Fortran 95

intrinsics

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- taken from

The Queen's University of Belfast
Parallel Computer Centre
http://www.pcc.qub.ac.uk/tec/courses
/f90/stu-notes/F90_notesMIF_13.html

- arguments are named according to their implicit types
- Optional arguments in square brackets [ ],
- keywords for the argument names are those given.
  - KIND
    - **describes the KIND number.**
  - SET
    - **a string containing a set of characters.**
  - BACK
    - **a logical used to determine the direction a string is to be searched.**
  - MASK
    - **a logical array used to identfy those element which are to take part in the desired operation.**
  - DIM
    - **a selected dimension of an argument (an integer).**

functions and subroutines

- nearly all intrinsics are functions
- reflects the significance of the function results in connection with array syntax and (not for intrinsics) derived types

1 Argument presence enquiry

- PRESENT(A)
  - true if A is present.

2 Numeric functions 1

- ABS(A)
  - return the absolute value of A.
- AIMAG(Z)
  - return the imaginary part of complex number Z.
- AINT(A [, KIND])
  - returns a value A truncated to a whole number.
- ANINT(A [, KIND])
  - returns a value rounded to the nearest value of A.
- CEILING(A)
  - returns the lowest integer greater than or equal to A.
- CMPLX(X [, Y][, KIND])
  - converts A to a complex number.
- CONJG(Z)
  - returns the conjugate of a complex number.
- DBLE(A)
  - converts A to a double precision real.

2 Numeric functions 2

- DIM(X, Y)
  - returns the maximum of X-Y or 0.
- DPROD(X, Y)
  - returns a double precision product.
- FLOOR(A)
  - returns the largest integer less than or equal to A.
- INT(A [, KIND])
  - converts to an integer.
- MAX(A1, A2 [, A3...])
  - returns the maximum value.
- MIN(A1, A2 [, A3...])
  - returns the minimum value.
- MOD(A, P)
  - returns remainder modulo P i.e. A-INT(A/P)*P.
- MODULO(A, P)
  - A modulo P.

2 Numeric functions 3

- NINT(A [, KIND])
  - returns the nearest integer to A.
- REAL(A [, KIND])
  - converts to a real.
- SIGN(A, B)
  - returns the absolute value of A times the sign of B.

3 Mathematical functions 1

- ACOS(X)
  - arccosine.
- ASIN(X)
  - arcsine.
- ATAN(X)
  - arctan.
- ATAN2(X, Y)
  - arctan.
- COS(X)
  - cosine.
- COSH(X)
  - hyperbolic cosine.
- EXP(X)
  - exponential.
- LOG(X)
  - natural logarithm.

3 Mathematical functions 2

- LOG10(X)
  - base 10 logarithm.
- SIN(X)
  - sine.
- SINH(X)
  - hyperbolic sine.
- SQRT(X)
  - square root.
- TAN(X)
  - tan.
- TANH(X)
  - hyperbolic tan.

4 Character functions 1

- ACHAR(I)
  - returns the Ith character in the ASCII collating sequence.
- ADJUSTL(STRING)
  - adjusts string left by removing any leading blanks and inserting trailing blanks.
- ADJUSTR(STRING)
  - adjusts string right by removing trailing blanks and inserting leading blanks.
- CHAR(I [, KIND])
  - returns the Ith character in the machine specific collating sequence.
- IACHAR(C)
  - returns the position of the character in the ASCII collating sequence.
- ICHAR(C)
  - returns the position of the character in the machine specific collating sequence.
- INDEX(STRING, SUBSTRING [, BACK])
  - returns the leftmost (rightmost if BACK is .TRUE.) starting position of SUBSTRING within STRING.

4 Character functions 2

- LEN(STRING)
  - returns the length of a string.
- LEN_TRIM(STRING)
  - returns the length of a string without trailing blanks.
- LGE(STRING_A, STRING_B)
  - lexically greater than or equal to.
- LGT(STRIN_A1, STRING_B)
  - lexically greater than.
- LLE(STRING_A, STRING_B)
  - lexically less than or equal to.
- LLT(STRING_A, STRING_B)
  - lexically less than.
- REPEAT(STRING, NCOPIES)
  - repeats concatenation.
- SCAN(STRING, SET [, BACK])
  - returns the index of the leftmost (rightmost if BACK is .TRUE.) character of STRING that belong to SET, or 0 if none belong.

4 Character functions 3

- TRIM(STRING)
  - removes training spaces from a string.
- VERIFY(STRING, SET [, BACK])
  - returns zero if all characters in STRING belong to SET or the index of the leftmost (rightmost if BACK is .TRUE.) that does not.

5 KIND functions

- KIND(X)
  - returns the kind type parameter value.
- SELECTED_INT_KIND(R)
  - kind of type parameter for specified exponent range.
- SELECTED_REAL_KIND([P] [,R])
  - kind of type parameter for specified precision and exponent range.

6 Logical functions

- LOGICAL(L [, KIND])
  - convert between different logical kinds.

7 Numeric enquiry functions 1

- DIGITS(X)
  - returns the number of significant digits in the model.
- EPSILON(X)
  - returns the smallest value such that REAL(1.0, KIND(X)) + EPSILON(X) is not equal to REAL(1.0, KIND(X)).
- HUGE(X)
  - returns the largest number in the model.
- MAXEXPONENT(X)
  - returns the maximum exponent value in the model.
- MINEXPONENT(X)
  - returns the minimum exponent value in the model.
- PRECISION(X)
  - returns the decimal precision.
- RADIX(X)
  - returns the base of the model.

7 Numeric enquiry functions 2

- RANGE(X)
  - returns the decimal exponent range.
- TINY(X)
  - returns the smallest positive number in the model.

8 Bit enquiry functions

- BIT_SIZE(I)
  - returns the number of bits in the model.

9 Bit manipulation functions 1

- BTEST(I, POS)
  - is .TRUE. if bit POS of integer I has a value 1.
- IAND(I, J)
  - logical .AND. on the bits of integers I and J.
- IBCLR(I, POS)
  - clears bit POS of interger I to 0.
- IBITS(I, POS, LEN)
  - extracts a sequence of bits length LEN from integer I starting at POS
- IBSET(I, POS)
  - sets bit POS of integer I to 1.
- IEOR(I, J)
  - performas an exclusive .OR. on the bits of integers I and J.
- IOR(I, J)
  - performes an inclusive .OR. on the bits of integers I and J.
- ISHIFT(I, SHIFT)
  - logical shift of the bits.

9 Bit manipulation functions 2

- ISHIFTC(I, SHIFT [, SIZE])
  - logical circular shift on a set of bits on the right.
- NOT(I)
  - logical complement on the bits.

10 Transfer functions

- TRANSFER(SOURCE, MOLD [, SIZE])
  - converts SOURCE to the type of MOLD.

11 Floating point manipulation functions

- EXPONENT(X)
  - returns the exponent part of X.
- FRACTION(X)
  - returns the fractional part of X.
- NEAREST(X, S)
  - returns the nearest different machine specific number in the direction given by the sign of S.
- RRSPACING(X)
  - returns the reciprocal of the relative spacing of model numbers near X.
- SCALE(X)
  - multiple X by its base to power I.
- SET_EXPONENT(X, I)
  - sets the exponent part of X to be I.
- SPACING(X)
  - returns the absolute spacing of model numbers near X.

12 Vector and matrix functions

- DOT_PRODUCT(VECTOR_A, VECTOR_B)
  - returns the dot product of two vectors (rank one arrays).
- MATMUL(MATRIX_A, MATRIX_B)
  - returns the product of two matricies.

13 Array reduction functions

- ALL(MASK [, DIM])
  - returns .TRUE. if all elements of MASK are .TRUE.
- ANY(MASK [, DIM])
  - returns .TRUE. if any elements of MASK are .TRUE.
- COUNT(MASK [, DIM])
  - returns the number of elements of MASK that are .TRUE.
- MAXVAL(ARRAY [, DIM] [,MASK])
  - returns the value of the maximum array element.
- MINVAL(ARRAY [, DIM] [,MASK])
  - returns the value of the minimum array element.
- PRODUCT(ARRAY [, DIM] [, MASK])
  - returns the product of array elements
- SUM(ARRAY [, DIM] [, MASK])
  - returns the sum of array elements.

14 Array enquiry functions

- ALLOCATED(ARRAY)
  - returns .TRUE. if ARRAY is allocated.
- LBOUND(ARRAY [, DIM])
  - returns the lower bounds of the array.
- SHAPE(SOURCE)
  - returns the array (or scalar) shape.
- SIZE(ARRAY [, DIM])
  - returns the total number of elements in an array.
- UBOUND(ARRAY [, DIM])
  - returns the upper bounds of the array.

15 Array constructor functions

- MERGE(TSOURCE, FSOURCE, MASK)
  - returns value(s) of TSOURCE when MASK is .TRUE. and FSOURCE otherwise.
- PACK(ARRAY, MASK [, VECTOR])
  - pack elements of ARRAY corresponding to true elements of MASK into a rank one result
- SPREAD(SOURCE, DIM, NCOPIES)
  - returns an array of rank one greater than SOURCE containing NCOPIES of SOURCE.
- UNPACK(VECTOR, MASK, FIELD)
  - unpack elements of VECTOR corresponding to true elements of MASK.

16 Array reshape and manipulation functions

- CSHIFT(ARRAY, SHIFT [, DIM])
  - performs a circular shift.
- EOSHIFT(ARRAY, SHIFT [, BOUNDARY] [, DIM])
  - performs an end-off shift.
- MAXLOC(ARRAY [, MASK])
  - returns the location of the maximum element.
- MINLOC(ARRAY [, MASK])
  - returns the location of the minimum element.
- RESHAPE(SOURCE, SHAPE [, PAD] [, ORDER])
  - rehapes SOURCE to shape SHAPE
- TRANSPOSE(MATRIX)
  - transpose a matrix (rank two array).

17 Pointer association status enquiry functions

- ASSOCIATED(POINTER [, TARGET])
  - returns .TRUE. if POINTER is associated.

18 Intrinsic subroutines

- CPU_TIME(TIME)
  - CPU time in seconds
- DATE_AND_TIME([DATE] [, TIME] [, ZONE] [, VALUES])
  - real time clock reading date and time.
- MVBITS(FROM, FROMPOS, LEN, TO TOPOS)
  - copy bits.
- RANDOM_NUMBER(HARVEST)
  - random number in the range 0-1 (inclusive).
- RANDOM_SEED([SIZE] [, PUT] [, GET])
  - initialise or reset the random number generator.
- SYSTEM_CLOCK([COUNT] [, COUNT_RATE] [, COUNT_MAX])
  - integer data from the real time clock.