

NAG Toolbox for MATLAB

g05ey

1 Purpose

g05ey returns a pseudo-random integer taken from a discrete distribution defined by a reference vector **r**.

2 Syntax

```
[result] = g05ey(r, 'nr', nr)
```

3 Description

g05ey is designed for use in conjunction with other functions in this chapter, which set up the reference vector **r** for specific distributions or according to a distribution specified in terms of the PDF (probability density function) or CDF (cumulative distribution function). See the G05 Chapter Introduction.

The function generates a random number x from g05ca and searches the CDF in **r** for the smallest value y such that $\text{CDF}(y) \geq x$ and $\text{CDF}(y - 1) < x$. **r** will contain an index to speed this process and the more space allotted to **r** the faster this will become.

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: **r(nr)** – double array
The reference vector **r**.

5.2 Optional Input Parameters

- 1: **nr** – int32 scalar
Default: The dimension of the array **r**.
It must be the same as the value of **nr** specified in a call to a function to set up the reference vector.

5.3 Input Parameters Omitted from the MATLAB Interface

None.

5.4 Output Parameters

- 1: **result** – int32 scalar
The result of the function.

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Further Comments

The time taken by g05ey decreases as the space allotted to the index part of **r** increases. There is a point, depending on the distribution, where the improvement becomes very small and the recommended values for **nr** in other functions are designed to approximate this point.

9 Example

```
r = [5;  
     -8.5;  
      8.5;  
      9.5;  
     10.5;  
     11.5;  
     12.5;  
     0.06720551273975141;  
     0.2486603971370802;  
     0.4936244910734741;  
     0.7140921756162286;  
     0.8629078626825879;  
     0.9432683336984219;  
     0.9794305456555472;  
     0.9933788274104385;  
     0.9980863725027143;  
     0.9994986360303969;  
     0.9998799471828712;  
     0.9999735417384785;  
     0.9999946005134902;  
     0.9999989742590696;  
     0.9999998177671456;  
     0.9999999695985993;  
     0.999999995220157;  
     0.9999999992894633;  
     0.9999999998998592;  
     0.9999999999865997;  
     0.9999999999983097;  
     0.999999999998153;  
     1];  
g05za('O');  
g05cb(int32(0));  
[result] = g05ey(r)
```

```
result =  
      4
```