

NAG Toolbox for MATLAB

g05na

1 Purpose

g05na performs a pseudo-random permutation of a vector of integers.

2 Syntax

```
[index, iseed, ifail] = g05na(index, igen, iseed, 'n', n)
```

3 Description

g05na permutes the elements of an integer array without inspecting their values. Each of the $n!$ possible permutations of the n values may be regarded as being equally probable.

Even for modest values of n (greater than 25 say), it is theoretically impossible that all $n!$ permutations may occur, as $n!$ exceeds the cycle length of g05ka for any valid value of **igen**. For practical purposes this is irrelevant, as the time necessary to generate all possible permutations is many millenia.

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 g05na.

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: **index(n)** – **int32** array

The n integer values to be permuted.

- 2: **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.

- 3: **iseed(4)** – **int32** array

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

5.2 Optional Input Parameters

- 1: **n** – **int32** scalar

Default: The dimension of the array **index**.

the number of values to be permuted.

Constraint: $n \geq 1$.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

1: **index(n) – int32 array**

The n permuted integer values.

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 = 1

On entry, $n < 1$.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

```
index = [int32(1);  
         int32(2);  
         int32(3);  
         int32(4);  
         int32(5);  
         int32(6);  
         int32(7);  
         int32(8)];  
igen = int32(1);  
iseed = [int32(1762543);  
         int32(9324783);  
         int32(42344);  
         int32(742355)];  
[indexOut, iseedOut, ifail] = g05na(index, igen, iseed)
```

```
indexOut =  
         2  
         4  
         3  
         7  
         8  
         6  
         5  
         1  
iseedOut =  
    11143339  
     7492254  
     6209399  
     1736486  
ifail =  
         0
```

