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# NaN

In computing, NaN, which stands for Not a Number, is a value or symbol that is usually produced as the result of an operation on invalid input operands. For example, most floating-point units are unable to explicitly calculate the square root of negative numbers, and will instead indicate that the operation was invalid and return a NaN result.

An invalid operation is not the same as an arithmetic overflow (which returns a positive or negative infinity). Arithmetic operations involving NaN always produce NaN, allowing the value to propagate through a calculation so that errors can be detected at the end without extensive testing during intermediate stages.

A NaN does not compare equal to any number or NaN. You can therefore test whether a variable has a NaN value by comparing it to itself, thus if `x == x` gives false (0) then x is a NaN code.

## How is a NaN created?

There are three kinds of operation which return NaN:

1. Operations with a NaN as at least one operand
2. Indeterminate forms
  - The divisions  $0/0$ ,  $\infty/\infty$ ,  $\infty/-\infty$ ,  $-\infty/\infty$ ,  $-\infty/-\infty$
  - The multiplications  $0 \times \infty$  and  $0 \times -\infty$
  - The power  $1^\infty$
  - The additions  $\infty + (-\infty)$ ,  $(-\infty) + \infty$  and equivalent subtractions.
3. Real operations with complex results
  - The square root of a negative number
  - The logarithm of a negative number
  - The tangent of an odd multiple of 90 degrees (or  $\pi/2$  radians)
  - The inverse sine or cosine of a number which is less than -1 or greater than +1.

## NaN in Tables

In MagicPlot NaN also is used to represent empty cells in tables.

Statistical functions ignores NaN values in tables.

## NaN in Expressions

You can use a predefined constants NaN, nan or NAN in expressions to indicate NaN value.

## Examples

Expression	Result
$0^0$	1
$0/0$	NaN
$\text{sqrt}(-1)$	NaN
$1/0$	Infinity
$-1/0$	-Infinity

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