

NAG Toolbox for MATLAB

g05ln

1 Purpose

g05ln generates a vector of pseudo-random numbers from a logistic distribution with mean a and spread b .

2 Syntax

```
[x, iseed, ifail] = g05ln(a, b, n, igen, iseed)
```

3 Description

The distribution has PDF (probability density function)

$$f(x) = \frac{e^{(x-a)/b}}{b(1 + e^{(x-a)/b})^2}.$$

g05ln returns the value

$$a + b \ln\left(\frac{y}{1-y}\right),$$

where y is a pseudo-random number uniformly distributed over $(0, 1)$.

One of the initialization functions g05kb (for a repeatable sequence if computed sequentially) or g05kc (for a non-repeatable sequence) must be called prior to the first call to g05ln.

4 References

Kendall M G and Stuart A 1969 *The Advanced Theory of Statistics (Volume 1)* (3rd Edition) Griffin
 Knuth D E 1981 *The Art of Computer Programming (Volume 2)* (2nd Edition) Addison–Wesley

5 Parameters

5.1 Compulsory Input Parameters

1: **a – double scalar**

a , the mean of the distribution.

2: **b – double scalar**

b , the spread of the distribution, where ‘spread’ is $\frac{\sqrt{3}}{\pi} \times$ standard deviation.

Constraint: $b > 0.0$.

3: **n – int32 scalar**

n , the number of pseudo-random numbers to be generated.

Constraint: $n \geq 0$.

4: **igen – int32 scalar**

Must contain the identification number for the generator to be used to return a pseudo-random number and should remain unchanged following initialization by a prior call to g05kb or g05kc.

5: **iseed(4) – int32 array**

Contains values which define the current state of the selected generator.

5.2 Optional Input Parameters

None.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

1: **x(*) – double array**

Note: the dimension of the array **x** must be at least $\max(1, \mathbf{n})$.

The n pseudo-random numbers from the specified logistic distribution.

2: **iseed(4) – int32 array**

Contains updated values defining the new state of the selected generator.

3: **ifail – int32 scalar**

0 unless the function detects an error (see Section 6).

6 Error Indicators and Warnings

Errors or warnings detected by the function:

ifail = 2

On entry, $\mathbf{b} \leq 0.0$.

ifail = 3

On entry, $\mathbf{n} < 0$.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

```
a = 1;
b = 2;
n = int32(5);
igen = int32(1);
iseed = [int32(1762543);
         int32(9324783);
         int32(42344);
         int32(742355)];
[x, iseedOut, ifail] = g05ln(a, b, n, igen, iseed)

x =
```

```
-3.6439  
6.9299  
0.2422  
3.1253  
6.8790  
iseedOut =  
16516983  
2826895  
4504715  
8850212  
ifail =  
0
```
