

## NAG Library Function Document

### nag\_quad\_1d\_gen\_vec\_multi\_dimreq (d01rcc)

#### 1 Purpose

The dimension of the arrays that must be passed as actual arguments to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac) are dependent upon a number of factors. `nag_quad_1d_gen_vec_multi_dimreq` (d01rcc) returns the correct size of these arrays enabling `nag_quad_1d_gen_vec_multi_rcomm` (d01rac) to be called successfully.

#### 2 Specification

```
#include <nag.h>
#include <nagd01.h>

void nag_quad_1d_gen_vec_multi_dimreq (Integer ni, Integer *lenxrq,
    Integer *ldfmrq, Integer *sdfmrq, Integer *licmin, Integer *licmax,
    Integer *lcmin, Integer *lcmx, const Integer iopts[],
    const double opts[], NagError *fail)
```

#### 3 Description

`nag_quad_1d_gen_vec_multi_dimreq` (d01rcc) returns the minimum dimension of the arrays **x** (*lenxrq*), **fm** (*ldfmrq* × *sdfmrq*), **icom** (*licmin*) and **com** (*lcmin*) that must be passed to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac) to enable the integration to commence given options currently set for the **ni** integrands. `nag_quad_1d_gen_vec_multi_dimreq` (d01rcc) also returns the upper bounds *licmax* and *lcmx* for the dimension of the arrays **icom** and **com**, that could possibly be required with the chosen options.

All the minimum values *lenxrq*, *ldfmrq*, *sdfmrq*, *licmin* and *lcmin*, and subsequently all the maximum values *licmax* and *lcmx* may be affected if different options are set, and hence `nag_quad_1d_gen_vec_multi_dimreq` (d01rcc) should be called after any options are set, and before the first call to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac).

A segment is here defined as a (possibly maximal) subset of the domain of integration. During subdivision, a segment is bisected into two new segments.

#### 4 References

None.

#### 5 Arguments

- 1: **ni** – Integer *Input*  
*On entry:*  $n_i$ , the number of integrals which will be approximated in the subsequent call to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac).  
*Constraint:* **ni** > 0.
- 2: **lenxrq** – Integer \* *Output*  
*On exit:* *lenxrq*, the minimum dimension of the array **x** that can be used in a subsequent call to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac).

- 3: **ldfmrq** – Integer \* *Output*  
*On exit:* *ldfmrq*, the minimum stride separating row elements of the matrix of values stored in the array **fm** that can be used in a subsequent call to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac).
- 4: **sdfmrq** – Integer \* *Output*  
*On exit:* *sdfmrq*, the minimum number of columns of the matrix of values stored in the array **fm** that can be used in a subsequent call to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac).  
**Note:** the minimum dimension of the array **fm** is  $ldfmrq \times sdfmrq$ .
- 5: **licmin** – Integer \* *Output*  
*On exit:* *licmin*, the minimum dimension of the array **icom** that must be passed to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac) to enable it to calculate a single approximation to all the  $n_i$  integrals over the interval  $[a, b]$  with  $s_{pri}$  initial segments.
- 6: **licmax** – Integer \* *Output*  
*On exit:* *licmax* the dimension of the array **icom** that must be passed to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac) to enable it to exhaust the adaptive process controlled by the currently set options for the  $n_i$  integrals over the interval  $[a, b]$  with  $s_{pri}$  initial segments.
- 7: **lcmmin** – Integer \* *Output*  
*On exit:* *lcmmin*, the minimum dimension of the array **com** that must be passed to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac) to enable it to calculate a single approximation to all the  $n_i$  integrals over the interval  $[a, b]$  with  $s_{pri}$  initial segments.
- 8: **lcmmax** – Integer \* *Output*  
*On exit:* *lcmmax*, the dimension of the array **com** that must be passed to `nag_quad_1d_gen_vec_multi_rcomm` (d01rac) to enable it to exhaust the adaptive process controlled by the currently set options for the  $n_i$  integrals over the interval  $[a, b]$  with  $s_{pri}$  initial segments.
- 9: **iopts** $[dim]$  – const Integer *Communication Array*  
**Note:** the dimension, *dim*, of this array is dictated by the requirements of associated functions that must have been previously called. This array MUST be the same array passed as argument **iopts** in the previous call to `nag_quad_opt_set` (d01zkc).  
*On entry:* the integer option array as returned by `nag_quad_opt_set` (d01zkc).  
*Constraint:* **iopts** must not be changed between calls to `nag_quad_opt_set` (d01zkc), `nag_quad_opt_get` (d01zlc), `nag_quad_1d_gen_vec_multi_dimreq` (d01rcc) and `nag_quad_1d_gen_vec_multi_rcomm` (d01rac).
- 10: **opts** $[dim]$  – const double *Communication Array*  
**Note:** the dimension, *dim*, of this array is dictated by the requirements of associated functions that must have been previously called. This array MUST be the same array passed as argument **opts** in the previous call to `nag_quad_opt_set` (d01zkc).  
*On entry:* the real option array as returned by `nag_quad_opt_set` (d01zkc).  
*Constraint:* **opts** must not be changed between calls to `nag_quad_opt_set` (d01zkc), `nag_quad_opt_get` (d01zlc), `nag_quad_1d_gen_vec_multi_dimreq` (d01rcc) and `nag_quad_1d_gen_vec_multi_rcomm` (d01rac).
- 11: **fail** – NagError \* *Input/Output*  
The NAG error argument (see Section 3.6 in the Essential Introduction).

## 6 Error Indicators and Warnings

### NE\_BAD\_PARAM

On entry, argument  $\langle value \rangle$  had an illegal value.

### NE\_INT

On entry,  $ni = \langle value \rangle$ .  
Constraint:  $ni > 0$ .

### 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 contact NAG for assistance.

### NE\_INVALID\_OPTION

One of the option arrays **iopts** or **opts** has become corrupted. Re-initialize the arrays using `nag_quad_opt_set (d01zkc)`.

## 7 Accuracy

Not applicable.

## 8 Parallelism and Performance

Not applicable.

## 9 Further Comments

None.

## 10 Example

See Section 10 in `nag_quad_1d_gen_vec_multi_rcomm (d01rac)` for examples of the usage of `nag_quad_1d_gen_vec_multi_dimreq (d01rcc)`.

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