APPENDIX

2

SAS Operators

Definition **1189**
Order of Evaluation of SAS Operators **1189**

Definition

SAS operators are symbols that request a comparison, a logical operation, an arithmetic calculation, or a concatenation.

Order of Evaluation of SAS Operators

A SAS expression with no more than one operator is called a *simple expression*. When an expression includes several operators, it is called a *compound expression*. When SAS encounters a compound expression, it follows certain rules to determine the order in which to evaluate each part of the expression. See "SAS Expressions" in *SAS Language Reference: Concepts* for a complete discussion of the rules for evaluating compound expressions.

The following table groups SAS operators according to their priority of evaluation (first column). In compound expressions, SAS evaluates the part of the expression that contains operators from Group I first; it evaluates Group II expressions next, and so on down to Group VII. Parentheses are often used in compound expressions to group operands; expressions within parentheses are evaluated before those outside. In addition, if a compound expression contains more than one operator from the same group, certain rules govern which part of the expression SAS evaluates first. These rules are listed in the table in the column named Order of Evaluation.

The other columns in the table are described here.

Symbols
: lists the actual symbols that you use to request the comparisons, operations, and calculations.

Mnemonic Equivalent
: lists written-out, alternate forms of the symbol. In some cases, such as when your keyboard does not support special symbols, you should use the alternate form.

Definition
: defines the symbol.

Example
: provides brief examples of how to use the symbol or mnemonic equivalent in a SAS expression.

Table A2.1 Summary of SAS Operators

Priority	Order of Evaluation	Symbols	Mnemonic Equivalent	Definition	Example
Group I	right to left	** [1]		exponentiation	`y=a**2;`
		+ [2]		positive prefix	`y=+(a+b);`
		-		negative prefix	`z=-(a+b);`
		^ ¬ ~ [3]	NOT	logical not	`if not z then put x;`
		><	MIN	minimum	`x=(a><b);` [4]
		<>	MAX	maximum	`x=(a<>b);`
Group II	left to right	*		multiplication	`c=a*b;`
		/		division	`f=g/h;`
Group III	left to right	+		addition	`c=a+b;`
		-		subtraction	`f=g-h;`
Group IV	left to right	|| !! ¦¦ [5]		concatenate character values	`name= 'J'||'SMITH';`
Group V [6]	left to right [7]	<	LT	less than	`if x<y then c=5;`
		<=	LE	less than or equal to	`if x le y then a=0;`
		=	EQ	equal to	`if y eq (x+a) then output;`
		¬=	NE	not equal to	`if x ne z then output;`
		>=	GE	greater than or equal to	`if y>=a then output;`
		>	GT	greater than	`if z>a then output;`
			IN	equal to one of a list	`if state in ('NY','NJ','PA') then region='NE';`

Group VI	left to right	&	AND	logical and	`if a=b & c=d then x=1;`
Group VII	left to right	| ! ¦[8]	OR	logical or	`if y=2 or x=3 then a=d;`

1 Because Group I operators are evaluated from right to left, the expression x=2**3**4 is evaluated as x=(2**(3**4)).

2 The plus (+) and minus (–)signs can be either prefix or arithmetic operators. A plus or a minus sign is a prefix operator only when it appears at the beginning of an expression or when it is immediately preceded by a left parenthesis or another operator.

3 Depending on the characters that are available on your keyboard, the symbol can be the not sign (¬), tilde (~), or caret (^). The SAS system option CHARCODE allows various other substitutions for unavailable special characters.

4 In this example of the MIN operator, the SAS System evaluates — 3>< — 3 as — (3>< — 3), which is equal to — (— 3), which equals +3. This is because Group I operators are evaluated from right to left.

5 Depending on the characters that are available on your keyboard, the symbol you use as the concatenation operator can be a single vertical bar (|), broken vertical bar (¦), or exclamation mark (!).

6 Group V operators are comparison operators. The result of a comparison operation is 1 if the comparison is true and 0 if it is false. Missing values are the lowest in any comparison operation.The symbols =< (less than or equal to) and => (greater than or equal to) are also allowed for compatibility with previous versions of the SAS System.When making character comparisons, you can use a colon (:) after any of the comparison operators to compare only the first character(s) of the value. The SAS System truncates the longer value to the length of the shorter value during the comparison. For example, if name=:'P' compares the value of the first character of NAME to the letter P. See "Character Comparisons" in Chapter 4 for details.

7 An exception to this rule occurs when two comparison operators surround a quantity. For example, the expression x<y<z is evaluated as (x<y) and (y<z).

8 Depending on the characters that are available on your keyboard, the symbol you use for the logical or can be a single vertical bar (|), broken vertical bar (¦), or exclamation mark (!). You can also use the mnemonic equivalent OR.

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