

# Operators

## Operators in expressions

The following tables show operand types and results of arithmetical and logical operations.

- [arithmetical operators](#)
- [logical operators](#)
- [relational operators](#)

When evaluating any expressions, there holds that if any operand in a calculation is invalid, the result is also invalid. However, an eval tag is exception, if the parameter "Replace Invalid values with 0" is set. Then it is evaluated as it is mentioned [here](#).

See also the topic [Order of operators by the priority](#)

## Arithmetical operators

| Operator | Operation      | Description  | Operand types                               | Result type                                 |               |
|----------|----------------|--|---|---|---------------|
| +        | addition       | Difference between two absolute times is calculated this way:<br>ATime - BTime = %SubTimeLocal(ATime, BTime)<br><br>All others combination of absolute and relative times with operators + and - are calculated this way:<br>ATime + RTime = %AddTimeLocal(ATime, RTime)<br><br>or<br><br>ATime - RTime = %AddTimeLocal(ATime, -RTime) | integer<br>real<br>boolean<br>time interval | integer<br>real<br>boolean<br>time interval |               |
|          |                |  | Operand 1                                   | Operand 2                                   | absolute time |
|          |                |  | absolute time                               | integer<br>real<br>relative time            |               |
|          |                |  | integer<br>real<br>relative time            | absolute time                               |               |
| -        | subtraction    | Difference between two absolute times is calculated this way:<br>ATime - BTime = %SubTimeLocal(ATime, BTime)<br><br>All others combination of absolute and relative times with operators + and - are calculated this way:<br>ATime + RTime = %AddTimeLocal(ATime, RTime)<br><br>or<br><br>ATime - RTime = %AddTimeLocal(ATime, -RTime) | integer<br>real<br>boolean<br>time interval | integer<br>real<br>boolean<br>time interval |               |
|          |                |  | Operand 1                                   | Operand 2                                   | absolute time |
|          |                |  | absolute time                               | integer<br>real<br>relative time            |               |
|          |                |  |   |   |               |
| *        | multiplication |  | integer<br>real<br>boolean                  | integer<br>real<br>integer                  |               |
| /        | division       |  | integer<br>real<br>boolean                  | real<br>real<br>integer                     |               |
| -        | unary operator |  | integer<br>real                             | integer<br>real                             |               |

In mathematical operations, operands of Boolean type are converted to Integer type as follows:

- TRUE -> 1
- FALSE -> 0

### Note

- Result of an function of Boolean type may be converted to other type by the multiplying with the constant of the particular type. For example: %Flag(Object, @A)\*1 gives a numerical type of the result value, i.e. Integer, Real.

## Logical operators

| operator | operation              | operand types      | result type        |
|----------|------------------------|--------------------|--------------------|
| &        | logical multiplication | boolean<br>integer | boolean<br>integer |
|          | logical addition       | boolean            | boolean            |
| !        | negation               | boolean            | boolean            |

Logical multiplication of two operands of **INTEGER** type represents decade form of logical multiplication performed between the corresponding bits of the both operands binary forms.

Example

179 & 217 = 145

|   |   |   |   |   |   |   |   |  |     |
|---|---|---|---|---|---|---|---|--|-----|
| 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |  | 179 |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 |  | 217 |
|   |   |   |   |   |   |   |   |  |     |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |  | 145 |

Relational operators

| operator | operation        | operand types                                     | result type |
|----------|------------------|---|-------------|
| =        | equal            | integer<br>real<br>absolute time<br>time interval | boolean     |
| #        | unequal          | integer<br>real<br>absolute time<br>time interval | boolean     |
| >        | greater          | integer<br>real<br>absolute time<br>time interval | boolean     |
| <        | less than        | integer<br>real<br>absolute time<br>time interval | boolean     |
| >=       | greater or equal | integer<br>real<br>absolute time<br>time interval | boolean     |
| <=       | less or equal    | integer<br>real<br>absolute time<br>time interval | boolean     |