

## 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:*  $0 \leq \mathbf{p} \leq 1$ .
- 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  $\mathbf{p} > 1.0$ :  $\mathbf{p} = \langle \text{value} \rangle$ .

**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
```

---