NAG C Library Function Document

nag_rngs_logical (g05kec)

1   Purpose

nag_rngs_logical (g05kec) returns a pseudo-random logical value – $true$ with probability p and $false$ with probability $(1 - p)$.

2   Specification

```
Boolean nag_rngs_logical (double p, Integer igen, Integer iseed[], NagError *fail)
```

3   Description

nag_rngs_logical (g05kec) returns the logical value of the relation

$$y < p$$

where y is a pseudo-random number from a uniform distribution over (0,1), generated by nag_rngs_basic (g05kac) using the values of **igen** and **iseed** as input to this function.

One of the initialisation functions nag_rngs_init_repeatable (g05kbc) (for a repeatable sequence if computed sequentially) or nag_rngs_init_nonrepeatable (g05kcc) (for a non-repeatable sequence) must be called prior to the first call to nag_rngs_logical (g05kec).

4   References

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

5   Parameters

1:    **p** – double   *Input*

On entry: must contain the probability of nag_rngs_logical (g05kec) returning a true result.

Constraint: $0 \le \mathbf{p} \le 1$.

2:    **igen** – Integer   *Input*

On entry: must contain the identification number for the generator to be used to return a pseudo-random number and should remain unchanged following initialisation by a prior call to one of the functions nag_rngs_init_repeatable (g05kbc) or nag_rngs_init_nonrepeatable (g05kcc).

3:    **iseed**[4] – Integer   *Input/Output*

On entry: contains values which define the current state of the selected generator.

On exit: contains updated values defining the new state of the selected generator.

4:    **fail** – NagError *   *Input/Output*

The NAG error parameter (see the Essential Introduction).

6   Error Indicators and Warnings

NE_REAL

On entry, $\mathbf{p} < 0.0$ or $\mathbf{p} > 1.0$: $\mathbf{p} = \langle value \rangle$.

NE_BAD_PARAM

On entry, parameter ⟨*value*⟩ had an illegal value.

NE_INTERNAL_ERROR

An internal error has occurred in this function. Check the function call and any array sizes. If the call is correct then please consult NAG for assistance.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

The example program prints the first five pseudo-random logical values generated by nag_rngs_logical (g05kec) after initialisation by nag_rngs_init_repeatable (g05kbc), when the probability of a TRUE value is 0.6.

9.1 Program Text

```
/* nag_rngs_logical(g05kec) Example Program.
 *
 * Copyright 2001 Numerical Algorithms Group.
 *
 * Mark 7, 2001.
 */

#include <stdio.h>
#include <nag.h>
#include <nag_stdlib.h>
#include <nagg05.h>

int main(void)
{

  /* Scalars */
  Integer  i, igen;
  Integer exit_status=0;
  Boolean  x;
  NagError fail;

  /* Arrays */
  Integer  iseed[4];

  INIT_FAIL(fail);
  Vprintf("g05kec Example Program Results\n\n");

  /* Initialise the seed */
  iseed[0] = 1762543;
  iseed[1] = 9324783;
  iseed[2] = 42344;
  iseed[3] = 742355;
  /* igen identifies the stream. */
  igen = 1;
  g05kbc(&igen, iseed);
  for (i = 1; i <= 5; ++i)
    {
      x = g05kec(0.6, igen, iseed, &fail);
      if (fail.code != NE_NOERROR)
        {
          Vprintf("Error from g05kec.\n%s\n", fail.message);
```

```
            exit_status = 1;
            goto END;
          }
        Vprintf("  %s\n", x? "T" : "F");
      }
  END:
    return exit_status;
}
```

9.2 Program Data

None.

9.3 Program Results

```
g05kec Example Program Results

  T
  F
  T
  F
  F
```