

ooRexx Documentation 4.2

Open Object Rexx™

RxMath Math Functions Reference



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RxMath Math Functions Reference

Edition 1

| | |
|--------|-------------------|
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Preface

This book describes the Open Object Rexx Math Function Library.

This book is intended for people who plan to develop applications using Rexx. Its users range from the novice, who might have experience in some programming language but no Rexx experience, to the experienced application developer, who might have had some experience with Object Rexx.

This book is a reference rather than a tutorial. It assumes you are already familiar with object-oriented programming concepts.

Descriptions include the use and syntax of the language and explain how the language processor "interprets" the language as a program is running.

1. Document Conventions

This manual uses several conventions to highlight certain words and phrases and draw attention to specific pieces of information.

In PDF and paper editions, this manual uses typefaces drawn from the *Liberation Fonts*¹ set. The Liberation Fonts set is also used in HTML editions if the set is installed on your system. If not, alternative but equivalent typefaces are displayed. Note: Red Hat Enterprise Linux 5 and later includes the Liberation Fonts set by default.

1.1. Typographic Conventions

Four typographic conventions are used to call attention to specific words and phrases. These conventions, and the circumstances they apply to, are as follows.

Mono-spaced Bold

Used to highlight system input, including shell commands, file names and paths. Also used to highlight keycaps and key combinations. For example:

To see the contents of the file **my_next_bestselling_novel** in your current working directory, enter the **cat my_next_bestselling_novel** command at the shell prompt and press **Enter** to execute the command.

The above includes a file name, a shell command and a keycap, all presented in mono-spaced bold and all distinguishable thanks to context.

Key combinations can be distinguished from keycaps by the hyphen connecting each part of a key combination. For example:

Press **Enter** to execute the command.

Press **Ctrl+Alt+F2** to switch to the first virtual terminal. Press **Ctrl+Alt+F1** to return to your X-Windows session.

The first paragraph highlights the particular keycap to press. The second highlights two key combinations (each a set of three keycaps with each set pressed simultaneously).

¹ <https://fedorahosted.org/liberation-fonts/>

If source code is discussed, class names, methods, functions, variable names and returned values mentioned within a paragraph will be presented as above, in **mono-spaced bold**. For example:

File-related classes include **filesystem** for file systems, **file** for files, and **dir** for directories. Each class has its own associated set of permissions.

Proportional Bold

This denotes words or phrases encountered on a system, including application names; dialog box text; labeled buttons; check-box and radio button labels; menu titles and sub-menu titles. For example:

Choose **System** → **Preferences** → **Mouse** from the main menu bar to launch **Mouse Preferences**. In the **Buttons** tab, click the **Left-handed mouse** check box and click **Close** to switch the primary mouse button from the left to the right (making the mouse suitable for use in the left hand).

To insert a special character into a **gedit** file, choose **Applications** → **Accessories** → **Character Map** from the main menu bar. Next, choose **Search** → **Find...** from the **Character Map** menu bar, type the name of the character in the **Search** field and click **Next**. The character you sought will be highlighted in the **Character Table**. Double-click this highlighted character to place it in the **Text to copy** field and then click the **Copy** button. Now switch back to your document and choose **Edit** → **Paste** from the **gedit** menu bar.

The above text includes application names; system-wide menu names and items; application-specific menu names; and buttons and text found within a GUI interface, all presented in proportional bold and all distinguishable by context.

Mono-spaced Bold Italic or *Proportional Bold Italic*

Whether mono-spaced bold or proportional bold, the addition of italics indicates replaceable or variable text. Italics denotes text you do not input literally or displayed text that changes depending on circumstance. For example:

To connect to a remote machine using ssh, type **ssh *username@domain.name*** at a shell prompt. If the remote machine is **example.com** and your username on that machine is john, type **ssh john@example.com**.

The **mount -o remount *file-system*** command remounts the named file system. For example, to remount the **/home** file system, the command is **mount -o remount /home**.

To see the version of a currently installed package, use the **rpm -q *package*** command. It will return a result as follows: ***package-version-release***.

Note the words in bold italics above — *username*, *domain.name*, *file-system*, *package*, *version* and *release*. Each word is a placeholder, either for text you enter when issuing a command or for text displayed by the system.

Aside from standard usage for presenting the title of a work, italics denotes the first use of a new and important term. For example:

Publican is a *DocBook* publishing system.

1.2. Pull-quote Conventions

Terminal output and source code listings are set off visually from the surrounding text.

Output sent to a terminal is set in **mono-spaced roman** and presented thus:

```
books      Desktop  documentation  drafts  mss    photos  stuff  svn
books_tests Desktop1  downloads      images  notes  scripts svgs
```

Source-code listings are also set in **mono-spaced roman** but add syntax highlighting as follows:

```
package org.jboss.book.jca.ex1;

import javax.naming.InitialContext;

public class ExClient
{
    public static void main(String args[])
        throws Exception
    {
        InitialContext iniCtx = new InitialContext();
        Object          ref    = iniCtx.lookup("EchoBean");
        EchoHome        home   = (EchoHome) ref;
        Echo            echo   = home.create();

        System.out.println("Created Echo");

        System.out.println("Echo.echo('Hello') = " + echo.echo("Hello"));
    }
}
```

1.3. Notes and Warnings

Finally, we use three visual styles to draw attention to information that might otherwise be overlooked.



Note

Notes are tips, shortcuts or alternative approaches to the task at hand. Ignoring a note should have no negative consequences, but you might miss out on a trick that makes your life easier.



Important

Important boxes detail things that are easily missed: configuration changes that only apply to the current session, or services that need restarting before an update will apply. Ignoring a box labeled 'Important' will not cause data loss but may cause irritation and frustration.



Warning

Warnings should not be ignored. Ignoring warnings will most likely cause data loss.

2. How to Read the Syntax Diagrams

Throughout this book, syntax is described using the structure defined below.

- Read the syntax diagrams from left to right, from top to bottom, following the path of the line.

The `>>---` symbol indicates the beginning of a statement.

The `--->` symbol indicates that the statement syntax is continued on the next line.

The `>---` symbol indicates that a statement is continued from the previous line.

The `---><` symbol indicates the end of a statement.

Diagrams of syntactical units other than complete statements start with the `>---` symbol and end with the `--->` symbol.

- Required items appear on the horizontal line (the main path).

```
>>-STATEMENT--required_item-----><
```

- Optional items appear below the main path.

```
>>-STATEMENT--+-----+-----><
                +-optional_item-+
```

- If you can choose from two or more items, they appear vertically, in a stack. If you must choose one of the items, one item of the stack appears on the main path.

```
>>-STATEMENT--+-required_choice1-+-----><
                +-required_choice2-+
```

- If choosing one of the items is optional, the entire stack appears below the main path.

```
>>-STATEMENT--+-----+-----><
                +-optional_choice1-+
                +-optional_choice2-+
```

- If one of the items is the default, it appears above the main path and the remaining choices are shown below.

```
                +-default_choice--+
>>-STATEMENT--+-----+-----><
                +-optional_choice-+
```

```
+ - optional_choice - +
```

- An arrow returning to the left above the main line indicates an item that can be repeated.

```

+-----+
  v      |
>>-STATEMENT---repeatable_item-+-----><

```

A repeat arrow above a stack indicates that you can repeat the items in the stack.

- A set of vertical bars around an item indicates that the item is a fragment, a part of the syntax diagram that appears in greater detail below the main diagram.

```
>>-STATEMENT--| fragment |-----><
```

fragment:

```
|--expansion_provides_greater_detail-----|
```

- Keywords appear in uppercase (for example, **PARM1**). They must be spelled exactly as shown but you can type them in upper, lower, or mixed case. Variables appear in all lowercase letters (for example, **parm**x). They represent user-supplied names or values.
- If punctuation marks, parentheses, arithmetic operators, or such symbols are shown, you must enter them as part of the syntax.

The following example shows how the syntax is described:

```

+ , - - - - +
  v      |
>>-MAX(---number-+---)-----><

```

3. Getting Help and Submitting Feedback

The Open Object Rexx Project has a number of methods to obtain help and submit feedback for ooRexx and the extension packages that are part of ooRexx. These methods, in no particular order of preference, are listed below.

3.1. The Open Object Rexx SourceForge Site

The *Open Object Rexx Project*² utilizes *SourceForge*³ to house the *ooRexx Project*⁴ source repositories, mailing lists and other project features. Over time it has become apparent that the Developer and User mailing lists are better tools for carrying on discussions concerning ooRexx and that the Forums provided by SourceForge are cumbersome to use. The ooRexx user is most likely to get timely replies from one of the mailing lists.

Here is a list of some of the most useful facilities provided by SourceForge.

The Developer Mailing List

You can subscribe to the oorexx-devel mailing list at [ooRexx Mailing List Subscriptions](#)⁵ page. This list is for discussing ooRexx project development activities and future interpreter enhancements. It also supports a historical archive of past messages.

The Users Mailing List

You can subscribe to the oorexx-users mailing list at [ooRexx Mailing List Subscriptions](#)⁶ page. This list is for discussing using ooRexx. It also supports a historical archive of past messages.

The Announcements Mailing List

You can subscribe to the oorexx-announce mailing list at [ooRexx Mailing List Subscriptions](#)⁷ page. This list is only used to announce significant ooRexx project events.

The Bug Mailing List

You can subscribe to the oorexx-bugs mailing list at [ooRexx Mailing List Subscriptions](#)⁸ page. This list is only used for monitoring changes to the ooRexx bug tracking system.

Bug Reports

You can create a bug report at [ooRexx Bug Report](#)⁹ page. Please try to provide as much information in the bug report as possible so that the developers can determine the problem as quickly as possible. Sample programs that can reproduce your problem will make it easier to debug reported problems.

Documentation Feedback

You can submit feedback for, or report errors in, the documentation at [ooRexx Documentation Report](#)¹⁰ page. Please try to provide as much information in a documentation report as possible. In addition to listing the document and section the report concerns, direct quotes of the text will help the developers locate the text in the source code for the document. (Section numbers are generated when the document is produced and are not available in the source code itself.) Suggestions as to how to reword or fix the existing text should also be included.

Request For Enhancement

You can suggest ooRexx features at the [ooRexx Feature Requests](#)¹¹ page.

² <http://www.oorexx.org/>

³ <http://sourceforge.net/>

⁴ <http://sourceforge.net/projects/ooorexx>

⁵ http://sourceforge.net/mail/?group_id=119701

⁶ http://sourceforge.net/mail/?group_id=119701

⁷ http://sourceforge.net/mail/?group_id=119701

⁸ http://sourceforge.net/mail/?group_id=119701

⁹ http://sourceforge.net/tracker/?group_id=119701&atid=684730

¹⁰ http://sourceforge.net/tracker/?group_id=119701&atid=1001880

¹¹ http://sourceforge.net/tracker/?group_id=119701&atid=684733

Patch Reports

If you create an enhancement patch for ooRexx please post the patch using the [ooRexx Patch Report](#)¹² page. Please provide as much information in the patch report as possible so that the developers can evaluate the enhancement as quickly as possible.

Please do not post bug fix patches here, instead you should open a bug report and attach the patch to it.

The ooRexx Forums

The ooRexx project maintains a set of forums that anyone may contribute to or monitor. They are located on the [ooRexx Forums](#)¹³ page. There are currently three forums available: Help, Developers and Open Discussion. In addition, you can monitor the forums via email.

3.2. The Rexx Language Association Mailing List

The [Rexx Language Association](#)¹⁴ maintains a mailing list for its members. This mailing list is only available to RexxLA members thus you will need to join RexxLA in order to get on the list. The dues for RexxLA membership are small and are charged on a yearly basis. For details on joining RexxLA please refer to the [RexxLA Home Page](#)¹⁵ or the [RexxLA Membership Application](#)¹⁶ page.

3.3. comp.lang.rexx Newsgroup

The [comp.lang.rexx](#)¹⁷ newsgroup is a good place to obtain help from many individuals within the Rexx community. You can obtain help on Open Object Rexx or on any number of other Rexx interpreters and tools.

4. Related Information

See also: *Open Object Rexx: Reference*

¹² http://sourceforge.net/tracker/?group_id=119701&atid=684732

¹³ http://sourceforge.net/forum/?group_id=119701

¹⁴ <http://www.rexxla.org/>

¹⁵ <http://rexxla.org/>

¹⁶ <http://www.rexxla.org/rexxla/join.html>

¹⁷ <http://groups.google.com/group/comp.lang.rexx/topics?hl=en>

Introduction

RxMath is a Rexx utility package that enables you to use enhanced mathematical functions.

The function names in the Rexx Mathematical Functions package are similar to the names of their corresponding mathematical functions.

The precision of calculation depends on:

- The value specified when the command is issued
- The numeric digits settings of the calling Rexx activity



Note

Precision is limited to 16 digits.

1.1. Using the RxMath package

The Rexx Mathematical Functions package is contained in the library *rxmath*, with the appropriate file name for the operating system. This library must be loadable by the operating system using the normal procedure for the system. For instance, on Windows the file must be placed in a directory listed in your PATH. When installing ooRexx from any of the installation packages, the details of where the file is placed are handled automatically.

Beginning with ooRexx 4.0.0, a more robust process is used to load external functions. To get access to the functions in the Rexx Mathematical Functions package, use a `::requires` directive. For example:

```
say 'The square root of 3 is:' RxCalcSqrt(3)

::requires 'rxmath' LIBRARY
```

Existing code that used the previous process to load external functions:

```
call rxfuncadd "MathLoadFuncs", "rxmath", "MathLoadFuncs"
```

does not need to be changed. However, both **MathLoadFuncs()** and **MathDropFuncs()** are nops in ooRexx 4.0.0 and later.

1.2. Error Handling and Function Returns

Error 40 (Incorrect call to routine) is raised if either the wrong number of arguments or incorrect data is passed to a function.

If a mathematical function fails, the function will return *nan*, *+infinity*, and *-infinity* as appropriate. These returns are consistent on all operating systems.

1.3. Package Limitations

The RxMath package internally uses the corresponding C library math functions to perform the actual calculations. These C functions are limited to values of the C numeric type of **double**. All numeric

Chapter 1. Introduction

arguments passed to the RxMath package functions are truncated (if needed) in order to convert them to the C **double** type.

Functions

Most function names in the Rexx Mathematical Functions package are similar to the names of their corresponding mathematical functions. Note that in ooRexx 4.0.0 and later, the **MathLoadFuncs()** and **MathDropFuncs()** are nops.

- MathLoadFuncs()
- MathDropFuncs()
- RxCalcSqrt()
- RxCalcExp()
- RxCalcLog()
- RxCalcLog10()
- RxCalcSinH()
- RxCalcCosH()
- RxCalcTanH()
- RxCalcPower()
- RxCalcSin()
- RxCalcCos()
- RxCalcTan()
- RxCalcCotan()
- RxCalcPi()
- RxCalcArcSin()
- RxCalcArcCos()
- RxCalcArcTan()

2.1. MathLoadFuncs()

```
>>-MathLoadFuncs()------><
```

Beginning with ooRexx 4.0.0 this function is basically a nop. Use:

```
::requires 'rxmath' LIBRARY
```

to gain access to the functions in the package.

However, if this function is called with a single, string, parameter, the copyright information is printed.

2.2. MathDropFuncs()

```
>>-MathDropFuncs()-----<<
```

This function is a nop in ooRexx 4.0.0 and later. It does nothing.

2.3. RxCalcSqrt()

```
>>-RxCalcSqrt(number---+-----+---)-----<<  
                +---, precision---+
```

Returns the absolute value of the square root of number.

Parameters:

number

The number whose square root you wish to calculate.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.4. RxCalcExp()

```
>>-RxCalcExp(number---+-----+---)-----<<  
                +---, precision---+
```

Returns the exponential function of number.

Parameters:

number

The number for which you wish to calculate the exponential function.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.5. RxCalcLog()

```
>>-RxCalcLog(number--+-----+--)------><
                +--, precision--+
```

Returns the natural logarithm (base e) of number.

Parameters:

number

The number for which you wish to calculate the natural logarithm.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.6. RxCalcLog10()

```
>>-RxCalcLog10(number--+-----+--)------><
                +--, precision--+
```

Returns the base 10 logarithm of number.

Parameters:

number

The number for which you wish to calculate the base 10 logarithm.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.7. RxCalcSinH()

```
>>-RxCalcSinH(number--+-----+--)------><
                +--, precision--+
```

Returns the hyperbolic sine of *number*.

Parameters:

number

The number for which you wish to calculate the hyperbolic sine.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.8. RxCalcCosH()

```
>>-RxCalcCosH(number-----+---)-----<<
                +---, precision---+
```

Returns the hyperbolic cosine of *number*.

Parameters:

number

The number for which you wish to calculate the hyperbolic cosine.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.9. RxCalcTanH()

```
>>-RxCalcTanH(number-----+---)-----<<
                +---, precision---+
```

Returns the hyperbolic tangent of *number*.

Parameters:

number

The number for which you wish to calculate the hyperbolic tangent.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.10. RxCalcPower()

```
>>-RxCalcPower(number1, number2-----+---)-----<<
                +---, precision---+
```

Returns the value of mathematical expression *number1* raised to the power of exponent *number2*.

Parameters:

number1

The mathematical expression to be raised to the power of exponent *number2*.

number2

The exponent to which number1 is to be raised.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.11. RxCalcSin()

```
>>-RxCalcSin(number---+-----+---)-----><
          |                +-D--+ |
      +---, precision, ---+-----+
                          +-R--+
                          +-G--+
```

Returns the sine value for number, where number is the angle size, expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The angle size, expressed in degree [D], radian [R], or grade [G] units.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the angle size is expressed in degrees. This is the default.

R

Indicates that the angle size is expressed in radians.

G

Indicates that the angle size is expressed in grades.

2.12. RxCalcCos()

```
>>-RxCalcCos(number---+-----+---)-----><
          |                +-D--+ |
      +---, precision, ---+-----+
                          +-R--+
                          +-G--+
```

Returns the cosine value for number, where number is the angle size, expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The angle size, expressed in degree [D], radian [R], or grade [G] units.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the angle size is expressed in degrees. This is the default.

R

Indicates that the angle size is expressed in radians.

G

Indicates that the angle size is expressed in grades.

2.13. RxCalcTan()

```
>>-RxCalcTan(number-----+-----)-----<<
                |                +-D--+ |
                +--, precision, --+-----+--+
                               +-R--+
                               +-G--+
```

Returns the tangent value for number, where number is the angle size, expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The angle size, expressed in degree [D], radian [R], or grade [G] units.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the angle size is expressed in degrees. This is the default.

R

Indicates that the angle size is expressed in radians.

G

Indicates that the angle size is expressed in grades.

2.14. RxCalcCotan()

```
>>-RxCalcCotan(number--+-----+--)------><
                |           +-D--+ |
                +--, precision, -+-----+--+
                               +-R--+
                               +-G--+
```

Returns the cotangent value for number, where number is the angle size, expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The angle size, expressed in degree [D], radian [R], or grade [G] units.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the angle size is expressed in degrees. This is the default.

R

Indicates that the angle size is expressed in radians.

G

Indicates that the angle size is expressed in grades.

2.15. RxCalcPi()

```
>>-RxCalcPi(---+-----+--)------><
                +--, precision---
```

Returns the value of pi.

Parameters:

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

2.16. RxCalcArcSin()

```
>>-RxCalcArcSin(number--+-----+--)------><
                |           +-D--+ |
                +--, precision, -+-----+--+
                               +-R--+
```

```
+--G--+
```

Returns the arcsine of number, where the result can be expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The number for which the arcsine is to be calculated.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the result is expressed in degrees. This is the default.

R

Indicates that the result is expressed in radians.

G

Indicates that the result is expressed in grades.

2.17. RxCalcArcCos()

```
>>-RxCalcArcCos(number--+-----+--)------<<
      |                +-D--+ |
      +--, precision, -+-----+
                        +-R--+
                        +-G--+
```

Returns the arccosine of number, where the result can be expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The number for which the arccosine is to be calculated.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the result is expressed in degrees. This is the default.

R

Indicates that the result is expressed in radians.

G

Indicates that the result is expressed in grades.

2.18. RxCalcArcTan()

```
>>-RxCalcArcTan(number-----)-----><
                |           +-D--+ |
                +--, precision, -+-----+--+
                               +-R--+
                               +-G--+
```

Returns the arctangent of number, where the result can be expressed in degree [D], radian [R], or grade [G] units.

Parameters:

number

The number for which the arctangent is to be calculated.

precision

The precision of the calculation. If a value is not specified, the precision of the calling Rexx activity is used. Precision is limited to 16 digits.

D

Indicates that the result is expressed in degrees. This is the default.

R

Indicates that the result is expressed in radians.

G

Indicates that the result is expressed in grades.

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Appendix C. Revision History

Revision 0-0 **Sat Aug 11 2012**

David Ashley

Initial creation of book by publican

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