```
c===========================================================
c     fdemo2:  Program which demonstrates basic usage
c     of character variables in Fortran 77.
c===========================================================
      program         fdemo2
      implicit        none
c-----------------------------------------------------------
c     See below for definition of integer function
c     ’indlnb’.   Note that this and other useful routines
c     are available in the ’p329f’ library.
c-----------------------------------------------------------
      integer         indlnb
c-----------------------------------------------------------
c     Define some character variables of various lengths
c-----------------------------------------------------------
      character*1     c1
      character*2     c2
      character*4     c4
      character*26    lcalph
      character       cc1*1,    cc2*2,   cc4*4
      character*60    buffer
c-----------------------------------------------------------
c     Assignment of constant strings to char. variables.
c     If length of character expression being assigned
c     is less than length of character variable, variable
c     is ’right-padded’ with blanks.
c-----------------------------------------------------------
      c1     = ’a’
      c2     = ’bc’
      c4     = ’defg’
      lcalph = ’abcdefghijklmnopqrstuvwxyz’

      write(*,*) ’c1 = ’, c1
      write(*,*) ’c2 = ’, c2
      write(*,*) 'c4 = ', c4
      write(*,*) 'lcalph = ', lcalph
      call prompt('Through constant assignment')
c-----------------------------------------------------------
c     // is the string concatentation operator
c-----------------------------------------------------------
      write(*,*) 'c1 // c2 // c4 = ', c1 // c2 // c4
      call prompt('Through concatenation')
c-----------------------------------------------------------
c     The integer intrinsic (built-in) function 'len'
c     returns the length of its string argument
c-----------------------------------------------------------
      write(*,*) 'len(c1) = ', len(c1)
      write(*,*) 'len(buffer) = ', len(buffer)
      call prompt('Through string length')
c-----------------------------------------------------------
c     Substring extraction
c-----------------------------------------------------------
      write(*,*) 'lcalph(1:13) = ',  lcalph(1:13)
      write(*,*) 'lcalph(18:18) = ', lcalph(18:18)
      call prompt('Through substring extraction')
c-----------------------------------------------------------
c     Substring assignment
c-----------------------------------------------------------
      c4(4:4) = 'Z'
      write(*,*) 'c4 = ', c4
      call prompt('Through substring assignment')
c-----------------------------------------------------------
c     Use of 'indlnb'
c-----------------------------------------------------------
      buffer = 'somefilename'
      write(*,*) '<' // buffer // '>'
      write(*,*) '<' // buffer(1:indlnb(buffer)) // '>'
      buffer = 'Some multi-word message'
      write(*,*) '<' // buffer // '>'
      write(*,*) '<' // buffer(1:indlnb(buffer)) // '>'
      buffer = ' '
      write(*,*) 'indlnb(buffer) = ', indlnb(buffer)
      call prompt('Through indlnb usage')

      call prompt('Through fdemo2')

      stop
      end
c-----------------------------------------------------------
c     Prints a message on stdout and then waits for input
c     from stdin.
c-----------------------------------------------------------
      subroutine prompt(pstring)

         implicit      none

         character*(*) pstring
         integer       rc
         character*1   resp

         write(*,*) pstring
         write(*,*) 'Enter any non-blank character & '//
     &              'enter to continue'
         read(*,*,iostat=rc,end=900)  resp
         return

 900     continue
         stop
      end
```

```
c------------------------------------------------------------
c     Returns index of last non-blank character in ’s’,
c     or 0 if the string is completely blank.
c------------------------------------------------------------
      integer function indlnb(s)

         character*(*)    s
         integer          i

         do indlnb = len(s) , 1 , -1
            if( s(indlnb:indlnb) .ne. ’ ’ ) return
         end do
         indlnb = 0

         return

      end
```

```
Script started on Sat Sep 19 10:51:39 1998
############################################################
# Blank lines added for readability.
############################################################
newton 21> fdemo2
 c1 = a
 c2 = bc
 c4 = defg
 lcalph = abcdefghijklmnopqrstuvwxyz
 Through constant assignment
 Enter any non-blank character & enter to continue
a

 c1 // c2 // c4 = abcdefg
 Through concatenation
 Enter any non-blank character & enter to continue
a

 len(c1) =            1
 len(buffer) =           60
 Through string length
 Enter any non-blank character & enter to continue
a

 lcalph(1:13) = abcdefghijklm
 lcalph(18:18) = r
 Through substring extraction
 Enter any non-blank character & enter to continue
a

 c4 = defZ
 Through substring assignment
 Enter any non-blank character & enter to continue
a
```

```
 <somefilename                                                >
 <somefilename>
 <Some multi-word message                                     >
 <Some multi-word message>
 indlnb(buffer) =            0
 Through indlnb usage
 Enter any non-blank character & enter to continue
a

 Through fdemo2
 Enter any non-blank character & enter to continue
a

newton 22> exit
newton 23>
script done on Sat Sep 19 10:51:54 1998
```

```
Script started on Sat Sep 19 10:26:28 1998
############################################################
# ’iota’ is an APL-inspired script I wrote to generate
# the integers from 1 to n, one per line.  It comes in
# useful in many places.
############################################################
newton 21> iota
usage: iota <n> [<origin|1>]


############################################################
# ’iota’ lives in my personal ’scripts’ directory.  This
# directory is in your default path on the SGI’s so you
# can use it as well.
############################################################
newton 22> which iota
/d/newton/usr2/people/matt/scripts/iota
```

```
############################################################
# ’mw’ is another script which attempts to locate
# the source for a script or other executable, and then
# displays the source.
############################################################
newton 23> mw iota
</d/newton/usr2/people/matt/scripts/iota>
#!/bin/sh

Usage="usage: iota <n> [<origin|1>]"

case $# in
1) n=$1; origin=1;;
2) n=$1; origin=$2;;
*) echo "$Usage"; exit 1;;
esac

if printf "%d" $n > /dev/null 2>&1 && \
   printf "%d" $n > /dev/null 2>&1 $origin; then
   awk ’BEGIN{for(i=0; i<’$n’; i++) \
       printf "%d\n", i+’$origin’}’ < /dev/null
else
   echo "$Usage"; exit 1;
fi
```

```
############################################################
# Sample 'iota' invocation.
############################################################
newton 24> iota 10
1
2
3
4
5
6
7
8
9
10

############################################################
# Create 'first100' file.
############################################################
newton 25> iota 100 > first100
```

```
############################################################
# Display first 10 lines of 'first100' using Unix 'head'
# command.  Note use of '!$' (last argument to previous
# command).
############################################################
newton 26> head -10 !$
head -10 first100
1
2
3
4
5
6
7
8
9
10

############################################################
# Display last 10 lines of 'first100' using Unix 'tail'
# command.
############################################################
newton 27> tail -10 !$
tail -10 first100
91
92
93
94
95
96
97
98
99
100
```

```
c===========================================================
c     mysum:  reads numbers one per line from stdin
c     and writes sum on stdout.  Ignores invalid inputs
c     but counts number encountered and reports on stderr.
c===========================================================
      program      mysum

      implicit     none

c-----------------------------------------------------------
c     vi:    Current number read from stdin
c     sum:   Current sum of numbers read
c     rc:    For storing return status from READ
c     nbad:  Count of number of bad inputs
c-----------------------------------------------------------
      real*8       vi,         sum
      integer      rc,         nbad

c-----------------------------------------------------------
c     Initialize ...
c-----------------------------------------------------------
      nbad = 0
      sum  = 0.0d0

c-----------------------------------------------------------
c     The following construct is roughly equivalent to
c     a while loop, execution keeps returning to the
c     top of the loop until end of file is detected on
c     stdin.
c-----------------------------------------------------------
 100  continue
         read(*,*,iostat=rc,end=200)  vi
         if( rc .eq. 0 ) then
c-----------------------------------------------------------
```

```
c           Read a bona fide real*8 value, update sum.
c-----------------------------------------------------------
            sum = sum + vi
         else
c-----------------------------------------------------------
c           Input was invalid.
c-----------------------------------------------------------
            nbad = nbad + 1
         end if
      go to 100
 200  continue

c-----------------------------------------------------------
c     Write sum on standard output.
c-----------------------------------------------------------
      write(*,*) sum

c-----------------------------------------------------------
c     Report # of invalid inputs only if there were some.
c-----------------------------------------------------------
      if( nbad .gt. 0 ) then
c-----------------------------------------------------------
c        Unit 0 is stderr (standard error) on most Unix
c        systems: if you redirect stdin using '>' and this
c        message is tripped, it will still appear on the
c        terminal.
c-----------------------------------------------------------
         write(0,*) nbad, ' invalid inputs'
      end if

      stop

      end
```

```
c------------------------------------------------------------
c     Less-commented (i.e. more reasonable level of
c     comments) version of mysum.
c------------------------------------------------------------
c     mysum_s:  reads numbers one per line from stdin
c     and writes sum on stdout.  Ignores invalid inputs
c     but counts number encountered and reports on stderr.
c------------------------------------------------------------
      program      mysum
      implicit     none
      real*8       vi,         sum
      integer      rc,         nbad

      nbad = 0
      sum  = 0.0d0

 100  continue
         read(*,*,iostat=rc,end=200)  vi
         if( rc .eq. 0 ) then
            sum = sum + vi
         else
            nbad = nbad + 1
         end if
      go to 100
 200  continue

      write(*,*) sum

      if( nbad .gt. 0 ) then
         write(0,*) nbad, ’ invalid inputs’
      end if

      stop
      end
```

```
Script started on Sat Sep 19 10:00:12 1998
newton 21> mysum
1
2
8
10
^D
    21.0000000000000

newton 22> mysum < first100
    5050.000000000000

newton 23> mysum
12
2
8
a
10
b
^D
    32.0000000000000
            2 invalid inputs

newton 24> mysum < first100 > mysum_result
newton 25> more !$
more mysum_result
    5050.000000000000
```

```
c===========================================================
c     Returns a double precision vector (one-dimensional
c     array) read from file 'fname'.  If 'fname' is the
c     string '-', the vector is read from standard input.
c
c     The file should contain one number per line; invalid
c     input is ignored.
c
c     This routine illustrates  a general technique for
c     reading data from a FORMATTED (ASCII) file.  In
c     Fortran, one associates a "logical unit number"
c     (an integer) with a file via the OPEN statement.
c     The unit number can then be used as the first
c     "argument" of the READ and WRITE statements to
c     perform input and output on the file.
c
c     Fortran reserves the following unit numbers:
c
c     5      terminal input (stdin)
c     6      terminal output (stdout)
c     0      error output on Unix systems (stderr)
c===========================================================

      subroutine dvfrom(fname,v,n,maxn)
c-----------------------------------------------------------
c     Arguments:
c
c        fname:  (I)    File name
c        v:      (O)    Return vector
c        n:      (O)    Length of v (# read)
c        maxn:   (I)    Maximum number to read
c-----------------------------------------------------------
         implicit         none
```

```
c-----------------------------------------------------------
c        The integer functions 'indlnb' and 'getu' are
c        defined in the 'p329f' library.
c-----------------------------------------------------------
         integer          indlnb,      getu
c-----------------------------------------------------------
c        Declaration of routine arguments: note
c        "adjustable dimensioning" of v; any array which
c        is declared with adjustable dimesions must be
c        a subroutine argument; any adjustable dimensions
c        must also be subroutine arguments.
c-----------------------------------------------------------
         character*(*)    fname
         integer          n,           maxn
         real*8           v(maxn)

c-----------------------------------------------------------
c        Programming style: Use parameter (ustdin) rather
c        than constant value (5) for stdin logical unit #
c-----------------------------------------------------------
         integer          ustdin
         parameter      ( ustdin = 5 )

c-----------------------------------------------------------
c        Local variables:
c
c        vn:     Current number read from input
c        ufrom:  Logical unit number for READ
c        rc:     For storing return status from READ
c-----------------------------------------------------------
         real*8           vn
         integer          ufrom,       rc
```

```
c-----------------------------------------------------------
c        Intialize
c-----------------------------------------------------------
         n = 0

c-----------------------------------------------------------
c        Read from stdin?
c-----------------------------------------------------------
         if( fname .eq. '-' ) then
c-----------------------------------------------------------
c           Set unit number to stdin default
c-----------------------------------------------------------
            ufrom = ustdin
         else
c-----------------------------------------------------------
c           Get an available unit number
c-----------------------------------------------------------
            ufrom = getu()
c-----------------------------------------------------------
c           Open the file for formatted I/O
c-----------------------------------------------------------
            open(ufrom,file=fname(1:indlnb(fname)),
     &           form='formatted',status='old',iostat=rc)
            if( rc .ne. 0 ) then
c-----------------------------------------------------------
c              Couldn't open the file, print error message
c              and return.
c-----------------------------------------------------------
               write(0,*) 'dvfrom: Error opening ',
     &                    fname(1:indlnb(fname))
               return
            end if
         end if
```

```
c-----------------------------------------------------------
c        Input numbers into vector (one per line) until
c        EOF or maximum allowable number read
c-----------------------------------------------------------
 100     continue
            read(ufrom,*,iostat=rc,end=200)  vn
            if( rc .eq. 0 ) then
               n = n + 1
               if( n .gt. maxn ) then
                  write(0,*)  ’dvfrom: Read maximum of ’,
     &                         maxn, ’ from ’,
     &                         fname(1:indlnb(fname))
                     n = maxn
                     return
               end if
               v(n) = vn
            end if
         go to 100
 200     continue

c-----------------------------------------------------------
c        If we are reading from a file, close the file.
c        This releases the unit number for subsequent use.
c-----------------------------------------------------------
         if( ufrom .ne. ustdin ) then
            close(ufrom)
         end if

         return

      end
```

```
c===========================================================
c     Test program for subroutine 'dvfrom'.
c
c     Program expects one argument which is the filename
c     to be passed to 'dvfrom'
c===========================================================
      program         tdvfrom
      implicit        none
c-----------------------------------------------------------
c     The integer function 'iargc' returns the number of
c     arguments supplied to the program.  It is
c     automatically available to all Fortran programs on
c     most Unix systems, as is 'getarg' (see below).
c-----------------------------------------------------------
      integer         iargc,      indlnb

      integer         maxn
      parameter     ( maxn = 100 000 )
      real*8          v(maxn)
      integer         n

      character*256   fname
c-----------------------------------------------------------
c     Unless exactly one argument is supplied, print usage
c     message and exit.
c-----------------------------------------------------------
      if( iargc() .ne. 1 ) then
         write(0,*) 'usage: tdvfrom <file name>'
         write(0,*)
         write(0,*) '       Use ''tdvfrom -'' to read ',
     &              'from standard input'
         stop
      end if
```

```
c-----------------------------------------------------------
c     The subroutine 'getarg' (Unix) takes 2 arguments.
c     The first is an integer input argument specifying
c     which argument is to be fetched, the second is
c     a character output argument which, on return,
c     contains the fetched argument.
c
c     Get the filename.
c-----------------------------------------------------------
      call getarg(1,fname)
c-----------------------------------------------------------
c     Call the routine ...
c-----------------------------------------------------------
      call dvfrom(fname,v,n,maxn)
c-----------------------------------------------------------
c     ... and report how many numbers were read.
c-----------------------------------------------------------
      write(0,*) 'tdvfrom: ', n, ' read from '//
     &           fname(1:indlnb(fname))

      stop
      end
```

```
Script started on Sat Sep 19 10:03:30 1998

newton 21> tdvfrom
 usage: tdvfrom <file name>

        Use 'tdvfrom -' to read from standard input

newton 22> tdvfrom -
1
2
3
4
5
^D
 tdvfrom:            5 read from -

newton 23> tdvfrom first100
 tdvfrom:          100 read from first100
```

```
c===========================================================
c     Writes a double precision vector to file 'fname'.
c     If fname is the string '-' then the vector is written
c     to standard output.
c===========================================================

      subroutine dvto(fname,v,n)
c-----------------------------------------------------------
c     Arguments:
c
c        fname:  (I)    File name
c        v:      (I)    Vector to be written
c        n:      (I)    Length of vector
c-----------------------------------------------------------
         implicit         none

         integer          getu,       indlnb

         character*(*)    fname
         integer          n
         real*8           v(n)

         integer          ustdout
         parameter      ( ustdout = 6 )

         integer          i,      uto,       rc
```

```
    if( fname .eq. '-' ) then
       uto = ustdout
    else
       uto = getu()
       open(uto,file=fname(1:indlnb(fname)),
&           form='formatted',iostat=rc)
       if( rc .ne. 0 ) then
          write(0,*) 'dvto: Error opening ',
&                    fname(1:indlnb(fname))
          return
       end if
    end if

    do i = 1 , n
       write(uto,*) v(i)
    end do

    if( uto .ne. ustdout ) then
       close(uto)
    end if

    return

 end
```

```
c===========================================================
c     Test program for subroutine 'dvto'.
c
c     Program expects two arguments, the name of a file
c     for output ('-' for stdout) and the length of the
c     test vector to be written.
c===========================================================
      program         tdvto

      implicit        none

c-----------------------------------------------------------
c     The integer function 'i4arg' is defined in the
c     'p329f' library.  It takes two arguments, the first
c     is an integer specifying which program argument is
c     to be parsed as an integer, and the second is a
c     default value which will be returned if the argument
c     was not supplied or could not be converted to an
c     integer.
c-----------------------------------------------------------
      integer         iargc,      indlnb,    i4arg

      integer         maxn
      parameter     ( maxn = 100 000 )
      real*8          v(maxn)
      integer         n

      integer         i
      character*256   fname
```

```
c-----------------------------------------------------------
c     Unless exactly two arguments are supplied, print usage
c     message and exit.
c
c     Note the use of the "logical-if" statement (no then)
c-----------------------------------------------------------
      if( iargc() .ne. 2 ) go to 900

      call getarg(1,fname)
      n = i4arg(2,-1)
      if( n .eq. -1 ) go to 900
c-----------------------------------------------------------
c     Limit the value of n
c-----------------------------------------------------------
      n = min(n,maxn)
c-----------------------------------------------------------
c     Define test vector
c-----------------------------------------------------------
      do i = 1 , n
         v(i) = i
      end do

c-----------------------------------------------------------
c     Call the routine ..
c-----------------------------------------------------------
      call dvto(fname,v,n)

c-----------------------------------------------------------
c     Normal exit
c-----------------------------------------------------------
      stop
```

```
c------------------------------------------------------------
c     Usage exit
c------------------------------------------------------------
 900  continue
         write(0,*) 'usage: tdvto <file name> <n>'
         write(0,*)
         write(0,*) '       Use ''tdvto -'' to write ',
     &              'to standard output'

      stop

      end
```

```
Script started on Sat Sep 19 10:04:52 1998
newton 21> tdvto
 usage: tdvto <file name> <n>

        Use ’tdvto -’ to write to standard output

newton 22>  tdvto -
 usage: tdvto <file name> <n>

        Use ’tdvto -’ to write to standard output

newton 23> tdvto - 10
    1.000000000000000
    2.000000000000000
    3.000000000000000
    4.000000000000000
    5.000000000000000
    6.000000000000000
    7.000000000000000
    8.000000000000000
    9.000000000000000
    10.00000000000000

newton 24>  tdvto foo 5
newton 25> more foo
    1.000000000000000
    2.000000000000000
    3.000000000000000
    4.000000000000000
    5.000000000000000
```

```
.IGNORE:

F77       = f77
F77FLAGS  = -g -n32
F77CFLAGS = -c
F77LFLAGS = -L/usr/localn32/lib -n32

F77_COMPILE  = $(F77) $(F77FLAGS) $(F77CFLAGS)
F77_LOAD     = $(F77) $(F77FLAGS) $(F77LFLAGS)

.f.o:
$(F77_COMPILE) $*.f

EXECUTABLES = fdemo2 mysum tdvfrom tdvto

all: $(EXECUTABLES)

fdemo2: fdemo2.o
$(F77_LOAD) fdemo2.o -o fdemo2

mysum: mysum.o
$(F77_LOAD) mysum.o -o mysum

tdvfrom: tdvfrom.o dvfrom.o
$(F77_LOAD) tdvfrom.o dvfrom.o -lp329f -o tdvfrom

tdvto: tdvto.o dvto.o
$(F77_LOAD) tdvto.o dvto.o -lp329f -o tdvto

clean:
rm *.o
rm $(EXECUTABLES)
```

```
############################################################
# Do the default make (all: $(EXECUTABLES))
#
# Note the warnings from the loader, since routines 'dvto'
# and 'dvfrom' live in the p329f utility library.  In this
# case we can safely ignore the warning, since the routines
# are identical.
#
# Also note that, for linking purposes, ALL Fortran routine
# names (more precisely, all external names) have an
# underscore appended---i.e. when you are linking object
# code generated from Fortran, and the linker complains that
# it can't find 'foo_', it's actually looking for a Fortran
# routine name 'foo'.  C routine names, on the other hand,
# retain their identity in the "external world".
############################################################
newton 22> make
        make -f Makefile
        f77 -g -n32 -c fdemo2.f
        f77 -g -n32 -L/usr/localn32/lib -n32 fdemo2.o -o fdemo2
        f77 -g -n32 -c mysum.f
        f77 -g -n32 -L/usr/localn32/lib -n32 mysum.o -o mysum
        f77 -g -n32 -c tdvfrom.f
        f77 -g -n32 -c dvfrom.f
        f77 -g -n32 -L/usr/localn32/lib -n32 tdvfrom.o dvfrom.o \
                    -lp329f -o tdvfrom
ld32: WARNING 15: multiply defined:(dvfrom_) in dvfrom.o and \
      /usr/localn32/lib/libp329f.a(utilio.o) (2nd definition ignored).
        f77 -g -n32 -c tdvto.f
        f77 -g -n32 -c dvto.f
        f77 -g -n32 -L/usr/localn32/lib -n32 tdvto.o dvto.o \
                    -lp329f -o tdvto
ld32: WARNING 15: multiply defined:(dvto_) in dvto.o and \
      /usr/localn32/lib/libp329f.a(utilio.o) (2nd definition ignored).
```

```
############################################################
# Here’s an alias which lists all the executables in a
# directory using the fact that the -F flag to ls appends
# a ’*’ to the name of such files.  I’ve included it here
# just to keep you thinking about tailoring your Unix
# environment to suit your own needs.
############################################################
newton 23> alias lsx
/bin/ls -F | fgrep \* | sed s/\*//g


newton 24> lsx
fdemo2
mysum
tdvfrom
tdvto


############################################################
# Clean up ...
############################################################
newton 25> make clean
        make -f Makefile clean
        rm *.o
        rm fdemo2 mysum tdvfrom tdvto


newton 26> lsx
```