to 32 | 142232 | 1.113  | .8671 |
| OPSO for test.dat | using bits 22 to 31 | 142062 | .526   | .7007 |
| OPSO for test.dat | using bits 21 to 30 | 141798 | -.384  | .3505 |
| OPSO for test.dat | using bits 20 to 29 | 142366 | 1.575  | .9423 |
| OPSO for test.dat | using bits 19 to 28 | 141576 | -1.149 | .1252 |
| OPSO for test.dat | using bits 18 to 27 | 141912 | .009   | .5037 |
| OPSO for test.dat | using bits 17 to 26 | 142327 | 1.440  | .9251 |
| OPSO for test.dat | using bits 16 to 25 | 142060 | .520   | .6983 |
| OPSO for test.dat | using bits 15 to 24 | 141692 | -.749  | .2268 |
| OPSO for test.dat | using bits 14 to 23 | 142143 | .806   | .7898 |
| OPSO for test.dat | using bits 13 to 22 | 141774 | -.467  | .3204 |
| OPSO for test.dat | using bits 12 to 21 | 142080 | .589   | .7219 |
| OPSO for test.dat | using bits 11 to 20 | 142129 | .757   | .7756 |
| OPSO for test.dat | using bits 10 to 19 | 141864 | -.156  | .4379 |
| OPSO for test.dat | using bits 9 to 18  | 142342 | 1.492  | .9321 |
| OPSO for test.dat | using bits 8 to 17  | 142406 | 1.713  | .9566 |
| OPSO for test.dat | using bits 7 to 16  | 142452 | 1.871  | .9693 |
| OPSO for test.dat | using bits 6 to 15  | 141746 | -.563  | .2866 |
| OPSO for test.dat | using bits 5 to 14  | 142045 | .468   | .6800 |
| OPSO for test.dat | using bits 4 to 13  | 142458 | 1.892  | .9708 |
| OPSO for test.dat | using bits 3 to 12  | 141177 | -2.525 | .0058 |
| OPSO for test.dat | using bits 2 to 11  | 141268 | -2.211 | .0135 |
| OPSO for test.dat | using bits 1 to 10  | 142000 | .313   | .6227 |
| QOSO for test.dat | using bits 28 to 32 | 142528 | 2.097  | .9820 |
| QOSO for test.dat | using bits 27 to 31 | 141963 | .182   | .5722 |
| QOSO for test.dat | using bits 26 to 30 | 141650 | -.879  | .1897 |
| QOSO for test.dat | using bits 25 to 29 | 141584 | -1.103 | .1351 |
| QOSO for test.dat | using bits 24 to 28 | 141242 | -2.262 | .0118 |
| QOSO for test.dat | using bits 23 to 27 | 141108 | -2.716 | .0033 |
| QOSO for test.dat | using bits 22 to 26 | 141636 | -.927  | .1771 |
| QOSO for test.dat | using bits 21 to 25 | 141657 | -.855  | .1962 |

|                   |                     |        |        |       |
|-------------------|---------------------|--------|--------|-------|
| QOSO for test.dat | using bits 20 to 24 | 141716 | -.655  | .2561 |
| QOSO for test.dat | using bits 19 to 23 | 141502 | -1.381 | .0837 |
| QOSO for test.dat | using bits 18 to 22 | 141907 | -.008  | .4969 |
| QOSO for test.dat | using bits 17 to 21 | 141536 | -1.266 | .1028 |
| QOSO for test.dat | using bits 16 to 20 | 142101 | .650   | .7421 |
| QOSO for test.dat | using bits 15 to 19 | 141909 | -.001  | .4996 |
| QOSO for test.dat | using bits 14 to 18 | 142096 | .633   | .7366 |
| QOSO for test.dat | using bits 13 to 17 | 141704 | -.696  | .2432 |
| QOSO for test.dat | using bits 12 to 16 | 141675 | -.794  | .2135 |
| QOSO for test.dat | using bits 11 to 15 | 141320 | -1.998 | .0229 |
| QOSO for test.dat | using bits 10 to 14 | 142088 | .606   | .7276 |
| QOSO for test.dat | using bits 9 to 13  | 142514 | 2.050  | .9798 |
| QOSO for test.dat | using bits 8 to 12  | 141961 | .175   | .5695 |
| QOSO for test.dat | using bits 7 to 11  | 141590 | -1.082 | .1395 |
| QOSO for test.dat | using bits 6 to 10  | 141887 | -.076  | .4698 |
| QOSO for test.dat | using bits 5 to 9   | 141854 | -.188  | .4256 |
| QOSO for test.dat | using bits 4 to 8   | 142307 | 1.348  | .9112 |
| QOSO for test.dat | using bits 3 to 7   | 141976 | .226   | .5894 |
| QOSO for test.dat | using bits 2 to 6   | 141995 | .290   | .6142 |
| QOSO for test.dat | using bits 1 to 5   | 142179 | .914   | .8197 |
| DNA for test.dat  | using bits 31 to 32 | 142209 | .884   | .8116 |
| DNA for test.dat  | using bits 30 to 31 | 142129 | .648   | .7415 |
| DNA for test.dat  | using bits 29 to 30 | 142078 | .498   | .6906 |
| DNA for test.dat  | using bits 28 to 29 | 141928 | .055   | .5220 |
| DNA for test.dat  | using bits 27 to 28 | 142188 | .822   | .7945 |
| DNA for test.dat  | using bits 26 to 27 | 142129 | .648   | .7415 |
| DNA for test.dat  | using bits 25 to 26 | 141659 | -.738  | .2301 |
| DNA for test.dat  | using bits 24 to 25 | 141965 | .164   | .5652 |
| DNA for test.dat  | using bits 23 to 24 | 142111 | .595   | .7240 |
| DNA for test.dat  | using bits 22 to 23 | 141699 | -.620  | .2675 |
| DNA for test.dat  | using bits 21 to 22 | 142192 | .834   | .7978 |
| DNA for test.dat  | using bits 20 to 21 | 142026 | .344   | .6346 |
| DNA for test.dat  | using bits 19 to 20 | 141713 | -.579  | .2812 |
| DNA for test.dat  | using bits 18 to 19 | 142322 | 1.217  | .8883 |
| DNA for test.dat  | using bits 17 to 18 | 142141 | .683   | .7528 |
| DNA for test.dat  | using bits 16 to 17 | 141178 | -2.157 | .0155 |
| DNA for test.dat  | using bits 15 to 16 | 142125 | .636   | .7377 |
| DNA for test.dat  | using bits 14 to 15 | 141438 | -1.390 | .0822 |
| DNA for test.dat  | using bits 13 to 14 | 141768 | -.417  | .3384 |
| DNA for test.dat  | using bits 12 to 13 | 142786 | 2.586  | .9951 |
| DNA for test.dat  | using bits 11 to 12 | 142280 | 1.093  | .8629 |
| DNA for test.dat  | using bits 10 to 11 | 142213 | .896   | .8148 |
| DNA for test.dat  | using bits 9 to 10  | 142243 | .984   | .8375 |
| DNA for test.dat  | using bits 8 to 9   | 142009 | .294   | .6156 |
| DNA for test.dat  | using bits 7 to 8   | 141600 | -.912  | .1808 |
| DNA for test.dat  | using bits 6 to 7   | 142501 | 1.745  | .9595 |
| DNA for test.dat  | using bits 5 to 6   | 141668 | -.712  | .2383 |
| DNA for test.dat  | using bits 4 to 5   | 142048 | .409   | .6588 |
| DNA for test.dat  | using bits 3 to 4   | 141947 | .111   | .5442 |
| DNA for test.dat  | using bits 2 to 3   | 142461 | 1.627  | .9482 |
| DNA for test.dat  | using bits 1 to 2   | 141507 | -1.187 | .1177 |

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Test results for test.dat

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 test.dat | 2518.56 | .262 | .603508 |
| byte stream for test.dat | 2502.46 | .035 | .513904 |

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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 | 2401.83 | -1.388 | .082507 |
| bits 2 to 9 | 2482.99 | -.241  | .404931 |

|               |         |        |         |
|---------------|---------|--------|---------|
| bits 3 to 10  | 2462.31 | -.533  | .297006 |
| bits 4 to 11  | 2499.98 | .000   | .499872 |
| bits 5 to 12  | 2525.63 | .362   | .641476 |
| bits 6 to 13  | 2437.38 | -.886  | .187909 |
| bits 7 to 14  | 2482.58 | -.246  | .402707 |
| bits 8 to 15  | 2539.34 | .556   | .711015 |
| bits 9 to 16  | 2502.23 | .032   | .512602 |
| bits 10 to 17 | 2576.07 | 1.076  | .858985 |
| bits 11 to 18 | 2477.84 | -.313  | .377009 |
| bits 12 to 19 | 2388.34 | -1.579 | .057149 |
| bits 13 to 20 | 2470.10 | -.423  | .336178 |
| bits 14 to 21 | 2533.80 | .478   | .683677 |
| bits 15 to 22 | 2489.82 | -.144  | .442784 |
| bits 16 to 23 | 2556.73 | .802   | .788817 |
| bits 17 to 24 | 2699.20 | 2.817  | .997577 |
| bits 18 to 25 | 2547.59 | .673   | .749531 |
| bits 19 to 26 | 2515.04 | .213   | .584198 |
| bits 20 to 27 | 2305.06 | -2.757 | .002918 |
| bits 21 to 28 | 2418.33 | -1.155 | .124045 |
| bits 22 to 29 | 2362.20 | -1.949 | .025660 |
| bits 23 to 30 | 2480.71 | -.273  | .392525 |
| bits 24 to 31 | 2365.65 | -1.900 | .028720 |
| bits 25 to 32 | 2492.28 | -.109  | .456536 |

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CDPARK: result of ten tests on file test.dat  
 Of 12,000 tries, the average no. of successes  
 should be 3523 with sigma=21.9

|                 |                |                  |
|-----------------|----------------|------------------|
| Successes: 3551 | z-score: 1.279 | p-value: .899470 |
| Successes: 3550 | z-score: 1.233 | p-value: .891189 |
| Successes: 3551 | z-score: 1.279 | p-value: .899470 |
| Successes: 3528 | z-score: .228  | p-value: .590298 |
| Successes: 3528 | z-score: .228  | p-value: .590298 |
| Successes: 3518 | z-score: -.228 | p-value: .409702 |
| Successes: 3527 | z-score: .183  | p-value: .572463 |
| Successes: 3525 | z-score: .091  | p-value: .536382 |
| Successes: 3551 | z-score: 1.279 | p-value: .899470 |
| Successes: 3516 | z-score: -.320 | p-value: .374623 |

| square size | avg. no. parked | sample sigma |
|-------------|-----------------|--------------|
| 100.        | 3534.500        | 13.775       |

KSTEST for the above 10: p= .933822

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

| Sample no. | d^2    | avg    | equiv uni |
|------------|--------|--------|-----------|
| 5          | 1.0852 | 1.3622 | .663992   |
| 10         | 2.6367 | .9845  | .929348   |
| 15         | 1.2403 | .9817  | .712492   |
| 20         | 1.2412 | 1.0993 | .712774   |
| 25         | .4224  | 1.1506 | .345900   |
| 30         | .3973  | 1.1894 | .329198   |
| 35         | 1.3218 | 1.3153 | .735107   |
| 40         | 2.1636 | 1.3448 | .886327   |
| 45         | .0731  | 1.2089 | .070793   |
| 50         | .6854  | 1.1346 | .497831   |
| 55         | .7710  | 1.1698 | .539231   |
| 60         | 1.0492 | 1.1699 | .651619   |
| 65         | .7098  | 1.1317 | .510014   |
| 70         | 1.1939 | 1.1392 | .698762   |
| 75         | 1.2491 | 1.1053 | .715020   |
| 80         | 2.3378 | 1.0947 | .904584   |
| 85         | .2690  | 1.0766 | .236911   |
| 90         | .2550  | 1.0604 | .226102   |
| 95         | .1372  | 1.0882 | .128825   |

100 2.2615 1.1018 .896987  
 MINIMUM DISTANCE TEST for test.dat  
 Result of KS test on 20 transformed mindist^2's:  
 p-value= .578208

The 3DSPHERES test for file test.dat

| sample no: | r^3=   | p-value= |
|------------|--------|----------|
| 1          | 34.363 | .68191   |
| 2          | 9.365  | .26813   |
| 3          | .251   | .00835   |
| 4          | 23.064 | .53643   |
| 5          | 18.434 | .45907   |
| 6          | 29.292 | .62334   |
| 7          | 34.462 | .68296   |
| 8          | 3.121  | .09881   |
| 9          | .713   | .02350   |
| 10         | 37.260 | .71119   |
| 11         | 21.532 | .51215   |
| 12         | 26.693 | .58924   |
| 13         | 6.189  | .18642   |
| 14         | 96.262 | .95959   |
| 15         | 7.482  | .22074   |
| 16         | 22.294 | .52438   |
| 17         | 3.099  | .09814   |
| 18         | 35.381 | .69253   |
| 19         | 54.556 | .83774   |
| 20         | 15.347 | .40044   |

3DSPHERES test for file test.dat p-value= .397024

RESULTS OF SQUEEZE TEST FOR test.dat  
 Table of standardized frequency counts  
 ( (obs-exp)/sqrt(exp) )^2

for j taking values <=6,7,8,...,47,>=48:

|      |      |      |      |      |     |
|------|------|------|------|------|-----|
| -.8  | .5   | .6   | -.5  | .0   | 2.7 |
| .2   | .1   | .3   | .5   | .4   | -.2 |
| -1.4 | 1.5  | -1.7 | -1.9 | .5   | -.2 |
| .8   | -1.0 | .6   | .9   | .4   | 2.0 |
| -.2  | -1.9 | -1.3 | .7   | 1.5  | .7  |
| 1.2  | .3   | .0   | -.3  | -1.6 | -.5 |
| -.7  | .2   | .1   | -1.3 | -1.3 | 1.0 |
| -1.1 |      |      |      |      |     |

Chi-square with 42 degrees of freedom: 46.663  
 z-score= .509 p-value= .713530

|             |         |         |
|-------------|---------|---------|
| Test no. 1  | p-value | .699214 |
| Test no. 2  | p-value | .031920 |
| Test no. 3  | p-value | .904006 |
| Test no. 4  | p-value | .903183 |
| Test no. 5  | p-value | .247957 |
| Test no. 6  | p-value | .865849 |
| Test no. 7  | p-value | .864370 |
| Test no. 8  | p-value | .812636 |
| Test no. 9  | p-value | .035840 |
| Test no. 10 | p-value | .578051 |

Results of the OSUM test for test.dat  
 KSTEST on the above 10 p-values: .842485

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

|                                |         |
|--------------------------------|---------|
| Run test for test.dat          | :       |
| runs up; ks test for 10 p's:   | .608964 |
| runs down; ks test for 10 p's: | .680247 |
| Run test for test.dat          | :       |

runs up; ks test for 10 p's: .685207  
runs down; ks test for 10 p's: .992038

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Results of craps test for test.dat

No. of wins: Observed Expected

98968 98585.86

Chisq= 19.99 for 20 degrees of freedom, p= .54151

Throws Observed Expected Chisq Sum

SUMMARY FOR test.dat

p-value for no. of wins: .956289

p-value for throws/game: .541507

Test completed. File test.dat

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: