

**NAME**

tql1 – Double-precision symmetric tridiagonal matrix eigenvalues

**SYNOPSIS**

Fortran (77, 90, 95, HPF):

```
f77 [ flags ] file(s) ... -L/usr/local/lib -lgjl
      SUBROUTINE tql1(n,d,e,ierr)
      DOUBLE PRECISION d(*), e(*)
      INTEGER ierr, n
```

C (K&R, 89, 99), C++ (98):

```
cc [ flags ] -I/usr/local/include file(s) ... -L/usr/local/lib -lgjl
Use
```

```
#include <gjl.h>
```

to get this prototype:

```
void tql1(const fortran_integer * n_,      fortran_double_precision d[],      for-
         tran_double_precision e[],      fortran_integer * ierr_);
```

NB: The definition of C/C++ data types **fortran\_**xxx, and the mapping of Fortran external names to C/C++ external names, is handled by the C/C++ header file. That way, the same function or subroutine name can be used in C, C++, and Fortran code, independent of compiler conventions for mangling of external names in these programming languages.

Last code modification: 31-Aug-1983

**DESCRIPTION**

Given a symmetric tridiagonal matrix of order **n** stored with its diagonal in **d**(1..**n**), and its subdiagonal in **e**(2..**n**), with **e**(1) arbitrary, use the QL method to find the eigenvalues.

On return, the original contents of **d**(\*) and **e**(\*) will have been destroyed, and **d**(\*) will contain the eigenvalues in ascending order.

The error indicator, **ierr**, is normally set to zero on return. However, if an error exit is made, **ierr** is set to a positive value, and then the eigenvalues are correct and ordered for indices 1, 2, ..., **ierr**-1, but may not be the smallest eigenvalues.

This routine is a translation of the Algol procedure **tql1()** from “The QR and QL Algorithms for Symmetric Matrices”, Numerische Mathematik 11, 293--306 (1968), by H. J. Bowdler, R. S. Martin, C. Reinsch and J. H. Wilkinson. That article was republished in the Handbook for Automatic Computation, Vol. II, Linear Algebra, 227--240 (1971), eds. J. H. Wilkinson and C. Reinsch, Springer-Verlag, ISBN 3-540-05414-6.

**tql1()** is part of the EISPACK-1 and EISPACK-2 libraries.

**AUTHORS**

The algorithms and code are described in detail in the paper

*Algorithm xxx: Quadruple-Precision Gamma(x) and psi(x) Functions for Real Arguments*

in ACM Transactions on Mathematical Software, Volume ??, Number ??, Pages ???--??? and ???--???, 2001, by

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