

NAG Fortran Library Routine Document

G05FAF

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of ***bold italicised*** terms and other implementation-dependent details.

1 Purpose

G05FAF generates a vector of pseudo-random numbers uniformly distributed over the interval $[a, b]$.

2 Specification

```
SUBROUTINE G05FAF(A, B, N, X, IFAIL)
  INTEGER          N, IFAIL
  real            A, B, X(N)
```

3 Description

If $a = 0$ and $b = 1$, G05FAF returns the next n values y_i from a uniform (0,1) generator (see G05CAF for details).

For other values of a and b , G05FAF applies the transformation

$$x_i = a + (b - a)y_i.$$

The routine ensures that the values x_i lie in the closed interval $[a, b]$.

If computing sequentially and using the same generator, G05FAF always generates exactly the same pseudo-random numbers as would n consecutive calls of G05CAF or G05DAF, and on many machines is likely to be much faster.

4 References

Knuth D E (1981) *The Art of Computer Programming (Volume 2)* (2nd Edition) Addison-Wesley

5 Parameters

- 1: A – ***real*** *Input*
- 2: B – ***real*** *Input*
On entry: the end-points a and b of the uniform distribution. It is not necessary that $a < b$.
- 3: N – INTEGER *Input*
On entry: the number, n , of pseudo-random numbers to be generated.
- 4: X(N) – ***real*** array *Output*
On exit: the n pseudo-random numbers from the specified uniform distribution.
- 5: IFAIL – INTEGER *Input/Output*
On entry: IFAIL must be set to 0, -1 or 1. Users who are unfamiliar with this parameter should refer to Chapter P01 for details.
On exit: IFAIL = 0 unless the routine detects an error (see Section 6).

For environments where it might be inappropriate to halt program execution when an error is detected, the value -1 or 1 is recommended. If the output of error messages is undesirable, then the

value 1 is recommended. Otherwise, for users not familiar with this parameter the recommended value is 0. **When the value -1 or 1 is used it is essential to test the value of IFAIL on exit.**

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

The example program prints five pseudo-random numbers from a uniform distribution between 1.0 and 1.5, generated by a single call to G05FAF, after initialisation by G05CBF.

The generator mechanism used is selected by an initial call to G05ZAF.

9.1 Program Text

Note: the listing of the example program presented below uses *bold italicised* terms to denote precision-dependent details. Please read the Users' Note for your implementation to check the interpretation of these terms. As explained in the Essential Introduction to this manual, the results produced may not be identical for all implementations.

```
*      G05FAF Example Program Text
*      Mark 20 Revised. NAG Copyright 2001.
*      .. Parameters ..
      INTEGER          NOUT
      PARAMETER        (NOUT=6)
      INTEGER          N
      PARAMETER        (N=5)
*      .. Local Scalars ..
      INTEGER          I
*      .. Local Arrays ..
      real              X(N)
*      .. External Subroutines ..
      EXTERNAL         G05CBF, G05FAF, G05ZAF
*      .. Executable Statements ..
      CALL G05ZAF('O')
      WRITE (NOUT,*) 'G05FAF Example Program Results'
      CALL G05CBF(0)

*
      CALL G05FAF(1.0e0,1.5e0,N,X)
*
      WRITE (NOUT,99999) (X(I),I=1,N)
      STOP
*
99999  FORMAT (1X,F10.4)
      END
```

9.2 Program Data

None.

9.3 Program Results

G05FAF Example Program Results

1.3976

1.1129

1.1856

1.1125

1.4394
