Evaluation of Intrinsic Procedures

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TITLE: Evaluation of Intrinsic Procedures
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QUESTION: 1. When the standard specifies an algorithm for computing a mathematical procedure, must a processor use the specified algorithm?

Example: ANINT is defined as INT (A + 0.5). On some processors ANINT (16 000 001.0) evaluates to 16 000 002.0 using this algorithm.

2. May a processor return a mathematically equivalent result in the evaluation of a numeric intrinsic procedure?

Example: If ANINT (16 000 001.0) can be computed as the more expected 16 000 001.0, may a processor do so?

ANSWER: 1. No, a processor is not required to use the algorithm from the standard.

2. Yes, a processor may return the mathematically equivalent result in the evaluation of any numeric intrinsic procedure.

DISCUSSION: The use or specification of an algorithm in the standard is intended to specify the value and properties of the required end result. It is not intended to require that a processor use a particular method of achieving that result. Thus, an algorithm specifies the mathematical results, not the computational results, of the evaluation of intrinsic procedures.

Although the standard does not directly address this issue, one may infer from several passages that the standard intends to permit a processor to use any mathematically equivalent method in the evaluation of intrinsic procedures. This practice is expressly permitted for the evaluation of numeric intrinsic operations in 7.1.7.3 [81:17-19].

> The rules given in 7.2.1 specify the interpretation of a numeric intrinsic operation. Once the interpretation has been established in accordance with those rules, the processor may evaluate any mathematically equivalent expression, provided that the integrity of parentheses is not violated.

Further into the section are two tables specifying allowable and nonallowable alternative forms for certain mathematical expressions [81:30-40, 82:3-10].

It is true that rule R701 in section 7.1.1.1 defines a *<<function-reference>>* as a *<<primary>>*. However, section 7.1.7, "Evaluation of operations", contains several references to rules concerning the evaluation of functions [79:40, 80:4-17, 81:1-8]. Thus the context indicates that the standard intends to permit a processor this freedom of operation in the evaluation of intrinsic procedures as well.

The standard intends to permit a processor to use infinite accuracy if available. Section 1.3.2, Exclusions, states in part, "This International Standard does not specify: . . . (6) The physical properties of the representation of quantities and the method of rounding, approximating, or computing numeric values on a particular processor." [1:19, 1:29-30]

EDITS: None.

SUBMITTED BY: Keith H. Bierman

HISTORY:	95-247	m134	Submitted with proposed response, adopted 9-4
	95-256	m134	Ballot failed, 10-6
	95-260	m135	Proposed response, no action
	96-023	m136	Proposed response, no action
	96-054	m137	Proposed response

[End of 96-054]