

NAG Toolbox

nag_rand_logical (g05tb)

1 Purpose

nag_rand_logical (g05tb) generates a vector of pseudorandom logical values – *true* with probability p and *false* with probability $(1 - p)$.

2 Syntax

```
[state, x, ifail] = nag_rand_logical(n, p, state)
[state, x, ifail] = g05tb(n, p, state)
```

3 Description

nag_rand_logical (g05tb) generates n logical values x_i from the relation

$$y_i < p$$

where y_i is a pseudorandom number from a uniform distribution over $(0, 1]$, generated by nag_rand_dist_uniform01 (g05sa) using the values of **state** as input to this function.

One of the initialization functions nag_rand_init_repeat (g05kf) (for a repeatable sequence if computed sequentially) or nag_rand_init_nonrepeat (g05kg) (for a non-repeatable sequence) must be called prior to the first call to nag_rand_logical (g05tb).

4 References

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

5 Parameters

5.1 Compulsory Input Parameters

1: **n** – INTEGER

n , the number of pseudorandom logical values to be generated.

Constraint: $n \geq 0$.

2: **p** – REAL (KIND=nag_wp)

Must contain the probability of nag_rand_logical (g05tb) returning *true*.

Constraint: $0.0 \leq p \leq 1.0$.

3: **state**(:) – INTEGER array

Note: the actual argument supplied **must** be the array **state** supplied to the initialization routines nag_rand_init_repeat (g05kf) or nag_rand_init_nonrepeat (g05kg).

Contains information on the selected base generator and its current state.

5.2 Optional Input Parameters

None.

5.3 Output Parameters

- 1: **state**(:) – INTEGER array
Contains updated information on the state of the generator.
- 2: **x**(**n**) – LOGICAL array
The n logical values.
- 3: **ifail** – INTEGER
ifail = 0 unless the function detects an error (see Section 5).

6 Error Indicators and Warnings

Errors or warnings detected by the function:

ifail = 1

Constraint: $\mathbf{n} \geq 0$.

ifail = 2

Constraint: $0.0 \leq \mathbf{p} \leq 1.0$.

ifail = 3

On entry, **state** vector has been corrupted or not initialized.

ifail = -99

An unexpected error has been triggered by this routine. Please contact NAG.

ifail = -399

Your licence key may have expired or may not have been installed correctly.

ifail = -999

Dynamic memory allocation failed.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

This example prints the first 20 pseudorandom logical values generated by `nag_rand_logical` (g05tb) after initialization by `nag_rand_init_repeat` (g05kf), when the probability of a *true* value is 0.5.

9.1 Program Text

```
function g05tb_example

fprintf('g05tb example results\n\n');

% Initialize the base generator to a repeatable sequence
seed = [nag_int(1762543)];
genid = nag_int(1);
subid = nag_int(1);
[state, ifail] = g05kf( ...
                    genid, subid, seed);

% Number of variates
n = nag_int(20);

% Parameters
p = 0.5;

% Generate variates from a logical distribution
[state, x, ifail] = g05tb( ...
                        n, p, state);

disp('Variates');
for i = 1:n
    if x(i)
        fprintf('    true\n');
    else
        fprintf('    false\n');
    end
end
```

9.2 Program Results

```
g05tb example results

Variates
false
true
false
false
true
true
true
false
true
false
true
true
false
true
false
true
true
false
false
false
```
