```
!  This is a test program for version 1.4 of module fm_quad_real, which contains the interface
!  routines allowing quadruple-precision real variables in the user's program to be used in
!  assignments, arithmetic, and comparisons involving type (fm), (im), and (zm) variables.
!  The same operations are provided as those in the basic module fmzm for single or double
!  precision variables.

!  All of the routines in module fm_quad_real are tested, and if all tests are completed
!  successfully, this line is printed:

!  512 cases tested.  No errors were found.

      module test_vars

      use fmvals
      use fmzm
      use fm_quad_real

!             Declare the derived type variables of type (fm), (im), and (zm).
!             These are in the form that would be found in a user program.

      type (fm), save ::  m_a, mfm1, mfm2, mfm3, mfm4, mfm5, mfm6,  &
                          mfmv1(3), mfmv2(3), mfma(3, 3), mfmb(3, 3)

      type (im), save :: m_j,  mim1,  mim2,  mim3, mim4, mim5
      type (im), save, dimension(3)   :: mimv1, mimv2
      type (im), save, dimension(3, 3) :: mima2, mimb2

      type (zm), save :: m_z, mzm1, mzm2, mzm3, mzm4, mzm5,  &
                         mzmv1(3),    mzmv2(3),              &
                         mzma2(3, 3), mzmb2(3, 3)

!             These are the variables that are not multiple precision.

      integer, save :: jv(3), jv2(3, 3)
      real, save :: r3, rsmall
      real (quad_fp), save :: qd1, qd2, qd3, qd4, qd5, qds, qdv(3), qdm(3, 3)
      complex, save :: c3
      complex (quad_fp), save :: zq1, zq2, zq3, zq4, zqv(3), zqm(3, 3)

      integer, save :: j, k, klog, kwsave, ncase, nerror
      real, save :: time1, time2

      end module test_vars

      module test_a
      use test_vars

      contains

      subroutine test1

!             Test the = assignment interface.

      implicit none

      write (kw, "(/' Testing the derived type = interface.')")
```

```
qds = epsilon(q_one)*100.0

ncase = 1
qd4 = mfm1
if (abs((qd4-581.21_quad_fp)/581.21_quad_fp) > qds) call prterr(kw)

ncase = 2
qd4 = mim1
if (abs((qd4-661.0_quad_fp)/661.0_quad_fp) > qds) call prterr(kw)

ncase = 3
qd4 = mzm1
if (abs((qd4-731.51_quad_fp)/731.51_quad_fp) > qds) call prterr(kw)

ncase = 4
zq4 = mfm1
if (abs((zq4-581.21_quad_fp)/581.21_quad_fp) > qds) call prterr(kw)

ncase = 5
zq4 = mim1
if (abs((zq4-661.0_quad_fp)/661.0_quad_fp) > qds) call prterr(kw)

ncase = 6
zq4 = mzm1
if (abs((zq4-(731.51_quad_fp, 711.41_quad_fp))/(731.51_quad_fp, 711.41_quad_fp)) > qds)  &
    call prterr(kw)

ncase = 7
mfm3 = qd2
call fm_st2m('391.6123456789012345678901', mfm4)
call fm_sub(mfm3, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_div(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
call fm_abs(mfm4, mfm6)
call fm_eq(mfm6, mfm4)
mfm3 = qds
if (fm_comp(mfm4, 'gt', mfm3)) call prterr(kw)

ncase = 8
mfm3 = zq2
call fm_st2m('431.11', mfm4)
call fm_sub(mfm3, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_div(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
call fm_abs(mfm4, mfm6)
call fm_eq(mfm6, mfm4)
mfm3 = qds
if (fm_comp(mfm4, 'gt', mfm3)) call prterr(kw)

ncase = 9
mfm3 = to_fm(zq2)
call fm_st2m('431.11', mfm4)
call fm_sub(mfm3, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_div(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
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call fm_abs(mfm4, mfm6)
call fm_eq(mfm6, mfm4)
mfm3 = qds
if (fm_comp(mfm4, 'gt', mfm3)) call prterr(kw)

ncase = 10
mim3 = qd2
call im_st2m('391', mim4)
call im_sub(mim3, mim4, mim5)
call im_eq(mim5, mim4)
call im_st2m('0', mim3)
if (im_compare(mim4, 'gt', mim3)) call prterr(kw)

ncase = 11
mim3 = zq2
call im_st2m('431', mim4)
call im_sub(mim3, mim4, mim5)
call im_eq(mim5, mim4)
call im_st2m('0', mim3)
if (im_compare(mim4, 'gt', mim3)) call prterr(kw)

ncase = 12
mim3 = to_im(zq2)
call im_st2m('431', mim4)
call im_sub(mim3, mim4, mim5)
call im_eq(mim5, mim4)
call im_st2m('0', mim3)
if (im_compare(mim4, 'gt', mim3)) call prterr(kw)

ncase = 13
mzm3 = qd2
call zm_st2m('391.6123456789012345678901', mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
mfm3 = qds
if (fm_comp(mfm4, 'gt', mfm3)) call prterr(kw)

ncase = 14
mzm3 = zq2
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
mfm3 = qds
if (fm_comp(mfm4, 'gt', mfm3)) call prterr(kw)

ncase = 15
mzm3 = to_zm(zq2)
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
```

```
      call fm_div(mfm5, mfm6, mfm4)
      mfm3 = qds
      if (fm_comp(mfm4, 'gt', mfm3)) call prterr(kw)

      end subroutine test1

      subroutine test2

!  Test the derived type == interface.

      implicit none

      write (kw, "(/' Testing the derived type == interface.')")

      ncase = 16
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1
      if (.not.(m_a == qd1)) then
          call errprt_fm('  ==  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 17
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1
      if (.not.(qd1 == m_a)) then
          call errprt_fm('  ==  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 18
      qd1 = 123
      m_j = qd1
      if (.not.(m_j == qd1)) then
          call errprt_im('  ==  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 19
      qd1 = 123
      m_j = qd1
      if (.not.(qd1 == m_j)) then
          call errprt_im('  ==  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 20
      qd1 = 12.345678901234567890123_quad_fp
      m_z = qd1
      if (.not.(m_z == qd1)) then
          call errprt_zm('  ==  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
      endif

      ncase = 21
      qd1 = 12.345678901234567890123_quad_fp
      m_z = qd1
      if (.not.(qd1 == m_z)) then
          call errprt_zm('  ==  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
      endif

      ncase = 22
      zq1 = 12.3
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m_a = zq1
if (.not.(m_a == zq1)) then
    call errprt_fm('  ==  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
endif

ncase = 23
zq1 = (12.3 , 45.6)
m_a = zq1
if (m_a == zq1) then
    call errprt_fm('  ==  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
endif

ncase = 24
zq1 = 12.3
m_a = zq1
if (.not.(zq1 == m_a)) then
    call errprt_fm('  ==  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
endif

ncase = 25
zq1 = (12.3 , 45.6)
m_a = zq1
if (zq1 == m_a) then
    call errprt_fm('  ==  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
endif

ncase = 26
zq1 = 123
m_j = zq1
if (.not.(m_j == zq1)) then
    call errprt_im('  ==  ', m_j, 'm_j', m_j, 'm_j')
endif

ncase = 27
zq1 = (123.0 , 45.6)
m_j = zq1
if (m_j == zq1) then
    call errprt_im('  ==  ', m_j, 'm_j', m_j, 'm_j')
endif

ncase = 28
zq1 = 123
m_j = zq1
if (.not.(zq1 == m_j)) then
    call errprt_im('  ==  ', m_j, 'm_j', m_j, 'm_j')
endif

ncase = 29
zq1 = (123.0 , 45.6)
m_j = zq1
if (zq1 == m_j) then
    call errprt_im('  ==  ', m_j, 'm_j', m_j, 'm_j')
endif

ncase = 30
zq1 = (12.3 , 45.6)
m_z = zq1
if (.not.(m_z == zq1)) then
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        call errprt_zm('  ==  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
      endif

      ncase = 31
      zq1 = (12.3 , 45.6)
      m_z = zq1
      if (.not.(zq1 == m_z)) then
        call errprt_zm('  ==  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
      endif

      return
      end subroutine test2

      subroutine test3

!  Test the derived type /= interface.

      implicit none

      write (kw, "(/' Testing the derived type /= interface.')")

      ncase = 32
      qd1 = 12.345678901234567890123_quad_fp
      m_a = 1 + qd1
      if (.not.(m_a /= qd1)) then
        call errprt_fm('  /=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 33
      qd1 = 12.345678901234567890123_quad_fp
      m_a = 1 + qd1
      if (.not.(qd1 /= m_a)) then
        call errprt_fm('  /=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 34
      qd1 = 123
      m_j = 1 + qd1
      if (.not.(m_j /= qd1)) then
        call errprt_im('  /=  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 35
      qd1 = 123
      m_j = 1 + qd1
      if (.not.(qd1 /= m_j)) then
        call errprt_im('  /=  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 36
      qd1 = 12.345678901234567890123_quad_fp
      m_z = 1 + qd1
      if (.not.(m_z /= qd1)) then
        call errprt_zm('  /=  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
      endif

      ncase = 37
      qd1 = 12.345678901234567890123_quad_fp
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m_z = ( 12.3 , 34.5 )
if (.not.(m_z /= qd1)) then
    call errprt_zm('  /=  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
endif

ncase = 38
qd1 = 12.345678901234567890123_quad_fp
m_z = 1 + qd1
if (.not.(qd1 /= m_z)) then
    call errprt_zm('  /=  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
endif

ncase = 39
qd1 = 12.345678901234567890123_quad_fp
m_z = ( 12.3 , 34.5 )
if (.not.(qd1 /= m_z)) then
    call errprt_zm('  /=  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
endif

ncase = 40
zq1 = 12.3
m_a = 1 + zq1
if (.not.(m_a /= zq1)) then
    call errprt_fm('  /=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
endif

ncase = 41
zq1 = (12.3 , 45.6)
m_a = (12.3 , 45.6)
if (.not.(m_a /= zq1)) then
    call errprt_fm('  /=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
endif

ncase = 42
zq1 = 12.3
m_a = 1 + zq1
if (.not.(zq1 /= m_a)) then
    call errprt_fm('  /=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
endif

ncase = 43
zq1 = (12.3 , 45.6)
m_a = (12.3 , 45.6)
if (.not.(zq1 /= m_a)) then
    call errprt_fm('  /=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
endif

ncase = 44
zq1 = 123
m_j = 1 + zq1
if (.not.(m_j /= zq1)) then
    call errprt_im('  /=  ', m_j, 'm_j', m_j, 'm_j')
endif

ncase = 45
zq1 = (123.0 , 45.6)
m_j = (123.0 , 45.6)
if (.not.(m_j /= zq1)) then
```

```
        call errprt_im('  /=  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 46
      zq1 = 123
      m_j = 1 + zq1
      if (.not.(zq1 /= m_j)) then
          call errprt_im('  /=  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 47
      zq1 = (123.0 , 45.6)
      m_j = (123.0 , 45.6)
      if (.not.(zq1 /= m_j)) then
          call errprt_im('  /=  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 48
      zq1 = (12.3 , 45.6)
      m_z = 1 + zq1
      if (.not.(m_z /= zq1)) then
          call errprt_zm('  /=  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
      endif

      ncase = 49
      zq1 = (12.3 , 45.6)
      m_z = 1 + zq1
      if (.not.(zq1 /= m_z)) then
          call errprt_zm('  /=  ', m_z, 'm_z', m_z, 'm_z', m_z, 'm_z')
      endif

      return
      end subroutine test3

      subroutine test4

!  Test the derived type > interface.

      implicit none

      write (kw, "(/' Testing the derived type > interface.')")

      ncase = 50
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1 + 1
      if (.not.(m_a > qd1)) then
          call errprt_fm('   >  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 51
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1 - 1
      if (.not.(qd1 > m_a)) then
          call errprt_fm('   >  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 52
      qd1 = 123
```

```
      m_j = qd1 + 1
      if (.not.(m_j > qd1)) then
          call errprt_im('   >  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 53
      qd1 = 123
      m_j = qd1 - 1
      if (.not.(qd1 > m_j)) then
          call errprt_im('   >  ', m_j, 'm_j', m_j, 'm_j')
      endif

      return
      end subroutine test4

      subroutine test5

!  Test the derived type >= interface.

      implicit none

      write (kw, "(/' Testing the derived type >= interface.')")

      ncase = 54
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1 + 1
      if (.not.(m_a >= qd1)) then
          call errprt_fm('  >=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 55
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1 - 1
      if (.not.(qd1 >= m_a)) then
          call errprt_fm('  >=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 56
      qd1 = 123
      m_j = qd1 + 1
      if (.not.(m_j >= qd1)) then
          call errprt_im('  >=  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 57
      qd1 = 123
      m_j = qd1 - 1
      if (.not.(qd1 >= m_j)) then
          call errprt_im('  >=  ', m_j, 'm_j', m_j, 'm_j')
      endif

      return
      end subroutine test5

      subroutine test6

!  Test the derived type < interface.
```

```
      implicit none

      write (kw, "(/' Testing the derived type < interface.')")

      ncase = 58
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1 - 2
      if (.not.(m_a < qd1)) then
          call errprt_fm('   <  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 59
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1 + 2
      if (.not.(qd1 < m_a)) then
          call errprt_fm('   <  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 60
      qd1 = 123
      m_j = qd1 - 2
      if (.not.(m_j < qd1)) then
          call errprt_im('   <  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 61
      qd1 = 123
      m_j = qd1 + 2
      if (.not.(qd1 < m_j)) then
          call errprt_im('   <  ', m_j, 'm_j', m_j, 'm_j')
      endif

      return
      end subroutine test6

      subroutine test7

!  Test the derived type <= interface.

      implicit none

      write (kw, "(/' Testing the derived type <= interface.')")

      ncase = 62
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1 - 2
      if (.not.(m_a <= qd1)) then
          call errprt_fm('  <=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 63
      qd1 = 12.345678901234567890123_quad_fp
      m_a = qd1 + 2
      if (.not.(qd1 <= m_a)) then
          call errprt_fm('  <=  ', m_a, 'm_a', m_a, 'm_a', m_a, 'm_a')
      endif

      ncase = 64
```

```
      qd1 = 123
      m_j = qd1 - 2
      if (.not.(m_j <= qd1)) then
          call errprt_im('  <=  ', m_j, 'm_j', m_j, 'm_j')
      endif

      ncase = 65
      qd1 = 123
      m_j = qd1 + 2
      if (.not.(qd1 <= m_j)) then
          call errprt_im('  <=  ', m_j, 'm_j', m_j, 'm_j')
      endif

      return
      end subroutine test7

      subroutine test8

!             Test the '+' arithmetic operator.

      implicit none

      write (kw, "(/' Testing the derived type + interface.')")

      qds = epsilon(q_one)*100.0

      ncase = 66
      mfm3 = qd2 + mfm1
      call fm_st2m('391.6123456789012345678901', mfm4)
      call fm_add(mfm4, mfm1, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_sub(mfm3, mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_div(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_abs(mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 67
      call fm_st2m('391.6123456789012345678901', mfm4)
      call fm_st2m('661', mfm3)
      call fm_add(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      mfm3 = qd2 + mim1
      call fm_sub(mfm3, mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_div(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_abs(mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 68
      mzm3 = qd2 + mzm1
      call zm_st2m('391.6123456789012345678901', mzm4)
      call zm_add(mzm4, mzm1, mzm5)
      call zm_eq(mzm5, mzm4)
```

```
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 69
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_st2m('581.21', mzm3)
call zm_add(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = zq2 + mfm1
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 70
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_st2m('661', mzm3)
call zm_add(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = zq2 + mim1
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 71
mzm3 = zq2 + mzm1
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_add(mzm4, mzm1, mzm5)
call zm_eq(mzm5, mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 72
mfm3 = mfm1 + qd2
call fm_st2m('391.6123456789012345678901', mfm4)
call fm_add(mfm1, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_sub(mfm3, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_div(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
call fm_abs(mfm4, mfm6)
call fm_eq(mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)
```

```
ncase = 73
call zm_st2m('431.11 + 441.21 i', mzm3)
call zm_st2m('581.21', mzm4)
call zm_add(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = mfm1 + zq2
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 74
call fm_st2m('391.6123456789012345678901', mfm3)
call fm_st2m('661', mfm4)
call fm_add(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
mfm3 = mim1 + qd2
call fm_sub(mfm3, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_div(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
call fm_abs(mfm4, mfm6)
call fm_eq(mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 75
call zm_st2m('431.11 + 441.21 i', mzm3)
call zm_st2m('661', mzm4)
call zm_add(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = mim1 + zq2
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 76
mzm3 = mzm1 + qd2
call zm_st2m('391.6123456789012345678901', mzm4)
call zm_add(mzm1, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 77
mzm3 = mzm1 + zq2
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_add(mzm1, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_sub(mzm3, mzm4, mzm5)
```

```
      call zm_eq(mzm5, mzm4)
      call zm_abs(mzm4, mfm5)
      call zm_abs(mzm3, mfm6)
      call fm_div(mfm5, mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      end subroutine test8

      subroutine test9

!             Test the '-' arithmetic operator.

      implicit none

      write (kw, "(/' Testing the derived type - interface.')")

      qds = epsilon(q_one)*100.0

      ncase = 78
      mfm3 = qd2 - mfm1
      call fm_st2m('391.6123456789012345678901', mfm4)
      call fm_sub(mfm4, mfm1, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_sub(mfm3, mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_div(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_abs(mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 79
      call fm_st2m('391.6123456789012345678901', mfm4)
      call fm_st2m('661', mfm3)
      call fm_sub(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      mfm3 = qd2 - mim1
      call fm_sub(mfm3, mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_div(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_abs(mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 80
      mzm3 = qd2 - mzm1
      call zm_st2m('391.6123456789012345678901', mzm4)
      call zm_sub(mzm4, mzm1, mzm5)
      call zm_eq(mzm5, mzm4)
      call zm_sub(mzm3, mzm4, mzm5)
      call zm_eq(mzm5, mzm4)
      call zm_abs(mzm4, mfm5)
      call zm_abs(mzm3, mfm6)
      call fm_div(mfm5, mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 81
```

```
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_st2m('581.21', mzm3)
call zm_sub(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = zq2 - mfm1
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 82
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_st2m('661', mzm3)
call zm_sub(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = zq2 - mim1
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 83
mzm3 = zq2 - mzm1
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_sub(mzm4, mzm1, mzm5)
call zm_eq(mzm5, mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 84
mfm3 = mfm1 - qd2
call fm_st2m('391.6123456789012345678901', mfm4)
call fm_sub(mfm1, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_sub(mfm3, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_div(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
call fm_abs(mfm4, mfm6)
call fm_eq(mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 85
call zm_st2m('431.11 + 441.21 i', mzm3)
call zm_st2m('581.21', mzm4)
call zm_sub(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = mfm1 - zq2
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
```

```
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 86
call fm_st2m('391.6123456789012345678901', mfm3)
call fm_st2m('661', mfm4)
call fm_sub(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
mfm3 = mim1 - qd2
call fm_sub(mfm3, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_div(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
call fm_abs(mfm4, mfm6)
call fm_eq(mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 87
call zm_st2m('431.11 + 441.21 i', mzm3)
call zm_st2m('661', mzm4)
call zm_sub(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = mim1 - zq2
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 88
mzm3 = mzm1 - qd2
call zm_st2m('391.6123456789012345678901', mzm4)
call zm_sub(mzm1, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 89
mzm3 = mzm1 - zq2
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_sub(mzm1, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

end subroutine test9
```

```
      end module test_a

      module test_b
      use test_vars

      contains

      subroutine test10

!             Test the '*' arithmetic operator.

      implicit none

      write (kw, "(/' Testing the derived type * interface.')")

      qds = epsilon(q_one)*100.0

      ncase = 90
      mfm3 = qd2 * mfm1
      call fm_st2m('391.6123456789012345678901', mfm4)
      call fm_mpy(mfm4, mfm1, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_sub(mfm3, mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_div(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_abs(mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 91
      call fm_st2m('391.6123456789012345678901', mfm4)
      call fm_st2m('661', mfm3)
      call fm_mpy(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      mfm3 = qd2 * mim1
      call fm_sub(mfm3, mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_div(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_abs(mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 92
      mzm3 = qd2 * mzm1
      call zm_st2m('391.6123456789012345678901', mzm4)
      call zm_mpy(mzm4, mzm1, mzm5)
      call zm_eq(mzm5, mzm4)
      call zm_sub(mzm3, mzm4, mzm5)
      call zm_eq(mzm5, mzm4)
      call zm_abs(mzm4, mfm5)
      call zm_abs(mzm3, mfm6)
      call fm_div(mfm5, mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 93
      call zm_st2m('431.11 + 441.21 i', mzm4)
```

```
call zm_st2m('581.21', mzm3)
call zm_mpy(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = zq2 * mfm1
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 94
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_st2m('661', mzm3)
call zm_mpy(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = zq2 * mim1
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 95
mzm3 = zq2 * mzm1
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_mpy(mzm4, mzm1, mzm5)
call zm_eq(mzm5, mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 96
mfm3 = mfm1 * qd2
call fm_st2m('391.6123456789012345678901', mfm4)
call fm_mpy(mfm1, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_sub(mfm3, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_div(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
call fm_abs(mfm4, mfm6)
call fm_eq(mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 97
call zm_st2m('431.11 + 441.21 i', mzm3)
call zm_st2m('581.21', mzm4)
call zm_mpy(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = mfm1 * zq2
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
```

```
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 98
call fm_st2m('391.6123456789012345678901', mfm3)
call fm_st2m('661', mfm4)
call fm_mpy(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
mfm3 = mim1 * qd2
call fm_sub(mfm3, mfm4, mfm6)
call fm_eq(mfm6, mfm4)
call fm_div(mfm4, mfm3, mfm6)
call fm_eq(mfm6, mfm4)
call fm_abs(mfm4, mfm6)
call fm_eq(mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 99
call zm_st2m('431.11 + 441.21 i', mzm3)
call zm_st2m('661', mzm4)
call zm_mpy(mzm4, mzm3, mzm5)
call zm_eq(mzm5, mzm4)
mzm3 = mim1 * zq2
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 100
mzm3 = mzm1 * qd2
call zm_st2m('391.6123456789012345678901', mzm4)
call zm_mpy(mzm1, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

ncase = 101
mzm3 = mzm1 * zq2
call zm_st2m('431.11 + 441.21 i', mzm4)
call zm_mpy(mzm1, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_sub(mzm3, mzm4, mzm5)
call zm_eq(mzm5, mzm4)
call zm_abs(mzm4, mfm5)
call zm_abs(mzm3, mfm6)
call fm_div(mfm5, mfm6, mfm4)
if (mfm4 > qds) call prterr(kw)

end subroutine test10

subroutine test11
```

```
!             Test the '/' arithmetic operator.

      implicit none

      write (kw, "(/' Testing the derived type / interface.')")

      qds = epsilon(q_one)*100.0

      ncase = 102
      mfm3 = qd2 / mfm1
      call fm_st2m('391.6123456789012345678901', mfm4)
      call fm_div(mfm4, mfm1, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_sub(mfm3, mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_div(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_abs(mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 103
      call fm_st2m('391.6123456789012345678901', mfm4)
      call fm_st2m('661', mfm3)
      call fm_div(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      mfm3 = qd2 / mim1
      call fm_sub(mfm3, mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_div(mfm4, mfm3, mfm6)
      call fm_eq(mfm6, mfm4)
      call fm_abs(mfm4, mfm6)
      call fm_eq(mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 104
      mzm3 = qd2 / mzm1
      call zm_st2m('391.6123456789012345678901', mzm4)
      call zm_div(mzm4, mzm1, mzm5)
      call zm_eq(mzm5, mzm4)
      call zm_sub(mzm3, mzm4, mzm5)
      call zm_eq(mzm5, mzm4)
      call zm_abs(mzm4, mfm5)
      call zm_abs(mzm3, mfm6)
      call fm_div(mfm5, mfm6, mfm4)
      if (mfm4 > qds) call prterr(kw)

      ncase = 105
      call zm_st2m('431.11 + 441.21 i', mzm4)
      call zm_st2m('581.21', mzm3)
      call zm_div(mzm4, mzm3, mzm5)
      call zm_eq(mzm5, mzm4)
      mzm3 = zq2 / mfm1
      call zm_sub(mzm3, mzm4, mzm5)
      call zm_eq(mzm5, mzm4)
      call zm_abs(mzm4, mfm5)
      call zm_abs(mzm3, mfm6)
```