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I used the Random() function in Java.

Random() seems to work the best followed closes by RANDU with LCG working the worst.

Results

|  |  |  |  |
| --- | --- | --- | --- |
| **Random()** | 80% | 90% | 95% |
| Chi-Square | Yes | Yes | Yes |
| Kolmogorov-Smirnov | Yes | Yes | Yes |
| Runs | Yes | Yes | Yes |
| Autocorrelations-2 | No | No | Yes |
| Autocorrelations-3 | Yes | Yes | Yes |
| Autocorrelations-5 | Yes | Yes | Yes |
| Autocorrelations-50 | Yes | Yes | Yes |

|  |  |  |  |
| --- | --- | --- | --- |
| **LCG** | 80% | 90% | 95% |
| Chi-Square | Yes | Yes | Yes |
| Kolmogorov-Smirnov | No | No | No |
| Runs | Yes | Yes | Yes |
| Autocorrelations-2 | No | No | No |
| Autocorrelations-3 | No | No | No |
| Autocorrelations-5 | No | No | No |
| Autocorrelations-50 | No | No | No |

|  |  |  |  |
| --- | --- | --- | --- |
| **RANDU** | 80% | 90% | 95% |
| Chi-Square | Yes | Yes | Yes |
| Kolmogorov-Smirnov | Yes | Yes | Yes |
| Runs | Yes | Yes | Yes |
| Autocorrelations-2 | Yes | Yes | Yes |
| Autocorrelations-3 | Yes | Yes | Yes |
| Autocorrelations-5 | No | No | No |
| Autocorrelations-50 | Yes | Yes | Yes |

I expected the supplied java method Random() to work the best because it was made specifically to output random values to I would assume they would use the best reasonable algorithm that was possible. I expected both of the LCG methods to be pretty good but not as good as Random(). I wasn’t sure which would be better because RANDU used larger numbers which would seem better but it also used 0 as a C value which I thought would hurt how random it’s results were.

After looking at the randomly generated results the Random() seemed to be very close to being random as far as I could tell from looking at the results. Since there were so many digits it was tough to see any patterns. The LCG test values looked to be random at first but I noticed the last two digits of the values were almost always 25 or 75. The RANDU values seemed to be pretty random as well but still had the numbers ending in 25 or 75. I would guess that they were more random than the LCG though because they contained more digits.

I think the set of experiments was sufficient. For each random number generator, we used 4 different tests and got 21 different results. Of course we could always use more test’s to get more accurate results but I think these were pretty good tests because each is testing for a different pattern. Chi-Square checks that each section has an even number of values, Auto-Correlation checks for repetition, and Kolmogorov-Smirnov checks that it aligns with the distribution.

One thing that could be done is to use a higher test for significance. The tests we used may be OK for most uses of random numbers but there will probably be cases where programs need to have higher levels of accuracy.