

! This is a test program for the FM 1.4 multiple-precision interval arithmetic package.

! All of the interval arithmetic routines are tested.

! Precision is set to 30 significant digits and the results are checked to that accuracy.

! If all tests are completed successfully, this line is printed:

! 1044 cases tested. No errors were found.

MODULE TEST_VARS_IA

USE FMVALS
 USE FMZM
 USE FM_INTERVAL_ARITHMETIC

! 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_INTERVAL), SAVE :: A, B, C, D, RESULT, CORRECT, &
 AVEC(3), BVEC(3), CVEC(3), DVEC(3), &
 AMAT(3,3), BMAT(3,3), CMAT(3,3), DMAT(3,3)

TYPE (FM), SAVE :: ERROR, MFM1, MFMV(3), MFMV2(3,3), MV4(4), MV8(8)
 TYPE (IM), SAVE :: MIM1, MIMV(3), MIMV2(3,3)
 TYPE (ZM), SAVE :: MZM1, MZMV(3), MZMV2(3,3)

! These are the variables that are not multiple precision.

INTEGER, SAVE :: J1, JV(3), JV2(3,3)
 REAL, SAVE :: R1, RSMALL, RV(3), RV2(3,3)
 DOUBLE PRECISION, SAVE :: D1, DSMALL, DV(3), DV2(3,3)
 COMPLEX, SAVE :: C1, CV(3), CV2(3,3)
 COMPLEX (KIND(0.0D0)), SAVE :: CD1, CDV(3), CDV2(3,3)

CHARACTER(100), SAVE :: ST1, ST2, STRING, STV2(3,3)
 INTEGER, SAVE :: KLOG, KWSAVE, NCASE, NERROR
 REAL, SAVE :: TIME1, TIME2
 LOGICAL, EXTERNAL :: FMCOMPARE

INTERFACE SUM_IVL
 MODULE PROCEDURE SUM0
 MODULE PROCEDURE SUM1
 MODULE PROCEDURE SUM2
 END INTERFACE

CONTAINS

FUNCTION SUM0(A,B) RESULT (RETURN_VALUE)

! Function that returns an interval result.

IMPLICIT NONE
 TYPE (FM_INTERVAL) :: A,B,RETURN_VALUE
 RETURN_VALUE = A + B
 END FUNCTION SUM0

FUNCTION SUM1(A,B) RESULT (RETURN_VALUE)

! Function that returns a interval vector result.

```
IMPLICIT NONE
TYPE (FM_INTERVAL) :: A(3),B(3),RETURN_VALUE(3)
INTEGER :: J
DO J = 1, 3
    RETURN_VALUE(J) = A(J) + B(J)
ENDDO
END FUNCTION SUM1

FUNCTION SUM2(A,B)      RESULT (RETURN_VALUE)
```

! Function that returns a interval matrix result.

```
IMPLICIT NONE
TYPE (FM_INTERVAL) :: A(3,3),B(3,3),RETURN_VALUE(3,3)
INTEGER :: J, K
DO J = 1, 3
    DO K = 1, 3
        RETURN_VALUE(J,K) = A(J,K) + B(J,K)
    ENDDO
ENDDO
END FUNCTION SUM2

SUBROUTINE TEST1
```

! Input and output testing.

```
IMPLICIT NONE
INTEGER :: J, K, L

WRITE (KW,"(/' Testing input and output conversion for intervals.')")
```

! NCASE is the number of cases tested.

```
NCASE = 1
RESULT = TO_FM_INTERVAL( TO_FM(14) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_FM(14) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 14
MFM1 = 14
```

! Use the .NOT. because FMCOMPARE returns FALSE for special cases like MD = UNKNOWN,
! and these should be treated as errors for these tests.

```
IF ( (.NOT. FMCOMPARE(RESULT%LEFT,'==',MFM1%MFM)) .OR. &
    (.NOT. FMCOMPARE(RESULT%RIGHT,'==',MFM1%MFM)) ) THEN
    CALL ERRPRFMC(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF
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```
NCASE = 2
RESULT = TO_FM_INTERVAL( 15 )
WRITE (KLOG,*) ' '

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WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( 15 ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 15
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

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```

NCASE = 3
RESULT = TO_FM_INTERVAL( 16.0 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( 16.0 ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 16
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 4
CALL FM_INTERVAL_SP2M(16.0,RESULT)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( 16.0 ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 16
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 5
RESULT = TO_FM_INTERVAL( 17.0D0 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( 17.0D0 ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 17
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

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```

NCASE = 6
RESULT = TO_FM_INTERVAL( CMLX( 18.0 , 28.0 ) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( CMLX( 18.0 , 28.0 ) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 18

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```

IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

NCASE = 7
RESULT = TO_FM_INTERVAL( CMLPX( 19.0D0 , 29.0D0 , KIND(1.0D0) ) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( CMLPX( 19.0D0 , 29.0D0 , KIND(1.0D0) ) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 19
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

NCASE = 8
A = TO_FM_INTERVAL( 20 , 21 )
RESULT = TO_FM_INTERVAL( A )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( A ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = A
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

NCASE = 9
RESULT = TO_FM_INTERVAL( TO_IM( 22 ) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_IM( 22 ) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 22
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

NCASE = 10
MIM1 = 22
CALL IM_INTERVAL_I2FM(MIM1,RESULT)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_IM( 22 ) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 22
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

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NCASE = 11
RESULT = TO_FM_INTERVAL( TO_ZM( " 23 + 33 i " ) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_ZM( " 23 + 33 i " ) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 23
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

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NCASE = 12
RESULT = TO_FM_INTERVAL( " 24 " )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( " 24 " ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = 24
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

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NCASE = 13
JV = (/ 25, 26, 27 /)
AVEC = TO_FM_INTERVAL( JV )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( (/ 25, 26, 27 /) ) '
DO J = 25, 27
    RESULT = AVEC(J-24)
    CORRECT = J
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    IF (.NOT.(RESULT == CORRECT)) THEN
        CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
    EXIT
ENDIF
ENDDO
WRITE (KLOG,*) ' '

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NCASE = 14
RV = (/ 25.0, 26.0, 27.0 /)
AVEC = TO_FM_INTERVAL( RV )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( (/ 25.0, 26.0, 27.0 /) ) '
DO J = 25, 27
    RESULT = AVEC(J-24)
    CORRECT = J
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    IF (.NOT.(RESULT == CORRECT)) THEN
        CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
    EXIT

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ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 15
DV = (/ 25.0D0, 26.0D0, 27.0D0 /)
AVEC = TO_FM_INTERVAL( DV )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( (/ 25.0D0, 26.0D0, 27.0D0 /) ) '
DO J = 25, 27
  RESULT = AVEC(J-24)
  CORRECT = J
  CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
  WRITE (KLOG,*) ' ',TRIM(STRING)
  IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
    EXIT
  ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 16
CV = (/ CMLPX( 25.0 , 35.0 ), CMLPX( 26.0 , 36.0 ), CMLPX( 27.0 , 37.0 ) /)
AVEC = TO_FM_INTERVAL( CV )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( CMLPX( 25.0 , 35.0 ), CMLPX( 26.0 , 36.0 ),', &
  ' CMLPX( 27.0 , 37.0 ) ) '
DO J = 25, 27
  RESULT = AVEC(J-24)
  CORRECT = J
  CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
  WRITE (KLOG,*) ' ',TRIM(STRING)
  IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
    EXIT
  ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 17
CDV = (/ CMLPX( 25.0 , 35.0 , KIND(1.0D0) ), CMLPX( 26.0 , 36.0 , KIND(1.0D0) ), &
  CMLPX( 27.0 , 37.0 , KIND(1.0D0) ) /)
AVEC = TO_FM_INTERVAL( CDV )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( (/ CMLPX( 25.0 , 35.0 , KIND(1.0D0) ), '
WRITE (KLOG,*) ' CMLPX( 26.0 , 36.0 , KIND(1.0D0) ), '
WRITE (KLOG,*) ' CMLPX( 27.0 , 37.0 , KIND(1.0D0) ) /) ) '
DO J = 25, 27
  RESULT = AVEC(J-24)
  CORRECT = J
  CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
  WRITE (KLOG,*) ' ',TRIM(STRING)
  IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
    EXIT
  ENDIF
ENDDO
WRITE (KLOG,*) ' '

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ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 18
BVEC = (/ 25, 26, 27 /)
AVEC = TO_FM_INTERVAL( BVEC )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( (/ TO_FM_INTERVAL(25), TO_FM_INTERVAL(26), ' &
' TO_FM_INTERVAL(27) /) ) '
DO J = 25, 27
  RESULT = AVEC(J-24)
  CORRECT = J
  CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
  WRITE (KLOG,*) ' ',TRIM(STRING)
  IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
    EXIT
  ENDIF
ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 19
AVEC = TO_FM_INTERVAL( TO_FM( (/ 25, 26, 27 /) ) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_FM( (/ 25, 26, 27 /) ) ) '
DO J = 25, 27
  RESULT = AVEC(J-24)
  CORRECT = J
  CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
  WRITE (KLOG,*) ' ',TRIM(STRING)
  IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
    EXIT
  ENDIF
ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 20
AVEC = TO_FM_INTERVAL( TO_IM( (/ 25, 26, 27 /) ) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_IM( (/ 25, 26, 27 /) ) ) '
DO J = 25, 27
  RESULT = AVEC(J-24)
  CORRECT = J
  CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
  WRITE (KLOG,*) ' ',TRIM(STRING)
  IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
    EXIT
  ENDIF
ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 21

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AVEC = TO_FM_INTERVAL( TO_ZM( (/ 25, 26, 27 /) ) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_ZM( (/ 25, 26, 27 /) ) ) '
DO J = 25, 27
  RESULT = AVEC(J-24)
  CORRECT = J
  CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
  WRITE (KLOG,*) ' ',TRIM(STRING)
  IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
    EXIT
  ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 22
AVEC = TO_FM_INTERVAL( (/ "25", "26", "27" /) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( (/ "25", "26", "27" /) ) '
DO J = 25, 27
  RESULT = AVEC(J-24)
  CORRECT = J
  CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
  WRITE (KLOG,*) ' ',TRIM(STRING)
  IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
    EXIT
  ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 23
DO J = 1, 3
  DO K = 1, 3
    JV2(J,K) = (J+30)*K
  ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( JV2 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( JV2 ) '
DO J = 1, 3
  WRITE (KLOG,"(A,I4)") '          Row ',J
  DO K = 1, 3
    RESULT = AMAT(J,K)
    CORRECT = (J+30)*K
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    IF (.NOT.(RESULT == CORRECT)) THEN
      CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
      EXIT
    ENDIF
  ENDDO
ENDDO
WRITE (KLOG,*) ' '

```



```

NCASE = 24
DO J = 1, 3
  DO K = 1, 3
    RV2(J,K) = (J+30)*K
  ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( RV2 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( RV2 ) '
DO J = 1, 3
  WRITE (KLOG,"(A,I4)") '          Row ',J
  DO K = 1, 3
    RESULT = AMAT(J,K)
    CORRECT = (J+30)*K
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    IF (.NOT.(RESULT == CORRECT)) THEN
      CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
      EXIT
    ENDIF
  ENDDO
ENDDO
WRITE (KLOG,*) ' '

```

```

NCASE = 25
DO J = 1, 3
  DO K = 1, 3
    DV2(J,K) = (J+30)*K
  ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( DV2 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( DV2 ) '
DO J = 1, 3
  WRITE (KLOG,"(A,I4)") '          Row ',J
  DO K = 1, 3
    RESULT = AMAT(J,K)
    CORRECT = (J+30)*K
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    IF (.NOT.(RESULT == CORRECT)) THEN
      CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
      EXIT
    ENDIF
  ENDDO
ENDDO
WRITE (KLOG,*) ' '

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```

NCASE = 26
DO J = 1, 3
  DO K = 1, 3
    CV2(J,K) = (J+30)*K
  ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( CV2 )
WRITE (KLOG,*) ' '

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```

WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( CV2 ) '
DO J = 1, 3
  WRITE (KLOG,"(A,I4)") '          Row ',J
  DO K = 1, 3
    RESULT = AMAT(J,K)
    CORRECT = (J+30)*K
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    IF (.NOT.(RESULT == CORRECT)) THEN
      CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
      EXIT
    ENDIF
  ENDDO
ENDDO
WRITE (KLOG,*) ' '

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```

NCASE = 27
DO J = 1, 3
  DO K = 1, 3
    CDV2(J,K) = (J+30)*K
  ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( CDV2 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( CDV2 ) '
DO J = 1, 3
  WRITE (KLOG,"(A,I4)") '          Row ',J
  DO K = 1, 3
    RESULT = AMAT(J,K)
    CORRECT = (J+30)*K
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    IF (.NOT.(RESULT == CORRECT)) THEN
      CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
      EXIT
    ENDIF
  ENDDO
ENDDO
WRITE (KLOG,*) ' '

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```

NCASE = 28
DO J = 1, 3
  DO K = 1, 3
    BMAT(J,K) = (J+30)*K
  ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( BMAT )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( BMAT ) '
DO J = 1, 3
  WRITE (KLOG,"(A,I4)") '          Row ',J
  DO K = 1, 3
    RESULT = AMAT(J,K)
    CORRECT = (J+30)*K
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)

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```

WRITE (KLOG,*) ' ',TRIM(STRING)
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
    EXIT
ENDIF
ENDDO
ENDDO
WRITE (KLOG,*) ' '

NCASE = 29
DO J = 1, 3
    DO K = 1, 3
        MFMV2(J,K) = (J+30)*K
    ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( MFMV2 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( MFMV2 ) '
DO J = 1, 3
    WRITE (KLOG,"(A,I4)") '          Row ',J
    DO K = 1, 3
        RESULT = AMAT(J,K)
        CORRECT = (J+30)*K
        CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
        WRITE (KLOG,*) ' ',TRIM(STRING)
        IF (.NOT.(RESULT == CORRECT)) THEN
            CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
            EXIT
        ENDIF
    ENDDO
ENDDO
ENDDO
WRITE (KLOG,*) ' '

NCASE = 30
DO J = 1, 3
    DO K = 1, 3
        MIMV2(J,K) = (J+30)*K
    ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( MIMV2 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( MIMV2 ) '
DO J = 1, 3
    WRITE (KLOG,"(A,I4)") '          Row ',J
    DO K = 1, 3
        RESULT = AMAT(J,K)
        CORRECT = (J+30)*K
        CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
        WRITE (KLOG,*) ' ',TRIM(STRING)
        IF (.NOT.(RESULT == CORRECT)) THEN
            CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
            EXIT
        ENDIF
    ENDDO
ENDDO
ENDDO
WRITE (KLOG,*) ' '

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```

NCASE = 31
DO J = 1, 3
  DO K = 1, 3
    MZMV2(J,K) = (J+30)*K
  ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( MZMV2 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( MZMV2 ) '
DO J = 1, 3
  WRITE (KLOG,"(A,I4)") '      Row ',J
  DO K = 1, 3
    RESULT = AMAT(J,K)
    CORRECT = (J+30)*K
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    IF (.NOT.(RESULT == CORRECT)) THEN
      CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
      EXIT
    ENDIF
  ENDDO
ENDDO
WRITE (KLOG,*) ' '

```

```

NCASE = 32
DO J = 1, 3
  DO K = 1, 3
    WRITE ( STV2(J,K) , "(I5)" ) (J+30)*K
  ENDDO
ENDDO
AMAT = TO_FM_INTERVAL( STV2 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( STV2 ) '
DO J = 1, 3
  WRITE (KLOG,"(A,I4)") '      Row ',J
  DO K = 1, 3
    RESULT = AMAT(J,K)
    CORRECT = (J+30)*K
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    IF (.NOT.(RESULT == CORRECT)) THEN
      CALL ERRPRTFM(' TO_FM_INTERVAL ',0,A,'A',B,'B',B,'B')
      EXIT
    ENDIF
  ENDDO
ENDDO
WRITE (KLOG,*) ' '

```

```

NCASE = 33
RESULT = TO_FM_INTERVAL( 41 , 42 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( 41 , 42 ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)

```

```

WRITE (KLOG,*) ' '
CALL FMI2M(41,CORRECT%LEFT)
CALL FMI2M(42,CORRECT%RIGHT)
IF (.NOT.(RESULT == CORRECT)) THEN
  CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 34
RESULT = TO_FM_INTERVAL( 41.0 , 42.0 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( 41.0 , 42.0 ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 41 , 42 )
IF (.NOT.(RESULT == CORRECT)) THEN
  CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 35
RESULT = TO_FM_INTERVAL( 41.0D0 , 42.0D0 )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( 41.0D0 , 42.0D0 ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 41 , 42 )
IF (.NOT.(RESULT == CORRECT)) THEN
  CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 36
RESULT = TO_FM_INTERVAL( CMLPX( 41.0 , 51.0 ) , CMLPX( 42.0 , 52.0 ) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( CMLPX( 41.0 , 51.0 ) , CMLPX( 42.0 , 52.0 ) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 41 , 42 )
IF (.NOT.(RESULT == CORRECT)) THEN
  CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 37
RESULT = TO_FM_INTERVAL( CMLPX( 41.0D0 , 51.0D0 , KIND(1.0D0) ) , &
  CMLPX( 42.0D0 , 52.0D0 , KIND(1.0D0) ) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( CMLPX( 41.0D0 , 51.0D0 , KIND(1.0D0) )', &
  ' CMLPX( 42.0D0 , 52.0D0 , KIND(1.0D0) ) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 41 , 42 )
IF (.NOT.(RESULT == CORRECT)) THEN

```

```
CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF
```

```
NCASE = 38
RESULT = TO_FM_INTERVAL( TO_FM(41) , TO_FM(42) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_FM(41) , TO_FM(42) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 41 , 42 )
IF (.NOT.(RESULT == CORRECT)) THEN
CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF
```

```
NCASE = 39
RESULT = TO_FM_INTERVAL( TO_IM(41) , TO_IM(42) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_IM(41) , TO_IM(42) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 41 , 42 )
IF (.NOT.(RESULT == CORRECT)) THEN
CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF
```

```
NCASE = 40
RESULT = TO_FM_INTERVAL( TO_ZM(41) , TO_ZM(42) )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( TO_ZM(41) , TO_ZM(42) ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 41 , 42 )
IF (.NOT.(RESULT == CORRECT)) THEN
CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF
```

```
NCASE = 41
RESULT = TO_FM_INTERVAL( "41" , "42" )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM_INTERVAL( "41" , "42" ) '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 41 , 42 )
IF (.NOT.(RESULT == CORRECT)) THEN
CALL ERRPRTFM(' TO_FM_INTERVAL',0,A,'A',B,'B',B,'B')
ENDIF
```

```
NCASE = 42
A = TO_FM_INTERVAL( 43 , 45 )
RESULT = TO_FM(A)
```

```

WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM(A) '
CALL FM_FORM('F40.35',TO_FM(A),STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 44 , 44 )
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_FM',0,A,'A',B,'B',B,'B')
ENDIF

NCASE = 43
MFMV = TO_FM( (/ TO_FM_INTERVAL( 43 , 45 ) , TO_FM_INTERVAL( 44 , 46 ) , &
                TO_FM_INTERVAL( 47 , 48 ) /) )
DV = (/ 44.0D0, 45.0D0, 47.5D0 /)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM( (/ TO_FM_INTERVAL( 43 , 45 ) , TO_FM_INTERVAL( 44 , 46 ) , ' , &
                ' TO_FM_INTERVAL( 47 , 48 ) /) ) '

DO J = 1, 3
    RESULT = MFMV(J)
    CALL FM_FORM('F40.35',MFMV(J),STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    CORRECT = DV(J)
    IF (.NOT.(RESULT == CORRECT)) THEN
        CALL ERRPRTFM(' TO_FM',0,A,'A',B,'B',B,'B')
        EXIT
    ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 44
DO J = 1, 3
    DO K = 1, 3
        AMAT(J,K) = TO_FM_INTERVAL( (J+50)*K , (J+55)*K )
        DV2(J,K) = (2*J+105)*K/2.0D0
    ENDDO
ENDDO
MFMV2 = TO_FM( AMAT )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_FM( AMAT ) '
DO J = 1, 3
    WRITE (KLOG,*) ' Row ',J
    DO K = 1, 3
        RESULT = MFMV2(J,K)
        CALL FM_FORM('F40.35',MFMV2(J,K),STRING)
        WRITE (KLOG,*) ' ',TRIM(STRING)
        CORRECT = DV2(J,K)
        IF (.NOT.(RESULT == CORRECT)) THEN
            CALL ERRPRTFM(' TO_FM',0,A,'A',B,'B',B,'B')
            EXIT
        ENDIF
    ENDDO
ENDDO
WRITE (KLOG,*) ' '

NCASE = 45

```

```

A = TO_FM_INTERVAL( 43 , 45 )
RESULT = TO_IM(A)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_IM(A) '
CALL IM_FORM('I10',TO_IM(A),STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 44 )
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_IM',0,A,'A',B,'B',B,'B')
ENDIF

NCASE = 46
MIMV = TO_IM( (/ TO_FM_INTERVAL( 43 , 45 ) , TO_FM_INTERVAL( 44 , 46 ) , &
                TO_FM_INTERVAL( 47 , 48 ) /) )
JV = (/ 44 , 45 , 47 /)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_IM( (/ TO_FM_INTERVAL( 43 , 45 ) , TO_FM_INTERVAL( 44 , 46 ) , ' , &
                ' TO_FM_INTERVAL( 47 , 48 ) /) ) '

DO J = 1, 3
    RESULT = MIMV(J)
    CALL IM_FORM('I10',MIMV(J),STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    CORRECT = JV(J)
    IF (.NOT.(RESULT == CORRECT)) THEN
        CALL ERRPRTFM(' TO_IM',0,A,'A',B,'B',B,'B')
        EXIT
    ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 47
DO J = 1, 3
    DO K = 1, 3
        AMAT(J,K) = TO_FM_INTERVAL( (J+50)*K , (J+55)*K )
        JV2(J,K) = (2*J+105)*K/2
    ENDDO
ENDDO
MIMV2 = TO_IM( AMAT )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_IM( AMAT ) '
DO J = 1, 3
    WRITE (KLOG,*) ' Row ',J
    DO K = 1, 3
        RESULT = MIMV2(J,K)
        CALL IM_FORM('I10',MIMV2(J,K),STRING)
        WRITE (KLOG,*) ' ',TRIM(STRING)
        CORRECT = JV2(J,K)
        IF (.NOT.(RESULT == CORRECT)) THEN
            CALL ERRPRTFM(' TO_IM',0,A,'A',B,'B',B,'B')
            EXIT
        ENDIF
    ENDDO
ENDDO
WRITE (KLOG,*) ' '

```



```

NCASE = 48
A = TO_FM_INTERVAL( 43 , 45 )
RESULT = TO_ZM(A)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_ZM(A) '
CALL ZM_FORM('F30.25', 'F30.25',TO_ZM(A),STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 44 , 44 )
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' TO_ZM',0,A,'A',B,'B',B,'B')
ENDIF

NCASE = 49
MZMV = TO_ZM( (/ TO_FM_INTERVAL( 43 , 45 ) , TO_FM_INTERVAL( 44 , 46 ) , &
                TO_FM_INTERVAL( 47 , 48 ) /) )
RV = (/ 44.0 , 45.0 , 47.5 /)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_ZM( (/ TO_FM_INTERVAL( 43 , 45 ) , TO_FM_INTERVAL( 44 , 46 ) , ' , &
                ' TO_FM_INTERVAL( 47 , 48 ) /) ) '

DO J = 1, 3
    RESULT = MZMV(J)
    CALL ZM_FORM('F30.25', 'F30.25',MZMV(J),STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    CORRECT = RV(J)
    IF (.NOT.(RESULT == CORRECT)) THEN
        CALL ERRPRTFM(' TO_ZM',0,A,'A',B,'B',B,'B')
        EXIT
    ENDIF
ENDDO
WRITE (KLOG,*) ' '

NCASE = 50
DO J = 1, 3
    DO K = 1, 3
        AMAT(J,K) = TO_FM_INTERVAL( (J+50)*K , (J+55)*K )
        RV2(J,K) = ( (J+50)*K + (J+55)*K ) / 2.0
    ENDDO
ENDDO
MZMV2 = TO_ZM( AMAT )
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' TO_ZM( AMAT ) '
DO J = 1, 3
    WRITE (KLOG,*) ' Row ',J
    DO K = 1, 3
        RESULT = MZMV2(J,K)
        CALL ZM_FORM('F30.25', 'F30.25',MZMV2(J,K),STRING)
        WRITE (KLOG,*) ' ',TRIM(STRING)
        CORRECT = RV2(J,K)
        IF (.NOT.(RESULT == CORRECT)) THEN
            CALL ERRPRTFM(' TO_ZM',0,A,'A',B,'B',B,'B')
            EXIT
        ENDIF
    ENDDO
ENDDO

```

```

ENDDO
WRITE (KLOG,*) ' '

NCASE = 51
OPEN(42,FILE="RWtest")
DO J = 1, 3
  DO K = 1, 3
    AMAT(J,K) = TO_FM_INTERVAL( (J+50)*K , (J+55)*K )
    CALL FM_INTERVAL_WRITE(42,AMAT(J,K))
  ENDDO
ENDDO
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' CALL FM_INTERVAL_WRITE( AMAT ) and CALL FM_INTERVAL_READ( AMAT ) '
CLOSE(42)
OPEN(42,FILE="RWtest")
DO J = 1, 3
  WRITE (KLOG,*) ' Row ',J
  DO K = 1, 3
    CALL FM_INTERVAL_READ(42,BMAT(J,K))
    RESULT = BMAT(J,K)
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    CORRECT = AMAT(J,K)
    IF (.NOT.(RESULT == CORRECT)) THEN
      CALL ERRPRTFM(' RWtest',0,A,'A',B,'B',B,'B')
      EXIT
    ENDIF
  ENDDO
ENDDO
WRITE (KLOG,*) ' '
CLOSE(42)

NCASE = 52
OPEN(42,FILE="RWtest")
DO J = 1, 3
  DO K = 1, 3
    AMAT(J,K) = TO_FM_INTERVAL( (J+50)*K , (J+55)*K )
    L = KW
    KW = 42
    CALL FMPRINT_INTERVAL(AMAT(J,K))
    KW = L
  ENDDO
ENDDO
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' CALL FM_INTERVAL_WRITE( AMAT ) and CALL FM_INTERVAL_READ( AMAT ) '
CLOSE(42)
OPEN(42,FILE="RWtest")
DO J = 1, 3
  WRITE (KLOG,*) ' Row ',J
  DO K = 1, 3
    CALL FM_INTERVAL_READ(42,BMAT(J,K))
    RESULT = BMAT(J,K)
    CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
    WRITE (KLOG,*) ' ',TRIM(STRING)
    CORRECT = AMAT(J,K)
    IF (.NOT.(RESULT == CORRECT)) THEN

```

```

        CALL ERRPRTFM(' RWtest',0,A,'A',B,'B',B,'B')
        EXIT
    ENDIF
ENDDO
ENDDO
WRITE (KLOG,*) ' '
CLOSE(42)

RETURN
END SUBROUTINE TEST1

```

```

SUBROUTINE TEST2

```

! +, -, *, / testing.

```

IMPLICIT NONE

```

```

WRITE (KW,"(/' Testing +, -, *, /.')")

```

! NCASE is the number of cases tested.

```

NCASE = 53
A = TO_FM_INTERVAL( 3 , 5 )
B = TO_FM_INTERVAL( 2 , 7 )
RESULT = A + B
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' ( 3 , 5 ) + ( 2 , 7 ) = '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 5 , 12 )
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' Addition',2,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 54
A = TO_FM_INTERVAL( 3 , 5 )
B = TO_FM_INTERVAL( 2 , 7 )
RESULT = A - B
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' ( 3 , 5 ) - ( 2 , 7 ) = '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( -4 , 3 )
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' Subtraction',2,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 55
A = TO_FM_INTERVAL( 3 , 5 )
B = TO_FM_INTERVAL( 2 , 7 )
CALL FM_INTERVAL_SUB(A,B,RESULT)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' ( 3 , 5 ) - ( 2 , 7 ) = '

```

```

CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( -4 , 3 )
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' Subtraction',2,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 56
A = TO_FM_INTERVAL( 3 , 5 )
B = TO_FM_INTERVAL( 2 , 7 )
RESULT = A
CALL FM_INTERVAL_SUB_R1(RESULT,B)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' ( 3 , 5 ) - ( 2 , 7 ) = '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( -4 , 3 )
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' Subtraction',2,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 57
A = TO_FM_INTERVAL( 3 , 5 )
B = TO_FM_INTERVAL( 2 , 7 )
RESULT = B
CALL FM_INTERVAL_SUB_R2(A,RESULT)
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' ( 3 , 5 ) - ( 2 , 7 ) = '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( -4 , 3 )
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' Subtraction',2,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 58
A = TO_FM_INTERVAL( 3 , 5 )
B = TO_FM_INTERVAL( 2 , 7 )
RESULT = A * B
WRITE (KLOG,*) ' '
WRITE (KLOG,"(A,I6)") ' NCASE = ',NCASE
WRITE (KLOG,*) ' ( 3 , 5 ) * ( 2 , 7 ) = '
CALL FMFORM_INTERVAL('F40.35',RESULT,STRING)
WRITE (KLOG,*) ' ',TRIM(STRING)
WRITE (KLOG,*) ' '
CORRECT = TO_FM_INTERVAL( 6 , 35 )
IF (.NOT.(RESULT == CORRECT)) THEN
    CALL ERRPRTFM(' Multiplication',2,A,'A',B,'B',B,'B')
ENDIF

```

```

NCASE = 59
A = TO_FM_INTERVAL( 3 , 5 )
B = TO_FM_INTERVAL( 2 , 7 )

```