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About This Book

This book provides reference material for various elements of Caché Basic: commands, functions, constants, operators and symbols, and a list of the reserved words in Caché Basic.

This book contains the following sections:

- Symbols
- Caché Basic Commands
- Caché Basic Functions
- Caché Basic Operators
- Caché Basic Constants
- Caché Basic Objects
- Caché Basic General Concepts

There is also a detailed Table of Contents.

Other related topics in the Caché documentation set are:

- Using Caché Basic

For general information, see Using InterSystems Documentation.
Symbols
Symbols Used in Caché Basic

A table of characters used in Caché Basic as operators, etc.

Table of Symbols

The following are the literal symbols used in Caché Basic. (This list does not include symbols indicating format conventions, which are not part of the language.) There is a separate table for symbols used in ObjectScript.

The name of each symbol is followed by its ASCII decimal code value.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name and Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>[space] or [tab]</td>
<td>White space (Tab (9) or Space (32)): One or more whitespace characters between keywords, identifiers, and variables.</td>
</tr>
<tr>
<td>&quot;</td>
<td>Quotes (34): Used to enclose string literals. In Dynamic SQL used to enclose the SQL code as a string argument of the Prepare method.</td>
</tr>
<tr>
<td>[tab]</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>Percent sign (37): Permitted first character in identifier names, such as variables, methods, and datatypes.</td>
</tr>
<tr>
<td>&amp;</td>
<td>Ampersand (38): String concatenation operator. Numeric base prefix with Hex (&amp;H) and Oct (&amp;O) functions.</td>
</tr>
<tr>
<td>( )</td>
<td>Parentheses (40,41): Used to enclose a procedure or function parameter list. Used to nest expressions; nesting overrides the default order of operator precedence. Used to specify array subscripts. Enclose a test expression for an If, While, or in-line Case command.</td>
</tr>
<tr>
<td>*</td>
<td>Asterisk (42): Multiplication operator.</td>
</tr>
<tr>
<td>+</td>
<td>Plus sign (43): Addition operator.</td>
</tr>
<tr>
<td>,</td>
<td>Comma (44): Used to separate parameters in a procedure or function parameter list. Used to separate subscripts in an array. With Const and Dim commands, used to separate multiple assignments.</td>
</tr>
<tr>
<td>–</td>
<td>Minus sign (45): Unary arithmetic negative operator. Subtraction operator.</td>
</tr>
<tr>
<td>.</td>
<td>Period (46): Decimal point character. A valid character in global or process-private global names. Cannot be used in local variable names. Object dot syntax used to refer to a method or property of an object: person.Name.</td>
</tr>
<tr>
<td>/</td>
<td>Slash (47): Division operator (keep remainder).</td>
</tr>
<tr>
<td>Symbol</td>
<td>Name and Usage</td>
</tr>
<tr>
<td>--------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| :     | **Colon (58):** *Label suffix*. For example, `LabelOne:`.  
*Statement divider*, used to separate multiple statements on the same line. For example,  
`Print a : Print b.`  
With *Case* function, used to associate `case:value` pairs. |
| <     | **Less than (60):** *Less than operator*. |
| <=    | **Less than or equal to:** *Less than or equal to operator*. |
| <>    | **Less than/Greater than:** *Inequality operator*. |
| =     | **Equal sign (61):** *Equals comparison operator*.  
*Assignment operator*. |
| >     | **Greater than (62):** *Greater than operator*. |
| >=    | **Greater than or equal to:** *Greater than or equal to operator*. |
| ?     | **Question mark (63):** In Dynamic SQL, an *input parameter* variable supplied by the *Execute* method. |
| @     | **At sign (64):** *Calling function syntax*: `func@Routine(args)`. |
| E, e  | **The letter “E” (69, 101):** *Base-10 exponent* (scientific notation) numeric literal. |
| \    | **Backslash (92):** *Integer division operator* (drop remainder). |
| ^     | **Caret (94):** *Global variable name prefix*; for example, `^myglobal`.  
*Cexponentiation* operator. |
| ^|    | **Caret bar:** depending on the character(s) that follow, this may be either:  
An *extended global reference*, a global reference where a pair of bars encloses a null string, or a quoted namespace or directory name. The bars and their contents are not part of the global name. For example: `^"|globname`, or `^"namespace"|globname`.  
A *process-private global* with the prefix `^||`. The bars *are* part of the process-private global name. For example, `^||ppgname`. Also valid as syntax for this process-private global: `^|||ppgname`. |
| _    | **Underscore (95):** *Line continuation character*. A line ending with an underscore continues on next line. Commonly preceded by one or more blank spaces.  
A valid character in *local variable names* or routine names. Cannot be used in global variable or process-private global variable names. |
| {}   | **Curly braces (123,125):** Code block delimiters used in procedures. |
Caché Basic Commands
Call

Transfers control to a Sub procedure or Function procedure.

\[
\text{[Call]} \ \text{name([arglist])}
\]

**Arguments**

The Call statement syntax has these parts:

<table>
<thead>
<tr>
<th>Call</th>
<th>Call is an optional keyword. If specified, you must enclose arglist in parentheses. For example: Call MyProc(0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Name of the procedure to call. To call a procedure in an external routine, specify name@routine(arglist).</td>
</tr>
<tr>
<td>arglist</td>
<td>Optional — Comma-delimited list of variables, arrays, or expressions to pass to the procedure. The parentheses are required, even when there are no arguments.</td>
</tr>
</tbody>
</table>

**Description**

You are not required to use the Call keyword when calling a procedure. However, if you use the Call keyword to call a procedure that requires arguments, argumentlist must be enclosed in parentheses. If you omit the Call keyword, you also must omit the parentheses around arglist. If you use either Call syntax to call any intrinsic or user-defined function, the function’s return value is discarded.

To omit an arglist argument value, you must specify an undefined variable. This is a significant difference between ObjectScript and Caché Basic. In ObjectScript an omitted argument can be specified using a placeholder comma. In Caché Basic you cannot use a placeholder comma; you must supply an undefined named variable.

**Examples**

The following example shows how to use the Call statement:

```caché
Call MyFunction("Hello World")

Function MyFunction(text)
  Println text
End Function
```
# Catch

Identifies a block of code to execute when an exception occurs.

```cachébasics
Try
    statements
Catch [exceptionvar]
    statements
End Try
```

## Arguments

| exceptionvar | Optional — An exception variable. Specified as a local variable, with or without subscripts, that receives a reference to a Caché Object. |

## Description

The **Catch** command defines an exception handler, one or more statements to execute when an exception occurs in the code following a **Try** statement. The **Catch** command is followed by one or more exception handling code statements. The **Catch** block must immediately follow its **Try**, and the paired **Try** and **Catch** are terminated by an **End Try** statement.

The **Catch** command has two forms:

- Without an argument
- With an argument

### Catch without an Argument

Argumentless **Catch** execute the series of statements between **Catch** and **End Try**.

### Catch with an Argument

**Catch** `exceptionvar` receives a Caché Object reference (oref) from the **Throw** command or from the system runtime environment in the event of a system error. This Object provides properties that contain information about the exception, such as the Name of the error and the Location where it occurred. The user-written **Catch** exception handler code can use this information to analyze the exception.

## Arguments

### exceptionvar

A local variable, used to receive the exception object reference from the **Throw** command or from the system runtime environment in the event of a system error. When a system error occurs, `exceptionvar` receives a reference to an object of type `%Exception.SystemException`. For further details, refer to the `%Exception.AbstractException` class in the *InterSystems Class Reference*.

## Examples

The following example shows a **Catch** invoked by a runtime error. The `myvar` argument receives a system-generated exception object:
Try
  PRINTLN "about to divide by zero"
SET a=7/0
  PRINTLN "this should not display"
Catch myvar
  PRINTLN "this is the exception handler"
  PRINTLN "Error is: ", Err.Description
  PRINTLN "Error code: ", myvar.Code
End Try
PRINTLN "this is where the code falls through"

See Also

- **Throw** command
- **Try** command
- **Err** object
**Const**

Declares constants for use in place of literal values.

```
Const constname = expression
```

**Arguments**

The `Const` statement syntax has these parts:

<table>
<thead>
<tr>
<th>constname</th>
<th>Name of the constant; follows standard variable-naming conventions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>expression</td>
<td>Literal or any combination that includes all arithmetic or logical operators except <code>Is</code>.</td>
</tr>
</tbody>
</table>

**Description**

To combine several constant declarations on the same line, separate each constant assignment with a comma.

You cannot use variables, user-defined functions, or intrinsic Caché Basic functions (such as `Chr`) in constant declarations. By definition, they cannot be constants. Constants declared in a `Sub` or `Function` procedure are local to that procedure. A constant declared outside a procedure is defined throughout the script in which it is declared. You can use constants anywhere you can use an expression.

**Examples**

The following code illustrates the use of the `Const` statement:

```caché
Const MyVar = 459
' Declare multiple constants on same line.
Const MyStr = "Hello", MyNumber = 3.4567
```

**Notes**

Constants can make your scripts self-documenting and easy to modify. Unlike variables, constants cannot be inadvertently changed while your script is running.

**See Also**

- `Dim` Statement
- `Function` Statement
- `Sub` Statement
**Continue**

Jumps to FOR or DO WHILE statements and reexecutes test and loop.

| Continue Do | Continue For |

**Arguments**

The **Continue Do** and **Continue For** statements do not have any arguments.

**Description**

The **Continue Do** or **Continue For** statement is used within the code block following a **For** or **Do While** statement. **Continue Do** or **Continue For** causes execution to jump back to the **For** or **Do While** statement and to evaluate its test condition, and, based on that evaluation, reexecutes the code block loop.

**Examples**

The following example illustrates the use of the **Continue** statement:

```cachébasic
For i = 1 to 10
 If i = 5 Then
  Continue For
 Println i
 End If
Next
```

**See Also**

- **Do...Loop Statement**
- **Exit Statement**
- **For Each...Next Statement**
- **For...Next Statement**
Copy

Copies array elements from source to target.

**Copy** target=source

### Arguments

The `Copy` statement has the following parameters:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>source</strong></td>
<td>The name of the variable, typically an array, which should be copied.</td>
</tr>
<tr>
<td><strong>target</strong></td>
<td>The name of the variable into which the contents of source should be copied.</td>
</tr>
</tbody>
</table>

### Description

All nodes in the target variable are deleted prior to the copy process. The only difference between `Copy` and `Merge` is the deletion of the target nodes.

### Examples

Erase source, target

```plaintext
target(1) = "node 1"
target(1,1) = "node 1,1"
target(2) = "node 2"
target(3,1) = "node 3,1"
source(3,2) = "node 3,2"
Copy target = source
Println Exists(target(3,1))  'not defined anymore, returns 0
Println Exists(target(3,2))  'does now exist, returns 1
Println Exists(target(1))    'not defined and has no subnodes, returns 0
```

### See Also

- `Merge` Statement
Debug

Interrupts program execution and enters programmer mode.

Arguments
None.

Description
The Debug statement interrupts execution of the current routine and returns control to programmer mode. Once in programmer mode, you can perform debugging operations. A Debug statement included in code sets a breakpoint, which interrupts routine execution and returns the process to programmer mode.

The Debug statement is functionally equivalent to the ObjectScript argumentless BREAK command.
**Dim**

Declares variables.

```
Dim varname[, varname] . . .
```

**Arguments**

The `Dim` statement syntax has these parts:

<table>
<thead>
<tr>
<th>varname</th>
<th>Name of the variable; follows standard variable naming conventions.</th>
</tr>
</thead>
</table>

**Description**

Variables declared with `Dim` at the script level are available to all procedures within the script. At the procedure level, variables are available only within the procedure.

All uninitialized variables are treated as zero-length strings (""").

**Examples**

The following examples illustrate the use of the Dim statement:

```
Dim MyStr        ' Declare one variable
Dim MyVar, MyNum ' Declare two variables
```

**Notes**

Caché Basic does not require the dimension of arrays to be specified, and therefore does not implement the `ReDim` Statement.

**See Also**

- `Set Statement`
Do...Loop

Repeats a block of statements while a condition is True or until a condition becomes True.

Do [(While | Until) condition]  
  [statements]  
  [Exit Do]  
  [statements]  
Loop

Or, you can use this syntax:

Do  
  [statements]  
  [Exit Do]  
  [statements]  
Loop [(While | Until) condition]

Arguments

The Do...Loop statement syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>condition</td>
<td>Numeric or string expression that is True or False.</td>
</tr>
<tr>
<td>statements</td>
<td>One or more statements that are repeated while or until condition is True.</td>
</tr>
</tbody>
</table>

Description

The Exit Do can only be used within a Do...Loop control structure to provide an alternate way to exit a Do...Loop. Any number of Exit Do statements may be placed anywhere in the Do...Loop. Often used with the evaluation of some condition (for example, If...Then), Exit Do transfers control to the statement immediately following the Loop.

When used within nested Do...Loop statements, Exit Do transfers control to the loop that is nested one level above the loop where it occurs.

Examples

The following examples illustrate use of the Do...Loop statement:

Do Until MyNum = 6  
  MyNum = Int (6 * Rnd + 1)  ' Generate a random integer between 1 and 6  
  Println MyNum  
Loop

Dim Check, Counter  
Check = True: Counter = 0  ' Initialize variables.  
Do  
  Do While Counter < 20  
    Counter = Counter + 1  
    If Counter = 10 Then  
      Check = False  
      Exit Do  
    End If  
  End Do  
  Exit Do  
End If  
Loop  
Loop Until Check = False  ' Exit outer loop immediately.

See Also

- Exit Statement
- For...Next Statement
- While...Wend Statement
Erase

Removes the named variable and deallocates dynamic-array storage space.

```
Erase varname
```

**Arguments**

The `Erase` statement has the following argument:

| varname | The name of the variable to be erased. |

**Description**

The `Erase` statement removes the variable and all descended nodes.

`Erase` may be used to insure that a variable has no defined value, such as when a named variable is used as a placeholder in an argument list.

**Examples**

The following example uses `Erase` to remove an array and its subnodes:

```
array = "root node"
array("subnode") = "subnode"
array("subnode", "subnode") = "subnode, subnode"
Println Exists(array) 'returns 3; variable defined and has array elements
Erase array
Println Exists(array) 'returns 0
```

The following example uses `Erase` to specify an explicitly undefined placeholder variable:

```
Erase blankvar
tStatement = New %SQL.Statement(blankvar, "Sample")
Println "Success"
```

**See Also**

- `EraseArray` Statement
- `EraseValue` Statement
EraseArray

Removes the array elements of a variable and deallocates dynamic-array storage space.

EraseArray varname

Arguments

The `EraseArray` statement has the following argument:

| varname         | The name of the variable for which the array elements should be erased. |

Description

The `EraseArray` statement removes array elements of the variable, but not the root node.

Examples

The following example demonstrates the use of the `EraseArray` statement:

```
array = "root node"
array("subnode") = "subnode"
array("subnode", "subnode") = "subnode, subnode"
Println Exists(array) 'returns 3; variable defined and has array elements
EraseArray array
Println Exists(array) 'returns 1
```

See Also

- [Erase Statement](#)
- [EraseValue Statement](#)
EraseValue

Removes the root node of a variable.

EraseValue varname

Arguments

The EraseValue statement has the following argument:

| varname | The name of the variable for which the root node should be erased. |

Description

The EraseValue statement removes the root nodes of the variable, but does not delete the array elements.

Examples

The following example demonstrates the use of the EraseArray statement:

```basic
array = "root node"
array("subnode") = "subnode"
array("subnode", "subnode") = "subnode, subnode"
Println Exists(array) 'returns 3; variable defined and has array elements
EraseValue array
Println Exists(array) 'returns 2
```

See Also

- Erase Statement
- EraseArray Statement
Exit

Exits a block of Do...Loop, For...Next, Function, or Sub code.

Exit Do
Exit For
Exit Function
Exit Sub

Arguments

The Exit statement syntax has these forms:

| Exit Do | Provides a way to exit a Do...Loop statement. It can be used only inside a Do...Loop statement. Exit Do transfers control to the statement following the Loop statement. When used within nested Do...Loop statements, Exit Do transfers control to the loop that is one nested level above the loop where it occurs. |
| Exit For | Provides a way to exit a For loop. It can be used only in a For...Next or For Each...Next loop. Exit For transfers control to the statement following the Next statement. When used within nested For loops, Exit For transfers control to the loop that is one nested level above the loop where it occurs. |
| Exit Function | Immediately exits the Function procedure in which it appears. Execution continues with the statement following the statement that called the Function. |
| Exit Sub | Immediately exits the Sub procedure in which it appears. Execution continues with the statement following the statement that called the Sub. |

Examples

The following example illustrates the use of the Exit statement:

```basic
Sub RandomLoop
    Dim I, MyNum
    Do
        For I = 1 To 1000
            MyNum = Int(Rnd * 100) ' Generate random numbers.
            Select Case MyNum
                Case 17: Print "Case 17" ' If 17, exit For...Next.
                Exit For
                Case 29: Print "Case 29" ' If 29, exit Do...Loop.
                Exit Do
                Case 54: Print "Case 54" ' If 54, exit Sub procedure.
                Exit Sub
            End Select
        Next
    Loop
End Sub
```

See Also

- Continue Statement
- Do...Loop Statement
- For Each...Next Statement
- For...Next Statement
- Function Statement
- Sub Statement
For Each...Next

Repeats a group of statements for each element in an array or collection.

```
For Each element In group
  [statements]
  [Exit For]
  [statements]
Next [element]
```

**Arguments**

The **For Each**...**Next** statement syntax has these parts:

| **element** | Variable used to iterate through the elements of the collection or array. For collections, element can only be a Variant variable, a generic Object variable, or any specific object variable. For arrays, element can only be a Variant variable. |
| **group**    | Name of an object collection or array. |
| **statement**| One or more statements that are executed on each item in group. |

**Description**

The **For Each** block is entered if there is at least one element in group. Once the loop has been entered, all the statements in the loop are executed for the first element in group. As long as there are more elements in group, the statements in the loop continue to execute for each element. When there are no more elements in group, the loop is exited and execution continues with the statement following the **Next** statement.

The **Exit For** can only be used within a **For Each**...**Next** or **For**...**Next** control structure to provide an alternate way to exit. Any number of **Exit For** statements may be placed anywhere in the loop. The **Exit For** is often used with the evaluation of some condition (for example, **If**...**Then**), and transfers control to the statement immediately following **Next**.

You can nest **For Each**...**Next** loops by placing one **For Each**...**Next** loop within another. However, each loop element must be unique.

**For Each and the Split Function**

A **Split** function cannot be directly used as the **group** argument of a **For Each**...**Next** statement. You must first assign the **Split** return value to an array variable. You can then specify this array variable as the **group** argument of the **For Each**...**Next** statement.

**Examples**

The following example illustrates use of the **For Each**...**Next** statement:

```
Erase ^RandomData

' Generate some random nodes
For i =  65 to 90
  If Rnd(i) > .5 Then
    ^RandomData(Chr(i))="subnode"="data"
  Else
    ^RandomData(Chr(i))="data"
  End If
Next

PrintLn "Traverse forwards"
For each k1 in ^RandomData
  PrintLn k1
  For each k2 in ^RandomData(k1)
    Print k1,vbTAB,k2
    If Exists(^RandomData(k1,k2)) and vbHasValue Then
```
Print " = ", RandomData(k1, k2)
End If
PrintLn
Next
Next

Notes
If you omit element in a **Next** statement, execution continues as if you had included it. If a **Next** statement is encountered before its corresponding **For** statement, an error occurs.

See Also
- **Do...Loop** Statement
- **Exit** Statement
- **For...Next** Statement
- **While...Wend** Statement
For...Next

Repeats a group of statements a specified number of times.

```
For counter = start To end [Step step]
    [statements]
    [Exit For]
    [statements]
Next
```

Arguments

The For...Next statement syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>counter</td>
<td>Numeric variable used as a loop counter. The variable cannot be an array element or an element of a user-defined type.</td>
</tr>
<tr>
<td>start</td>
<td>Initial value of counter.</td>
</tr>
<tr>
<td>end</td>
<td>Final value of counter.</td>
</tr>
<tr>
<td>step</td>
<td>Amount counter is changed each time through the loop. If not specified, step defaults to one.</td>
</tr>
<tr>
<td>statements</td>
<td>One or more statements between For and Next that are executed the specified number of times.</td>
</tr>
</tbody>
</table>

Description

The step argument can be either positive or negative. The value of the step argument determines loop processing as follows:

<table>
<thead>
<tr>
<th>Value</th>
<th>Loop Executes If</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive or 0</td>
<td>counter &lt;= end</td>
</tr>
<tr>
<td>Negative</td>
<td>counter &gt;= end</td>
</tr>
</tbody>
</table>

Once the loop starts and all statements in the loop have executed, step is added to counter. At this point, either the statements in the loop execute again (based on the same test that caused the loop to execute initially), or the loop is exited and execution continues with the statement following the Next statement.

Exit For can only be used within a For Each...Next or For...Next control structure to provide an alternate way to exit. Any number of Exit For statements may be placed anywhere in the loop. Exit For is often used with the evaluation of some condition (for example, If...Then), and transfers control to the statement immediately following Next.

You can nest For...Next loops by placing one For...Next loop within another. Give each loop a unique variable name as its counter. The following construction is correct:

```
For I = 1 To 10
    For J = 1 To 10
        For K = 1 To 10
            ' Some statements
        Next
    Next
Next
```

Notes

Changing the value of counter while inside a loop can make it more difficult to read and debug your code.
See Also

- **Do...Loop** Statement
- **Exit** Statement
- **For Each...Next** Statement
- **While...Wend** Statement
# Function

Declares the name, arguments, and code that form the body of a Function procedure.

```
[Public | Private] Function name [(arglist)] [ As classname ]
  [statements]
  [name = expression]
  [Exit Function]
  [statements]
  [name = expression]
End Function
```

## Arguments

The `Function` statement syntax has these parts:

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>Optional — Keyword indicating that the <code>Function</code> procedure is accessible to all other procedures in all scripts.</td>
</tr>
<tr>
<td>Private</td>
<td>Optional — Keyword indicating that the <code>Function</code> procedure is accessible only to other procedures in the script where it is declared.</td>
</tr>
<tr>
<td>name</td>
<td>Name of the <code>Function</code>. Follows local variable naming conventions.</td>
</tr>
<tr>
<td>arglist</td>
<td>Optional — List of variables representing arguments that are passed to the <code>Function</code> procedure when it is called, separated by commas.</td>
</tr>
<tr>
<td>classname</td>
<td>Optional — Name of the class of the return value.</td>
</tr>
<tr>
<td>statements</td>
<td>Any group of statements to be executed within the body of the <code>Function</code> procedure.</td>
</tr>
<tr>
<td>expression</td>
<td>Optional — Return value of the <code>Function</code>.</td>
</tr>
</tbody>
</table>

The `arglist` argument has the following syntax and parts:

```
[ByVal | ByRef] varname[( )]
```

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ByVal</td>
<td>Indicates that the argument is passed by value.</td>
</tr>
<tr>
<td>ByRef</td>
<td>Indicates that the argument is passed by reference.</td>
</tr>
<tr>
<td>varname</td>
<td>Name of the variable representing the argument; follows standard variable naming conventions.</td>
</tr>
</tbody>
</table>

## Description

`Function` procedures are visible to all other procedures in your script. The value of local variables in a `Function` is not preserved between calls to the procedure.

All executable code must be contained in the procedure. Nesting is not permitted; you cannot define a `Function` procedure inside another `Function` or `Sub` procedure.

The `Exit Function` statement causes an immediate exit from a `Function` procedure. Program execution continues with the statement following the statement that called the `Function` procedure. Any number of `Exit Function` statements can appear anywhere in a `Function` procedure.

Like a `Sub` procedure, a `Function` procedure is a separate procedure that can take arguments, perform a series of statements, and change the values of its arguments. However, unlike a `Sub` procedure, you can use a `Function` procedure on the right
side of an expression in the same way you use any intrinsic function, such as `Sqr`, `Cos`, or `Chr`, when you want to use the value returned by the function.

You call a `Function` procedure using the function name, followed by the argument list in parentheses, in an expression. See the `Call` statement for specific information on how to call `Function` procedures.

There are two ways to return a value from a function: you can specify the value on a `Return` statement, or you can assign the value to the function name. Any number of such assignments can appear anywhere within the procedure. If no value is assigned to name, the procedure returns a default value: a zero-length string (""). A function that returns an object reference returns a zero-length string ("") if no object reference is assigned to name within the `Function`.

Variables used in `Function` procedures fall into two categories: those that are explicitly declared within the procedure and those that are not. Variables that are explicitly declared in a procedure (using `Dim` or the equivalent) are always local to the procedure. Variables that are used but not explicitly declared in a procedure are also local unless they are explicitly declared at some higher level outside the procedure.

All variables in a Caché Basic `Function` procedure are private. Therefore, a `Function` procedure cannot access public variables, such as `SQLCODE`. To use public variables, use a top-level Caché Basic routine, rather than a called function or subroutine.

To omit an `arglist` argument value, you must specify an undefined variable. This is a significant difference between ObjectScript and Caché Basic. In ObjectScript an omitted argument can be specified using a placeholder comma. In Caché Basic you cannot use a placeholder comma; you must supply an undefined named variable.

### Examples

The following example shows both ways to assign a return value. First by specifying “True” to the `Return` statement, then by assigning “False” to the function named `IsGreaterThan`. False is assigned to the function name to indicate that an invalid value was found.

```cachexml
Function IsGreaterThan(lower, upper)
If lower < upper Then Return True
IsGreaterThan = False
End Function
```

### Notes

`Function` procedures can be recursive; that is, they can call themselves to perform a given task. However, recursion can lead to stack overflow.

### See Also

- `Call` Statement
- `Dim` Statement
- `Return` Statement
- `Sub` Statement
Goto

Transfers program execution to the specified location.

**Goto label**

**Arguments**

| label | A line label specifying the target of the Goto operation. A label is a valid identifier, followed by a colon suffix. See Labels in Using Caché Basic. The Goto label reference can be specified with or without a colon suffix. |

**Description**

The Goto statement immediately shifts program execution to the line location in the program specified by the label. The specified line must be in the same procedure as the Goto statement, or a compile-time error occurs.

The label argument specifies an existing label in the current program. Specifying the label's colon suffix is optional. Label names are case-sensitive. Specifying a non-existent label name results in a runtime error.

**Examples**

The following example illustrates the use of the Goto statement. Note that the label argument can include or omit the colon suffix:

```basic
Mod1:
    Println "Mod1"
    Goto Mod2
    Println "skipped over"
Mod2:
    Println "Mod2"
    Goto Mod4:
    Mod3:
    Println "skipped Mod3"
Mod4:
    Println "Mod4"
```

The following example illustrates that more than one label can appear on a single line:

```basic
Mod1:
    Println "Mod1"
    Goto Mod3:
    Println "skipped over"
Mod2: Mod3:
    Println "Mods 2 and 3"
    Goto Mod4:
Mod4:
    Println "Mod4"
```

**See Also**

- Basic: On Error Goto statement
- ObjectScript: GOTO command
- Labels in the “Lexical Structure” chapter of Using Caché Basic.
If...Then...Else

Conditionally executes a group of statements, depending on the value of an expression.

```
If condition Then statements [Else elsestatements ]
```

Or, you can use the block form syntax:

```
If condition Then
  [statements]
[ElseIf condition-n Then
  [elseifstatements]] . . .
[Else
  [elsestatements]]
End If
```

**Arguments**

The **If...Then...Else** statement syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>condition</td>
<td>An expression that evaluates to <strong>True</strong> or <strong>False</strong>.</td>
</tr>
<tr>
<td>statements</td>
<td>One or more statements separated by colons; executed if condition is <strong>True</strong>.</td>
</tr>
<tr>
<td>condition-n</td>
<td>Same as condition.</td>
</tr>
<tr>
<td>elseifstatements</td>
<td>One or more statements executed if the associated condition-n is <strong>True</strong>.</td>
</tr>
<tr>
<td>elsestatements</td>
<td>One or more statements executed if no previous condition or condition-n expression is True.</td>
</tr>
</tbody>
</table>

**Description**

You can use the single-line form (first syntax) for short, simple tests. However, the block form (second syntax) provides more structure and flexibility than the single-line form and is usually easier to read, maintain, and debug.

When executing a block **If** (second syntax), condition is tested. If condition is **True**, the statements following **Then** are executed. If condition is **False**, each **ElseIf** (if any) is evaluated in turn. When a **True** condition is found, the statements following the associated **Then** are executed. If none of the **ElseIf** statements are **True** (or there are no **ElseIf** clauses), the statements following **Else** are executed. After executing the statements following **Then** or **Else**, execution continues with the statement following **End If**.

The **Else** and **ElseIf** clauses are both optional. You can have as many **ElseIf** statements as you want in a block **If**, but none can appear after the **Else** clause. Block **If** statements can be nested; that is, contained within one another.

What follows the **Then** keyword is examined to determine whether or not a statement is a block **If**. If anything other than a comment appears after the **Else** clause, the statement is treated as a single-line **If** statement.

A block **If** statement must be the first statement on a line. The block **If** must end with an **End If** statement.

**Notes**

With the single-line syntax, it is possible to have multiple statements executed as the result of an **If...Then** decision, but they must all be on the same line and separated by colons, as in the following statement:

```
If A > 10 Then A = A + 1 : B = B + A : C = C + B
```

**See Also**

- Case Function
Imports

Imports a package name.

```
Imports package [,package2 [,...]]
```

Arguments

The **Imports** statement syntax has these parts:

| package | A package name, or a comma-separated list of package names. |

Description

You use the **Imports** statement to import a package. This allows statements to append a package name to a class without having to explicitly declare the package name each time. If the package does not exist, or if the specified class is not found in any of the imported packages, or if the specified class is found in more than one imported package, no package name is appended to the class name.

Examples

The following example illustrates the use of the **Imports** statement:

```
Imports %Library
MyObject = new %Library.MsgHandler
```

which is equivalent to:

```
MyObject = new %Library.MsgHandler
```

See Also

- System Object
Input

Accepts input and stores it in a variable.

<table>
<thead>
<tr>
<th>Input data</th>
</tr>
</thead>
</table>

Arguments

<table>
<thead>
<tr>
<th>data</th>
<th>Either the name of a variable used to receive the data input, or a quoted string specifying the data.</th>
</tr>
</thead>
</table>

Description

The **Input** statement inputs a literal data value. It can interactively receives a data value from the user into a variable, or it can input a specified quoted string.

**Input** with a variable cannot be used in a program running in background. Program execution is paused until the user indicates the end of data input and submits the data value by pressing the Return key.

**Input** does not time out.

The ObjectScript **READ** command provides more extensive support for interactive user input.

Examples

The following example illustrates the interactive use of the **Input** statement:

```cachébasic
Println "Type your name, then press Return"
Input namevar
Println "Thanks ",namevar
```

The following example illustrates the background use of the **Input** statement:

```cachébasic
Println "Here's the name"
Input "Fred"
Println
Println "Thanks "
```

See Also

- Basic: Print statement
- ObjectScript: READ command
Let

Assigns an object reference to a variable or property.

Let objectvar = objectexpression

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectvar</td>
<td>Name of the variable or property; follows standard variable-naming conventions.</td>
</tr>
<tr>
<td>objectexpression</td>
<td>Expression consisting of the name of an object, another declared variable of the same object type, or a function or method that returns an object of the same object type.</td>
</tr>
</tbody>
</table>

Description

In Caché Basic, the Let statement is functionally identical to the Set statement. Refer to the Set statement for further details.
**Merge**

Merges array elements from source to target.

\[
\text{Merge target=source}
\]

**Arguments**

The `Merge` statement has the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>source</code></td>
<td>The name of the variable, typically an array, which should be merged into the target variable.</td>
</tr>
<tr>
<td><code>target</code></td>
<td>The name of the variable into which the contents of source should be merged.</td>
</tr>
</tbody>
</table>

**Description**

Nodes in the source variable overwrite corresponding nodes in the target variable, and all descendents of source overwrite corresponding descendents of target. All other target nodes are unchanged. The only difference between `Copy` and `Merge` is that `Copy` deletes the target nodes, and `Merge` does not.

**Examples**

Erase source, target

```
target(1) = "node 1"
target(1,1) = "node 1,1"
target(2) = "node 2"
target(3,1) = "node 3,1"
source(3,2) = "node 3,2"
```

Merge target=source

```
Println Exists(target(3,1)) 'is still defined, returns 1
Println Exists(target(3,2)) 'does now exist, returns 1
```

**See Also**

- [Copy Statement](#)
New

Creates a new instance of an object.

```
New object
```

Arguments

The `New` statement has the following argument:

```
| object | Name of the object for which a new instance should be created. |
```

Examples

The following examples demonstrate how to use the `New` statement:

```
person = New User.Person
output = New %File("\PersonList.txt")
```

See Also

- `IsObject` Function
- `OpenId` Statement
On Error Goto

Enables an error-handling routine and specifies the location of the routine within a procedure.

```
On Error Goto [ label | 0 ]
```

Arguments

The `On Error Goto` statement has the following argument:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>label</code></td>
<td>A line label specifying the target of the <code>Goto</code> operation. A label is a valid identifier, followed by a colon suffix. See <code>Labels</code> in Using Caché Basic.</td>
</tr>
</tbody>
</table>

Description

Enables the error-handling routine that starts at the line specified by the `label` argument. If a runtime error occurs, control branches to the specified line, making the error handler active. The specified line must be in the same procedure as the `On Error` statement, or a compile-time error will occur.

The `label` argument specifies an existing label in the current program. Specifying the label's colon suffix is optional. Label names are case-sensitive. Specifying a non-existent label name results in a runtime error.

Use `On Error Goto 0` to disable error handling if you have previously enabled it.

When `On Error Goto` is triggered by an error, it is automatically disabled. This means that the occurrence of a second error causes a program abort, rather than initiating an infinite loop.

An error-handling routine is not a `Sub` procedure or a `Function` procedure. It is a section of code marked by a line label.

Error-handling routines rely on the value in the Number property of the `Err` object to determine the cause of the error. The routine should test or save relevant property values in the `Err` object before any other error can occur or before a procedure that might cause an error is called. The property values in the `Err` object reflect only the most recent error. The error message associated with `Err.Number` is contained in `Err.Description`.

Examples

The following example shows the use of the `On Error Goto` statement. Here the error is attempting to divide 6 by 0. The ErrMod error handler displays the error number (18) and description:

```
Mod1:
  On Error Goto ErrMod
  PrintLn "Mod1 pre-div"
  Println "result: ",6/0
  Println "Mod1 post-div"
  Goto Done
ErrMod:
  PrintLn "Handling an error!"
  PrintLn "Error ",Err.Number," ",Err.Description
Done:
  Println "All done"
```

In the following example, the ErrMod error handler corrects the division by zero problem by changing `divisor` to 1, and retries the Mod1 operation. Note that invoking the ErrMod error handling module resets `On Error Goto`, so that the occurrence of the second error in this program (attempting to divide 5 by 0) aborts the program, rather than calling ErrMod again:
Setup:
  On Error Goto ErrMod
divisor=0
Mod1:
  Println "Mod1 pre-div"
  Println "result: ",6/divisor
  Println "Mod1 post-div"
  Println 5/0
  Goto Done
ErrMod:
  Println "Handling an error!"
  If Err.Number=18 Then
    divisor=1
    Goto Mod1
  Else
    Println Err.Number
  End If
  Goto Done
Done:
  Println "All done"

The following example shows the use of the On Error GoTo statement in a user-defined function:

Println ErrorTest(1)
Println ErrorTest(0)

Function ErrorTest(Arg)
  On Error Goto ErrDisplay
  return 1/Arg
ErrDisplay:
  Err.Clear
  Return 0
End Function

See Also

- **Goto** statement
- **Err** object
- **Labels** in the “Lexical Structure” chapter of Using Caché Basic.
OpenId

Opens a new instance of an object for a given Identifier.

**OpenId object**

### Arguments

The **OpenId** statement has the following argument:

| object | Name of the object for which a new instance should be created. |

### Examples

The following example demonstrate how to use the **OpenId** statement:

```caché
person = OpenId User.Person(5012)

'Instantiates a person object with the Id of 5012
```

### See Also

- **IsObject Function**
- **New Statement**
Option Explicit

Used at script level to force explicit declaration of all variables in that script.

**Arguments**
none

**Description**
If used, the `Option Explicit` statement must appear in a script before any procedures.

When you use the `Option Explicit` statement, you must explicitly declare all variables using the `Dim` statement. If you attempt to use an undeclared variable name, an error occurs.

**Note:** You cannot use `Option Explicit` inside a method.

**Examples**
The following example illustrates use of the `Option Explicit` statement:

```caché
Option Explicit    ' Force explicit variable declaration.
Dim MyVar          ' Declare variable.
MyInt = 10         ' Undeclared variable generates error.
MyVar = 10         ' Declared variable does not generate error.
```

**Notes**
Use `Option Explicit` to avoid incorrectly typing the name of an existing variable or to avoid confusion in code where the scope of the variable is not clear.
Print, Println

Writes a string to the current device.

**Print** expr
**Println** expr

**Arguments**

| expr | An expression that is evaluated and written to the current device. This can be a single expression, or a comma-separated list of expressions. |

**Description**

The **Print** statement is used to write an expression (or a list of expressions) to the current device. The **Println** statement is identical to **Print**, except that it automatically appends vbCRLF (carriage return / line feed) after writing the last expression in the list.

**Examples**

The following example demonstrate the use of the **Print** and **Println** commands with strings and string variables. To include a quote character within a string, double the quote character. Printing the empty string (""") completes without error and can be used with **Println** to insert a blank line. An undefined variable (z in this example) is treated the same as the empty string. Note that variable names are case-sensitive.

```caché
Set a="big ", b="bad ", c="bug"
Print "Hello"
Println " world!"
Println ""
Println "this is a quote ("") character"
Println z
Println a,b
Println c
Print a,b
Print c
```

The following example demonstrate the use of the **Print** and **Println** commands with numeric expressions. Caché converts numbers to canonical form, removing unnecessary signs and leading and trailing blanks. It then evaluates arithmetic expressions. Numbers specified as string are passed as literals without conversion.

```caché
Set x="++007.9900"
Set y=++007.9900
Println 123456
Println (3+3)*2
Println 3+(3*2)
Println +007.9900
Println x
Println y
```

The following example demonstrate the use of the **Print** and **Println** commands with subscripted global variables:

```caché
Set ^a(1)="fruit"
Set ^a(1,1)="apple"
Println "An ","a(1,1)," is a ","a(1)
```

**See Also**

- Basic: Set command
- ObjectScript: WRITE command
Randomize

Initializes the random-number generator.

```
Randomize [number]
```

**Arguments**

The number argument can be any valid numeric expression.

**Description**

*Randomize* uses number to initialize the *Rnd* function's random-number generator, giving it a new seed value. If you omit number, the value returned by the system timer is used as the new seed value.

If *Randomize* is not used, the *Rnd* function (with no arguments) uses the same number as a seed the first time it is called, and thereafter uses the last generated number as a seed value.

**Examples**

The following example illustrates use of the *Randomize* statement:

```
Dim MyValue, Response
Randomize   ' Initialize random-number generator.
MyValue = Int((6 * Rnd) + 1)   ' Generate random value between 1 and 6.
Println MyValue
```

**Notes**

To repeat sequences of random numbers, call *Rnd* with a negative argument immediately before using *Randomize* with a numeric argument. Using *Randomize* with the same value for number does not repeat the previous sequence.

**See Also**

- *Rnd* Function
Rem

Used to include explanatory remarks in a program.

```plaintext
Rem  comment
or
'  comment
```

**Arguments**

None.

The comment argument is the text of any comment you want to include. After the `Rem` keyword, a space is required before comment.

**Description**

As shown in the syntax section, you can use an apostrophe (`'`) instead of the `Rem` keyword. If the `Rem` keyword follows other statements on a line, it must be separated from the statements by a colon. However, when you use an apostrophe, the colon is not required after other statements.

**Examples**

The following example illustrates the use of the `Rem` statement:

```plaintext
Dim MyStr1, MyStr2
MyStr1 = "Hello" : Rem Comment after a statement separated by a colon.
MyStr2 = "Goodbye"   ' This is also a comment; no colon is needed.
Rem Comment on a line with no code; no colon is needed.
```
**Return**

Exits from the current function and returns a value from that function.

```
Return expression
```

**Arguments**

The `Return` statement syntax has these parts:

| expression | Any numeric or string expression. |

**Description**

You use the `Return` statement to stop execution of a function and return the value of expression. If no `Return` statement is executed from within the function, the expression that called the current function is assigned the value undefined.

**Examples**

The following example illustrates the use of the `Return` statement:

```cacs
Function IsGreaterThan(lower, upper)
If lower > upper Then
  Return False
ElseIf lower = upper Then
  Return False
Else
  Return True
End If
End Function
```

**See Also**

- `Function Statement`
Select Case

Executes one of several groups of statements, depending on the value of an expression.

```
Select Case testexpression
    [Case expressionlist-n
        [statements-n]] . . .
    [Case Else elsestatements]
End Select
```

**Arguments**

The `Select Case` statement syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>testexpression</code></td>
<td>Any numeric or string expression.</td>
</tr>
<tr>
<td><code>expressionlist-n</code></td>
<td>Required if Case appears. Delimited list of one or more expressions.</td>
</tr>
<tr>
<td><code>statements-n</code></td>
<td>One or more statements executed if <code>testexpression</code> matches any part of <code>expressionlist-n</code>.</td>
</tr>
<tr>
<td><code>elsestatements</code></td>
<td>One or more statements executed if <code>testexpression</code> does not match any of the Case clauses. There can be only one Case Else clause with only one set of <code>elsestatements</code>.</td>
</tr>
</tbody>
</table>

**Description**

If `testexpression` matches (is equal to) any `Case expressionlist` expression, the statements following that `Case` clause are executed up to the next `Case` clause, or for the last clause, up to `End Select`. Control then passes to the statement following `End Select`. If `testexpression` matches an expressionlist expression in more than one `Case` clause, only the statements following the first match are executed.

The `Case Else` clause is used to indicate the `elsestatements` to be executed if no match is found between the `testexpression` and an expressionlist in any of the other `Case` selections. Although not required, it is a good idea to have a `Case Else` statement in your `Select Case` block to handle unforeseen `testexpression` values. If no `Case` expressionlist matches `testexpression` and there is no `Case Else` statement, execution continues at the statement following `End Select`.

Select `Case` statements can be nested. Each nested `Select Case` statement must have a matching `End Select` statement.

**Examples**

The following example illustrates the use of the `Select Case` statement:

```
Dim Color, MyVar
Sub ChangeBackground (Color)
    MyVar = lcase (Color)
    Select Case MyVar
        Case "red"    document.bgColor = "red"
        Case "green"  document.bgColor = "green"
        Case "blue","azure" document.bgColor = "blue"
        Case Else     Print "pick another color"
    End Select
End Sub
```

**See Also**

- `If...Then...Else` Statement
Set

Assigns an object reference to a variable or property.

**Set** objectvar = objectexpression

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>objectvar</td>
<td>Name of the variable or property; follows standard variable-naming conventions.</td>
</tr>
<tr>
<td>objectexpression</td>
<td>Expression consisting of the name of an object, another declared variable of the same object type, or a function or method that returns an object of the same object type.</td>
</tr>
</tbody>
</table>

**Description**

The **Set** statement is used to assign a value to a variable. This value can be a number, a string, or an object reference. The variable can be a local variable, a process-private global variable, or a global variable, and can be subscripted. For further details on types of variables, see Identifiers and Variables in Using Caché Basic.

Generally, when you use **Set** to assign an object reference to a variable, no copy of the object is created for that variable. Instead, a reference to the object is created. More than one object variable can refer to the same object. Because these variables are references to (rather than copies of) the object, any change in the object is reflected in all variables that refer to it.

**Examples**

The following example shows two **Set** statements assigning a string to a variable. The second **Set** statement uses the concatenation operator to construct the string:

```caché
Set a = "the quick brown fox"
Println a
Set b = "the "&"quick "&"brown "&"fox"
Println b
```

The following example shows two **Set** statements that assign a string to a subscripted global variable:

```caché
Set ^a(1)="fruit"
Set ^a(1,1)="apple"
Println "An ",^a(1,1)," is a ",^a(1)
```

The following example shows how to assign an object reference to a variable:

```caché
Set person = New User.Person()
Println person
```

**See Also**

- Basic: Dim Statement
- ObjectScript: SET command
Sleep

Causes program execution to delay for the specified number of seconds.

<table>
<thead>
<tr>
<th>Sleep time</th>
</tr>
</thead>
</table>

**Arguments**

| time | A number specifying the number of seconds to delay. Can be an integer specifying whole seconds, or a decimal number specifying fractional seconds. |

**Description**

The `Sleep` statement delays program execution for the specified duration in seconds. Program execution then resumes at the statement immediately following `Sleep`. A non-numeric `time` value is treated as zero.

**Examples**

The following example illustrates the use of the `Sleep` statement with whole seconds:

```c
Println now
Sleep 5
Println now
```

The following example illustrates the use of the `Sleep` statement with fractional seconds:

```c
Println now
Sleep 0.9
Println now
```

**See Also**

- Basic: Now function, Timer function
- ObjectScript: HANG command
**Sub**

Declares the name, arguments, and code that form the body of a **Sub** procedure.

```
[Public | Private] Sub name [(arglist)]
    [statements]
    [Exit Sub]
    [statements]
End Sub
```

**Arguments**

The **Sub** statement syntax has these parts:

<table>
<thead>
<tr>
<th>Optional</th>
<th>Keyword indicating that the <strong>Sub</strong> procedure is accessible to all other procedures in all scripts.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public</strong></td>
<td>Keyword indicating that the <strong>Sub</strong> procedure is accessible only to other procedures in the script where it is declared.</td>
</tr>
<tr>
<td><strong>name</strong></td>
<td>Name of the <strong>Sub</strong>. Follows local variable naming conventions.</td>
</tr>
<tr>
<td><strong>arglist</strong></td>
<td>List of variables representing arguments that are passed to the <strong>Sub</strong> procedure when it is called. Multiple variables are separated by commas.</td>
</tr>
<tr>
<td><strong>statements</strong></td>
<td>Any group of statements to be executed within the body of the <strong>Sub</strong> procedure.</td>
</tr>
</tbody>
</table>

The **arglist** argument has the following syntax and parts:

```
[ByVal | ByRef] varname[( )]
```

<table>
<thead>
<tr>
<th>ByVal</th>
<th>Indicates that the argument is passed by value.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ByRef</td>
<td>Indicates that the argument is passed by reference.</td>
</tr>
<tr>
<td>varname</td>
<td>Name of the variable representing the argument; follows standard variable naming conventions.</td>
</tr>
</tbody>
</table>

**Description**

The value of local variables in a **Sub** procedure is not preserved between calls to the procedure.

All executable code must be contained in the procedure. Nesting is not permitted; you cannot define a **Sub** procedure inside another **Sub** or **Function** procedure.

The **Exit Sub** statement causes an immediate exit from a **Sub** procedure. Program execution continues with the statement following the statement that called the **Sub** procedure. Any number of **Exit Sub** statements can appear anywhere in a **Sub** procedure.

Like a **Function** procedure, a **Sub** procedure is a separate procedure that can take arguments, perform a series of statements, and change the value of its arguments. However, unlike a **Function** procedure, which returns a value, a **Sub** procedure cannot be used in an expression.

You call a **Sub** procedure using the procedure name followed by the argument list. See the **Call** statement for specific information on how to call **Sub** procedures.

Variables used in **Sub** procedures fall into two categories: those that are explicitly declared within the procedure and those that are not. Variables that are explicitly declared in a procedure (using **Dim**) are always local to the procedure. Variables
that are used but not explicitly declared in a procedure are also local unless they are explicitly declared at some higher level outside the procedure.

All variables in a Caché Basic `Sub` procedure are private. Therefore, a `Sub` procedure cannot access public variables, such as SQLCODE. To use public variables, use a top-level Caché Basic routine, rather than a called subroutine.

To omit an `arglist` argument value, you must specify an undefined variable. This is a significant difference between ObjectScript and Caché Basic. In ObjectScript an omitted argument can be specified using a placeholder comma. In Caché Basic you cannot use a placeholder comma; you must supply an undefined named variable.

**Notes**

`Sub` procedures can be recursive; that is, they can call themselves to perform a given task. However, recursion can lead to stack overflow.

A procedure can use a variable that is not explicitly declared in the procedure, but a naming conflict can occur if anything you have defined at the script level has the same name. If your procedure refers to an undeclared variable that has the same name as another procedure, constant or variable, it is assumed that your procedure is referring to that script-level name. Explicitly declare variables to avoid this kind of conflict. You can use an `Option Explicit` statement to force explicit declaration of variables.

**See Also**

- `Call ` Statement
- `Dim ` Statement
- `Function ` Statement
**TCommit**

Marks the successful completion of a transaction.

<table>
<thead>
<tr>
<th>TCommit</th>
</tr>
</thead>
</table>

**Arguments**

The **TCommit** statement does not have any arguments.

**Description**

**TCommit** marks the successful end of a transaction initiated by the corresponding **TStart**.

**Examples**

The following example illustrates the use of the **TCommit** statement:

```csh
TStart
If StorePerson(personobject) Then
   TCommit
Else
   TRollback
End If
```

**See Also**

- **TRollback Statement**
- **TStart Statement**
**Throw**

Throws an exception from a Try block to a Catch exception handler.

| Throw [oref] |

**Arguments**

| oref  | Optional — A user-defined object reference. |

**Description**

The **Throw** command explicitly issues an exception from within a block of code defined by a **Try** command. Issuing a **Throw** transfers execution from the **Try** block to the corresponding **Catch** exception handler.

**Throw** is used to issue an explicit exception. Caché issues an implicit exception when a runtime error occurs. A runtime error generates an exception object which it throws to a **Catch** exception handler.

**Throw** has two forms:

- Without an argument
- With an argument

**Throw without an Argument**

Argumentless **Throw** transfers error processing to the corresponding **Catch** error handler. No object is pushed on the stack, but the %New() method is called.

**Throw with an Argument**

**Throw** **oref** specifies a user-defined object reference, which it throws to the **Catch** command, pushing it on the execution stack. The calling of the %New() method is optional.

**Arguments**

**expression**

A user-defined object reference (oref). For example, **Throw ##class(%Exception).%New()**. The creation and population of this exception object is the responsibility of the programmer.

**Examples**

The following example shows an argumentless **Throw**:

```cache
Try
    SET x=2
    PRINTLN "about to divide by ",x
    Throw
    SET a=7/x
    PRINTLN "Success: the result is ",a
Catch myvar
    PRINTLN "this is the exception handler"
    PRINTLN "Error number: ",Err.Number
    PRINTLN "Error is: ",Err.Description
    PRINTLN "Error code: ",myvar.Code
END Try
PRINTLN "this is where the code falls through"
```

**See Also**

- **Catch** command
Caché Basic Commands

- Try command
- Err object
**TRollback**

Rolls back (reverts) changes made during the current transaction.

**Arguments**

The **TRollback** statement does not have any arguments.

**Description**

**TRollback** terminates the current transaction and restores all journaled database values to the values they held at the start of the transaction.

Caché Basic does not support nested transactions. A **TRollback** returns the transaction level ($TLEVEL) to 0, regardless of how many nested **TStart** statements have been issued.

**Examples**

The following example illustrates the use of the **TRollback** statement:

```
TStart
If StorePerson(personobject) Then
  TCommit
Else
  TRollback
End If
```

**See Also**

- **TCommit Statement**
- **TStart Statement**
**Try**

Identifies a block of code to monitor for errors during execution.

```plaintext
Try statements
Catch [exceptionvar] statements
End Try
```

**Description**

The **Try** command takes no arguments. It is used to identify one or more Caché Basic code statements between the **Try** keyword and the **Catch** keyword. This block of code is protected code for structured exception handling. If an exception occurs within this block of code, Caché sets **Err**, then transfers execution to an exception handler, identified by the **Catch** command. This is known as throwing an exception. If no error occurs, execution continues with the next Caché Basic statement after the **End Try** statement.

An exception may occur as a result of a runtime error, such as attempting to divide by 0, or it may be explicitly propagated by issuing a **Throw** command.

A **Try** block must be immediately followed by a **Catch** block. The paired **Try** and **Catch** are terminated by an **End Try** statement.

**Examples**

In the following examples, the **Try** code block is executed. It attempts to set the local variable `a`. In the first example, the code completes successfully, and the **Catch** is skipped over. In the second example, the code fails an **Err** error indicating division by zero, and execution is passed to the **Catch** command.

**Try succeeds:**

```plaintext
Try
  SET x=2
  PRINTLN "about to divide by ",x
  SET a=7/x
  PRINTLN "Success: the result is ",a
Catch myvar
  PRINTLN "this is the exception handler"
  PRINTLN "Error number: ",Err.Number
  PRINTLN "Error is: ",Err.Description
  PRINTLN "Error code: ",myvar.Code
End Try
PRINTLN "this is where the code falls through"
```

**Try fails:**

```plaintext
Try
  SET x=0
  PRINTLN "about to divide by ",x
  SET a=7/x
  PRINTLN "Success: the result is ",a
Catch myvar
  PRINTLN "this is the exception handler"
  PRINTLN "Error number: ",Err.Number
  PRINTLN "Error is: ",Err.Description
  PRINTLN "Error code: ",myvar.Code
End Try
PRINTLN "this is where the code falls through"
```

**See Also**

- **Catch** command
- **Throw** command
• **Err object**
TStart

Marks the beginning of a transaction.

TStart

Arguments

The TStart statement does not have any arguments.

Description

TStart marks the beginning of a transaction. Following TStart, database operations are journaled to enable a subsequent TCommit or TRollback statement.

Any locks issued within a transaction will be held until the end of the transaction even if the lock is released.

Examples

The following example illustrates the use of the TStart statement:

TStart
If StorePerson(personobject) Then
  TCommit
Else
  TRollback
End If

See Also

- TCommit Statement
- TRollback Statement
While...Wend

Executes a series of statements as long as a given condition is true.

```plaintext
While condition
  [statements]
Wend
```

**Arguments**

The `While...Wend` statement syntax has these parts:

<table>
<thead>
<tr>
<th>conditions</th>
<th>Expression that evaluates to <strong>True</strong> or <strong>False</strong>.</th>
</tr>
</thead>
<tbody>
<tr>
<td>statements</td>
<td>One or more statements executed while condition is True.</td>
</tr>
</tbody>
</table>

**Description**

If condition is **True**, all statements in statements are executed until the `Wend` statement is encountered. Control then returns to the `While` statement and condition is again checked. If condition is still **True**, the process is repeated. If it is not **True**, execution resumes with the statement following the `Wend` statement.

`While...Wend` loops can be nested to any level. Each `Wend` matches the most recent `While`.

**Examples**

The following example illustrates use of the `While...Wend` statement:

```plaintext
Dim Counter
Counter = 0                ' Initialize variable.
While Counter < 20         ' Test value of Counter.
  Counter = Counter + 1   ' Increment Counter.
  Print Counter
Wend                       ' End While loop when Counter > 19.
```

**Notes**

The `Do...Loop` statement provides a more structured and flexible way to perform looping.

**See Also**

- `Do...Loop` Statement
- `Exit` Statement
- `For Each...Next` Statement
- `For...Next` Statement
### With

Executes a series of statements on a single object.

```cachébasic
With object
    statements
End With
```

#### Arguments

The `With` statement requires the following arguments:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>object</code></td>
<td>An expression that resolves to an object reference. <code>object</code> may be a function call that returns an object reference, or a subscripted variable that contains an object reference.</td>
</tr>
<tr>
<td><code>statements</code></td>
<td>One or more statements to be executed on the object.</td>
</tr>
</tbody>
</table>

#### Description

The `With` statement allows you to perform a series of statements on a specified object without requalifying the name of the object. For example, to change a number of different properties on a single object, place the property assignment statements within the `With` block code, referring to the object once instead of referring to it with each property assignment.

The `object` object reference is evaluated upon entering the `With` block, and is not reevaluated within the `With` block. Therefore, you cannot use a single `With` statement to affect a number of different objects. Changing the `object` variable value within the `With` block is permitted, but does not change which object is used for anonymous references within the `With` block.

While property manipulation is an important aspect of `With` functionality, it is not the only use. Any legal code can be used within a `With` block.

You can nest `With` statements by placing one `With` block within another. However, because members of outer `With` blocks are masked within the inner `With` blocks, you must provide a fully qualified object reference in an inner `With` block to any member of an object in an outer `With` block.

A `Goto` statement cannot be used to enter the body of a `With` block, or into a nested inner `With` block. You can, however, issue a `Goto` within a `With` block to a label within that block, or to an outer `With` block label, or to a label outside the `With` block.

#### Examples

The following example illustrates use of the `With` statement to assign values to several properties of the same object.

```cachébasic
With myPerson
    .City = "Cambridge"
    .State = "MA"
    .Street = "One Memorial Drive"
End With
```
Caché Basic Functions
Abs

Returns the absolute value of a number.

Abs(number)

Arguments

The number argument can be any valid numeric expression. If number is an uninitialized variable or a non-numeric value, Abs returns 0 (zero).

Description

The absolute value of a number is its unsigned magnitude. For example, Abs(-1) and Abs(1) both return 1. Abs removes signs, and leading and trailing zeros from number.

Examples

The following example uses the Abs function to compute the absolute value of a number:

Println Abs(0050.300)  'Returns 50.3
Println Abs(-50.3)     'Returns 50.3
Println Abs(+50.3)     'Returns 50.3
Println Abs(0)         'Returns 0
Println Abs(-0)        'Returns 0

See Also

- Sgn function
Asc

Returns the ANSI character code corresponding to the first character in a string.

**Asc**(string)

**Arguments**

The *string* argument is any valid string expression. A number is treated as a string expression. If the *string* contains no characters (an empty string), -1 is returned.

**Description**

The Asc function takes a character and returns the corresponding ANSI code. The Chr function takes an ANSI code and returns the corresponding character.

In ObjectScript, the $ASCII function performs the same operation.

**Examples**

In the following example, Asc returns the ANSI character code of the first character of each string:

```plaintext
Println Asc("A")       ' Returns 65
Println Asc("a")       ' Returns 97
Println Asc("Apple")   ' Returns 65
Println Asc(">")       ' Returns 62
Println Asc(Chr(959+1)) ' Returns 960
Println Asc(12345)      ' Returns 49
Println Asc("")        ' Returns -1
```

**See Also**

- Basic: Chr function
- ObjectScript: $ASCII function
Atn

Returns the arctangent of a number.

\[ \text{Atn}(\text{number}) \]

**Arguments**

The `number` argument can be any valid numeric expression.

**Description**

The `Atn` function takes the ratio of two sides of a right triangle (number) and returns the corresponding angle in radians. The ratio is the length of the side opposite the angle divided by the length of the side adjacent to the angle. The range of the result is -\(\pi/2\) to \(\pi/2\) radians.

To convert degrees to radians, multiply degrees by \(\pi/180\). To convert radians to degrees, multiply radians by \(180/\pi\).

**Examples**

The following example returns the arctangents of the integers from -4 through 4:

```vbnet
For x = -4 To 4
    Println "Arctangent of ",x," is: ",Atn(x)
Next
```

The following example uses `Atn` to calculate the value of \(\pi\):

```vbnet
Dim pi
pi = 4 * Atn(1)  ' Calculate the value of \(\pi\).
Println "\(\pi\) is: ",pi
```

**Notes**

Arctangent (`Atn`) is the inverse trigonometric function of tangent (`Tan`), which takes an angle as its argument and returns the ratio of two sides of a right triangle. Do not confuse the arctangent with the cotangent; a cotangent is the simple inverse of a tangent (1/tangent).

**See Also**

- Cos function
- Sin function
- Tan function
- Derived Math Functions
Case

Compares a target to cases and returns the value associated with the first matching case.

**Case**(target, case:rvalue, case:rvalue,...,:default)

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>target</td>
<td>A value, variable, or expression to be compared with the case arguments.</td>
</tr>
<tr>
<td>case</td>
<td>A value, variable, or expression, the value of which is matched with the value of target.</td>
</tr>
<tr>
<td>rvalue</td>
<td>The value to be returned upon a successful match of target and case.</td>
</tr>
<tr>
<td>default</td>
<td>Optional — The value to be returned if no case matches target.</td>
</tr>
</tbody>
</table>

**Description**

The **Case** function compares target to a list of cases (literals or expressions), and returns the rvalue associated with the first matching case value. An unlimited number of case:rvalue pairs can be specified. Cases are matched in the order specified (left-to-right); matching stops when the first exact match is encountered.

If there is no matching case, the default is returned. If there is no matching case and no default is specified, an error is returned.

**Arguments**

**target**

**CASE** evaluates the target expression once, then matches the result to each case value in left-to-right order.

**case**

A case can be a literal or an expression; matching of literals is substantially more efficient than matching expressions, because literals can be evaluated at compile time. Each case must be paired with an rvalue. An unlimited number of case and rvalue pairs may be specified.

**rvalue**

An rvalue can be a literal or an expression. Every rvalue is associated with a specific case as a pair joined with a colon (:) and separated from other pairs by a comma (,). rvalue is the value returned when there is an exact match of the target value with its associated case value. Only the first exact match encountered (in left-to-right order) returns an rvalue.

**default**

A default argument can be a literal or an expression. The default is specified like a case:rvalue pair, except that there is no case specified between the comma separator and the colon. The default is always the final argument specified in a **CASE** function. The default value is the value returned if no exact match occurs.

**Examples**

The following **Case** example takes a numeric input and writes out the appropriate explanatory string:

```plaintext
input "Input a number 1-3: ", x
multi=CASE(x,1:"single",2:"double",3:"triple",:"input error")
PrintLn multi
```
See Also

- If...Then...Else statement
Chr

Returns the character corresponding to the specified ANSI character code.

\texttt{Chr(charcode)}

\textbf{Arguments}

The \textit{charcode} argument is a decimal integer that identifies a character. For 8-bit characters, the value in \textit{charcode} must evaluate to a positive integer in the range 0 to 255. For 16-bit characters, specify integers in the range 256 through 65534.

\textbf{Description}

The \texttt{Chr} function takes an ANSI code and returns the corresponding character. The \texttt{Asc} function takes a character and returns the corresponding ANSI code.

Numbers from 0 to 31 are the same as standard, nonprintable ASCII codes. For example, \texttt{Chr(10)} returns a linefeed character.

The Caché Basic \texttt{Chr} function returns a single character. The corresponding ObjectScript $\texttt{CHAR}$ function can return multiple characters by specifying a comma-separated list of ASCII codes.

\textbf{Examples}

The following example uses the \texttt{Chr} function to return the character associated with the specified character code:

\begin{verbatim}
Println Chr(65)   ' Returns A.
Println Chr(97)   ' Returns a.
Println Chr(37)   ' Returns %.
Println Chr(62)   ' Returns >.
Println Chr(960)  ' Returns the symbol for pi.
\end{verbatim}

\textbf{See Also}

- Basic: \texttt{Asc} function
- ObjectScript: $\texttt{CHAR}$ function
Cos

Returns the cosine of an angle.

\[ \text{Cos}(\text{number}) \]

**Arguments**

The *number* argument can be any valid numeric expression that expresses an angle in radians.

**Description**

The **Cos** function takes an angle and returns the ratio of two sides of a right triangle. The ratio is the length of the side adjacent to the angle divided by the length of the hypotenuse. The result lies in the range -1 to 1.

To convert degrees to radians, multiply degrees by \pi/180. To convert radians to degrees, multiply radians by 180/\pi.

**Examples**

The following example uses the **Cos** function to return the cosine of an angle:

```basic
Dim MyAngle
MyAngle = 1.3           ' Define angle in radians.
Println Cos(MyAngle)    ' Calculate cosine.
```

The following example uses the **Cos** function to return the secant of an angle:

```basic
Dim MyAngle, MySecant
MyAngle = 1.3                ' Define angle in radians.
MySecant = 1 / Cos(MyAngle)  ' Calculate secant.
Println MySecant
```

**See Also**

- **Atn** function
- **Sin** function
- **Tan** function
- **Derived Math Functions**
Date

Returns the current system date.

**Arguments**

none

**Description**

The *Date* function returns the current date in a format such as the following:

```
mm/dd/yyyy
```

The exact display format depends on your system configuration. Leading zeros are displayed. The year is displayed as four digits.

**Examples**

The following example uses the *Date* function to return the current system date:

```
Dim MyDate
MyDate = Date
Println MyDate
```

**See Also**

- Basic: *Now* function, *Time* function
- ObjectScript: *$HOROLOG* special variable
- SQL: *NOW* function
**DateAdd**

Returns a date to which a specified time interval has been added.

```
DateAdd(interval, number, date)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>interval</td>
<td>A string expression code that specifies the interval type you want to add, specified as a quoted string. The table of available codes is shown below.</td>
</tr>
<tr>
<td>number</td>
<td>A numeric expression that is the number of intervals you want to add. The numeric expression can either be positive to add intervals, or negative to subtract intervals.</td>
</tr>
<tr>
<td>date</td>
<td>Variable name or literal representing the date to which the specified interval is added (or subtracted). The date can optionally have a time component; if not specified, the time defaults to 00:00:00.</td>
</tr>
</tbody>
</table>

The `DateAdd` function returns the calculated date in the following format:

```
mm/dd/yyyy
```

Leading zeros are displayed. The year is displayed as four digits.

**Description**

The `interval` argument can have the following values:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>yyyyy</td>
<td>Year</td>
</tr>
<tr>
<td>q</td>
<td>Quarter</td>
</tr>
<tr>
<td>m</td>
<td>Month</td>
</tr>
<tr>
<td>y</td>
<td>Day of Year (this adds the specified number of days to <code>date</code>; same as “d”).</td>
</tr>
<tr>
<td>d</td>
<td>Day</td>
</tr>
<tr>
<td>w</td>
<td>Weekday (this adds the specified number of days to <code>date</code>; same as “d”).</td>
</tr>
<tr>
<td>wwww</td>
<td>Week (this adds the specified number of weeks to <code>date</code>).</td>
</tr>
<tr>
<td>h</td>
<td>Hour</td>
</tr>
<tr>
<td>n</td>
<td>Minute (note this is “n”, not “m”)</td>
</tr>
<tr>
<td>s</td>
<td>Second</td>
</tr>
</tbody>
</table>

You can use the `DateAdd` function to add or subtract a specified interval from a date. For example, you can use `DateAdd` to calculate a date 30 days from a given date, or a date 100 hours earlier than a given date. To add days to `date`, you can use Day of Year ("y"), Day ("d"), or Weekday ("w").

The `DateAdd` function computes the varying number of days in different months (including leap years), and avoids returning an invalid date.
Examples

The following example adds one of each date interval unit to January 31, 2005:

```cachébasic
NewDay = DateAdd("d",1,"31-Jan-2005")
NewWDay = DateAdd("w",1,"31-Jan-2005")
NewWeek = DateAdd("ww",1,"31-Jan-2005")
NewMonth = DateAdd("m",1,"31-Jan-2005")
NewQuarter = DateAdd("q",1,"31-Jan-2005")
NewYDay = DateAdd("y",1,"31-Jan-2005")
NewYear = DateAdd("yyyy",1,"31-Jan-2005")
Println NewDay
Println NewWDay
Println NewWeek
Println NewMonth
Println NewQuarter
Println NewYDay
Println NewYear
```

In the case of adding one month to 31-Jan-2005, **DateAdd** returns 02/28/2005, not 02/31/2005. If date is 31-Jan-2004, it returns 02/29/2005, because 2004 is a leap year. If the calculated date would precede the year 100, an error occurs.

The following example adds a time interval large enough to increment the specified date:

```cachébasic
NewHour = DateAdd("h",27, "31-Jan-2005")
NewMin = DateAdd("n",1545, "31-Jan-2005")
NewSec = DateAdd("s",91522, "31-Jan-2005")
Println NewHour
Println NewMin
Println NewSec
```

Note that the values returned contain both a date and a time component.

See Also

- **DateDiff** function
- **DatePart** function
DateConvert

Converts dates between internal and external formats.

\[ \text{DateConvert} \text{(date, vbToInternal)} \]
\[ \text{DateConvert} \text{(date, vbToExternal)} \]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>The date to be converted. An external date is represented as a string, such as “10–22–1980”. An internal date is represented as a five-digit integer, which is the first part of the Caché $HOROLOG ($H) date/time format.</td>
</tr>
<tr>
<td>vbToInternal</td>
<td>This keyword specifies converting an external date to internal ($H) format.</td>
</tr>
<tr>
<td>vbToExternal</td>
<td>This keyword specifies converting an internal date ($H format) to external date format.</td>
</tr>
</tbody>
</table>

**Description**

If you specify a date/time value, DateConvert ignores the time portion.

The DateConvert function returns an external date in the following format:

\[ \text{mm/dd/yyyy} \]

Leading zeros are displayed. The year is displayed as four digits.

The DateConvert function returns an internal date/time in the following format:

\[ \text{dddd} \]

Where “d” is the date count (number of days since 12/31/1840). For further details, see $HOROLOG in the Caché ObjectScript Reference.

An omitted year value defaults to 2000; the two-digit year defaults are 2000 through 2029 (for 00 through 29) and 1930 through 1999 (for 30 through 99).

**Examples**

The following example takes an external date/time value, converts the date part to an internal format ($HOROLOG) value, then converts this internal value back to an external format date.

```
Dim GetDate, InDate, ExDate
GetDate = "1-12-1953 11:45:23"
Println GetDate
InDate = DateConvert(GetDate, vbToInternal)
Println InDate
ExDate = DateConvert(InDate, vbToExternal)
Println ExDate
```

The values printed are as follows:

1-12-1953 11:45:23
40919
01/12/1953

**See Also**

- Basic: DateTimeConvert function
- Basic: TimeConvert function
• ObjectScript: $HOROLOG special variable
DateDiff

Returns the number of intervals between two dates.

```
DateDiff(interval, date1, date2[, , firstdayofweek[, , firstweekofyear]])
```

**Arguments**

- **interval**: A string expression code that specifies the interval you want to use to calculate the difference between `date1` and `date2`. Specified as a quoted string. A list of these interval codes is provided below.

- **date1, date2**: Two date expressions. The two dates you want to use in the calculation. These date expressions can optionally also include a time component. If the time is omitted, it defaults to `00:00:00`.

- **firstdayofweek**: Optional — Constant that specifies the day of the week. If not specified, Sunday is assumed. A list of the available constants is provided below.

- **firstweekofyear**: Optional — Constant that specifies the first week of the year. If not specified, the first week is assumed to be the week in which January 1 occurs. A list of the available constants is provided below.

**Description**

You can use the `DateDiff` function to determine how many specified time intervals exist between two dates. For example, you might use `DateDiff` to calculate the number of days between two dates, or the number of weeks between today and the end of the year. `DateDiff` returns a positive integer for the number of intervals if `date1` is earlier than `date2`; otherwise it returns a negative integer for the number of intervals. If both dates are the same, or if the time between them is less than the specified interval, `DateDiff` returns zero (0).

Intervals are calculated from the specified unit itself. Thus a year interval is determined by whether the two year dates differ, not by how many days have elapsed. Similarly, a day interval is determined by whether the two dates differ, not by how many hours have elapsed.

The `interval` argument can have the following values:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>YYYY</code></td>
<td>Year</td>
</tr>
<tr>
<td><code>q</code></td>
<td>Quarter</td>
</tr>
<tr>
<td><code>m</code></td>
<td>Month</td>
</tr>
<tr>
<td><code>y</code></td>
<td>Day of Year</td>
</tr>
<tr>
<td><code>d</code></td>
<td>Day</td>
</tr>
<tr>
<td><code>w</code></td>
<td>Weekday (number of seven-day units)</td>
</tr>
<tr>
<td><code>ww</code></td>
<td>Week (number of calendar weeks)</td>
</tr>
<tr>
<td><code>h</code></td>
<td>Hour</td>
</tr>
<tr>
<td><code>n</code></td>
<td>Minute</td>
</tr>
<tr>
<td><code>s</code></td>
<td>Second</td>
</tr>
</tbody>
</table>
To calculate the number of days between \textit{date1} and \textit{date2}, you can use either Day ("d") or Day of Year ("y").

To calculate the number of weeks between \textit{date1} and \textit{date2} you can use Weekday ("w") or Week ("ww"). When \textit{interval} is Weekday ("w"), \textit{DateDiff} returns the number of weeks between the two dates. If \textit{date1} falls on a Monday, \textit{DateDiff} counts the number of Mondays until \textit{date2}. It counts \textit{date2} but not \textit{date1}. If \textit{interval} is Week ("ww"), however, the \textit{DateDiff} function returns the number of calendar weeks between the two dates. It counts the number of Sundays between \textit{date1} and \textit{date2}. \textit{DateDiff} counts \textit{date2} if it falls on a Sunday; but it does not count \textit{date1}, even if it does fall on a Sunday.

The \textit{firstdayofweek} argument affects calculations that use the "w" and "ww" interval symbols. The \textit{firstdayofweek} argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbUseSystem</td>
<td>0</td>
<td>Use National Language Support (NLS) API setting.</td>
</tr>
<tr>
<td>vbSunday</td>
<td>1</td>
<td>Sunday</td>
</tr>
<tr>
<td>vbMonday</td>
<td>2</td>
<td>Monday</td>
</tr>
<tr>
<td>vbTuesday</td>
<td>3</td>
<td>Tuesday</td>
</tr>
<tr>
<td>vbWednesday</td>
<td>4</td>
<td>Wednesday</td>
</tr>
<tr>
<td>vbThursday</td>
<td>5</td>
<td>Thursday</td>
</tr>
<tr>
<td>vbFriday</td>
<td>6</td>
<td>Friday</td>
</tr>
<tr>
<td>vbSaturday</td>
<td>7</td>
<td>Saturday</td>
</tr>
</tbody>
</table>

The \textit{firstweekofyear} argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbUseSystem</td>
<td>0</td>
<td>Use National Language Support (NLS) API setting.</td>
</tr>
<tr>
<td>vbFirstJan1</td>
<td>1</td>
<td>Use the week in which January 1 occurs (default).</td>
</tr>
<tr>
<td>bFirstFourDays</td>
<td>2</td>
<td>Use the first week that has at least four days in the new year.</td>
</tr>
<tr>
<td>vbFirstFullWeek</td>
<td>3</td>
<td>Use the first full week of the year.</td>
</tr>
</tbody>
</table>

The Year ("yyyy") interval calculates number of years based on the year date, not the number of elapsed days. Thus, when comparing December 31 to January 1 of the immediately succeeding year, \textit{DateDiff} for Year ("yyyy") returns 1, even though only a day has elapsed.

If \textit{date1} or \textit{date2} is a date literal, the specified year becomes a permanent part of that date. However, if \textit{date1} or \textit{date2} is enclosed in quotation marks (" ") and you omit the year, the current year is inserted in your code each time the \textit{date1} or \textit{date2} expression is evaluated. This makes it possible to write code that can be used in different years.

**Examples**

The following example uses the \texttt{DateDiff} function to display the number of days between a given date and today:

```cachébasic
DiffADate = DateDiff("d","11/12/1953",Date)
Print "Days to the present day: ", DiffADate
Println DiffADate
```

The following example calculates the number of each date interval unit between November 12, 1953 and November 1, 2005:
NewDay = DateDiff("d","11/12/1953","11/1/2005")
NewWeek = DateDiff("w","11/12/1953","11/1/2005")
NewMonth = DateDiff("m","11/12/1953","11/1/2005")
NewQuarter = DateDiff("q","11/12/1953","11/1/2005")
NewYDay = DateDiff("y","11/12/1953","11/1/2005")
NewYear = DateDiff("yyyy","11/12/1953","11/1/2005")
Println NewDay
Println NewWeek
Println NewMonth
Println NewQuarter
Println NewYDay
Println NewYear

The following example calculates the number of each days between January 1 and March 1 on a leap year (2004) and a non-leap year (2005):

LeapDays = DateDiff("d","1/1/2004","3/1/2004")
NLeapDays = DateDiff("d","1/1/2005","3/1/2005")
Println LeapDays
Println NLeapDays

As one would expect, the difference is 60 days in leap years, and 59 days in non-leap years.

The following example calculates the number of time intervals between two successive days. Note that if the time is not specified, it defaults to 00:00:00:

NumH = DateDiff("h","1/1/2004","1/2/2004")
NumHNoon = DateDiff("h","1/1/2004","1/2/2004 12:00:00")
NumMin = DateDiff("n","1/1/2004","1/2/2004")
NumMinNoon = DateDiff("n","1/1/2004","1/2/2004 12:00:00")
NumSec = DateDiff("s","1/1/2004","1/2/2004")
NumSecNoon = DateDiff("s","1/1/2004","1/2/2004 12:00:00")
Println NumH
Println NumHNoon
Println NumMin
Println NumMinNoon
Println NumSec
Println NumSecNoon

See Also

• DateAdd function
• DatePart function
DatePart

Returns the specified part of a given date.

DatePart(interval,date[,firstdayofweek[,firstweekofyear]])

Arguments

<table>
<thead>
<tr>
<th>interval</th>
<th>A string expression code that is the interval of time you want to return. See below for code values.</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>Date expression you want to evaluate, specified as a quoted string.</td>
</tr>
<tr>
<td>firstdayofweek</td>
<td>Optional — Constant that specifies the day of the week. If not specified, Sunday is assumed. See below for values.</td>
</tr>
<tr>
<td>firstweekofyear</td>
<td>Optional — Constant that specifies the first week of the year. If not specified, the first week is assumed to be the week in which January 1 occurs. See below for values.</td>
</tr>
</tbody>
</table>

Description

You can use the DatePart function to evaluate a date and return a specific interval as an integer value. For example, you might use DatePart to calculate the day of the week or the number of days since the start of the year.

The interval argument can have the following values:

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>yyyy</td>
<td>Year date</td>
</tr>
<tr>
<td>q</td>
<td>Quarters since beginning of year</td>
</tr>
<tr>
<td>m</td>
<td>Month date; number of months since beginning of year</td>
</tr>
<tr>
<td>y</td>
<td>Day of Year; number of days since beginning of year</td>
</tr>
<tr>
<td>d</td>
<td>Day date; number of days since beginning of month.</td>
</tr>
<tr>
<td>w</td>
<td>Weekday (day of the week, with Sunday counted as 1)</td>
</tr>
<tr>
<td>ww</td>
<td>Weeks since beginning of year</td>
</tr>
<tr>
<td>h</td>
<td>Hour (defaults to 1).</td>
</tr>
<tr>
<td>n</td>
<td>Minute (defaults to 0).</td>
</tr>
<tr>
<td>s</td>
<td>Second (defaults to 0).</td>
</tr>
</tbody>
</table>

The firstdayofweek argument can have the following values:
The **firstweekofyear** argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbUseSystem</td>
<td>0</td>
<td>Use National Language Support (NLS) API setting.</td>
</tr>
<tr>
<td>vbSunday</td>
<td>1</td>
<td>Sunday</td>
</tr>
<tr>
<td>vbMonday</td>
<td>2</td>
<td>Monday</td>
</tr>
<tr>
<td>vbTuesday</td>
<td>3</td>
<td>Tuesday</td>
</tr>
<tr>
<td>vbWednesday</td>
<td>4</td>
<td>Wednesday</td>
</tr>
<tr>
<td>vbThursday</td>
<td>5</td>
<td>Thursday</td>
</tr>
<tr>
<td>vbFriday</td>
<td>6</td>
<td>Friday</td>
</tr>
<tr>
<td>vbSaturday</td>
<td>7</td>
<td>Saturday</td>
</tr>
</tbody>
</table>

You must specify a **firstdayofweek** argument value in order to specify a **firstweekofyear** argument value. The **firstdayofweek** argument affects calculations that use the "w" and "ww" intervals.

If date is a date literal, the specified year becomes a permanent part of that date. However, if date is enclosed in quotation marks (" "), and you omit the year, the current year is inserted in your code each time the date expression is evaluated. This makes it possible to write code that can be used in different years.

**Examples**

The following example takes a date and displays the corresponding interval counts:

```cachébasic
NewDay = DatePart("d","30-Nov-2005")
NewWDay = DatePart("w","30-Nov-2005")
NewWeek = DatePart("ww","30-Nov-2005")
NewMonth = DatePart("m","30-Nov-2005")
NewQuarter = DatePart("q","30-Nov-2005")
NewYDay = DatePart("y","30-Nov-2005")
NewYear = DatePart("yyyy","30-Nov-2005")
NewHour = DatePart("h","30-Nov-2005")
NewMin = DatePart("m","30-Nov-2005")
NewSec = DatePart("s","30-Nov-2005")
Println NewDay
Println NewWDay
Println NewWeek
Println NewMonth
Println NewQuarter
Println NewYDay
Println NewYear
Println NewHour
Println NewMin
Println NewSec
```

The following example shows the effects of the **firstdayofweek** argument:

```cachébasic
```
MyDay0 = DatePart("w","11/1/2005",vbUseSystem)
MyDay1 = DatePart("w","11/1/2005",vbSunday)
MyDay2 = DatePart("w","11/1/2005",vbMonday)
MyDay3 = DatePart("w","11/1/2005",vbTuesday)
MyDay4 = DatePart("w","11/1/2005",vbWednesday)
MyDay5 = DatePart("w","11/1/2005",vbThursday)
MyDay6 = DatePart("w","11/1/2005",vbFriday)
MyDay7 = DatePart("w","11/1/2005",vbSaturday)
Println "Day is: ",MyDay0," Week begins System Default"
Println "Day is: ",MyDay1," Week begins Sunday"
Println "Day is: ",MyDay2," Week begins Monday"
Println "Day is: ",MyDay3," Week begins Tuesday"
Println "Day is: ",MyDay4," Week begins Wednesday"
Println "Day is: ",MyDay5," Week begins Thursday"
Println "Day is: ",MyDay6," Week begins Friday"
Println "Day is: ",MyDay7," Week begins Saturday"

Nov. 1, 2005 is a Tuesday. DatePart ("w", "11/1/2005", vbTuesday) returns 1.

The following example returns the week of the year count for February 29, 2008, based on different firstdayofweek and firstweekofyear argument values:

Println "Week is: ",DatePart ("ww", "2/29/2008", vbUseSystem, vbUseSystem)
Println "Week is: ",DatePart ("ww", "2/29/2008", vbThursday, vbUseSystem)
Println "Week is: ",DatePart ("ww", "2/29/2008", vbUseSystem, vbFirstJan1)
Println "Week is: ",DatePart ("ww", "2/29/2008", vbThursday, vbFirstJan1)
Println "Week is: ",DatePart ("ww", "2/29/2008", vbUseSystem, vbFirstFourDays)
Println "Week is: ",DatePart ("ww", "2/29/2008", vbThursday, vbFirstFourDays)
Println "Week is: ",DatePart ("ww", "2/29/2008", vbUseSystem, vbFirstFullWeek)
Println "Week is: ",DatePart ("ww", "2/29/2008", vbThursday, vbFirstFullWeek)

Note that both firstweekofyear and firstdayofweek can affect the week of the year count.

See Also

- DateAdd function
- DateDiff function
DateSerial

Returns the date for a specified year, month, and day.

**DateSerial** *(year, month, day)*

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>year</strong></td>
<td>A four-digit integer between 1841 and 9999, inclusive, a two-digit integer, or a numeric expression that evaluates to an integer within these ranges.</td>
</tr>
<tr>
<td><strong>month</strong></td>
<td>A positive or negative integer or a numeric expression that evaluates to an integer. A <em>month</em> value of 0 or the empty string (&quot;&quot;&quot;) is interpreted as the last month of the previous year. A negative <em>month</em> value backs up the specified number of months from the last month of the previous year. Thus -1 is the 11th month of the previous year.</td>
</tr>
<tr>
<td><strong>day</strong></td>
<td>A positive or negative integer or a numeric expression that evaluates to an integer. A <em>day</em> value of 0 or the empty string (&quot;&quot;&quot;) is interpreted as the last day of the previous month. A negative <em>day</em> value backs up the specified number of days from the last day of the previous month. Thus, a <em>day</em> value of -1 is interpreted as the day before the last day of the previous month.</td>
</tr>
</tbody>
</table>

**Description**

DateSerial takes the input arguments and generates a valid date in the format:

```
mm/dd/yyyy
```

The range of numbers for each DateSerial argument can be an exact date value or a relative date value. A relative date value is an integer value outside the accepted range for the unit; that is, 1–31 for days and 1–12 for months. In this case, DateSerial uses these numbers to calculate a valid date. Any numeric expression can be used to represent some number of days, months, or years before or after a certain date.

*Year* values between 0 and 99, inclusive, are interpreted as the years 1900–1999. The empty string (""") is interpreted as the year 1900. For all other year arguments, use a complete four-digit year (for example, 2005). The earliest allowed *year* value is 1841.

**Examples**

The following example uses numeric expressions instead of absolute date numbers. Here the DateSerial function returns a date that is the day before the first day (1 – 1) of two months before August (8 – 2) of 10 years before 1990 (1990 – 10); in other words, May 31, 1980.

```vba
Dim MyDate1, MyDate2
MyDate1 = DateSerial(1970, 1, 1)
MyDate2 = DateSerial(1990 - 10, 8 - 2, 1 - 1)
Println MyDate1 ' Returns 01/01/1970 (January 1, 1970)
Println MyDate2 ' Returns 05/31/1980
```

The following example uses *month* values of 0, the empty string (""), and negative numbers:

```vba
Println DateSerial(2009,"",3) ' Returns 12/03/2008
Println DateSerial(2009,0,3) ' Returns 12/03/2008
Println DateSerial(2009,-1,3) ' Returns 11/03/2008
Println DateSerial(2009,-2,3) ' Returns 10/03/2008
```

The following example uses *day* value that is not valid for the specified month. DateSerial is aware of leap year values and adjusts the month accordingly:

```vba
Println DateSerial(2009,2,29) ' Returns 03/01/2008
```
The following example uses day and month values that are larger than the number of days in the specified month and monthsd in a year. **DateSerial** adjusts the day, month, and year accordingly:

```
Println DateSerial(2009,13,40)  ' Returns 02/09/2010
```

**Notes**
When any argument exceeds the accepted range for that argument, it increments to the next larger unit as appropriate. For example, if you specify 35 days, it is evaluated as one month and some number of days, depending on where in the year it is applied. However, if any single argument is outside the range -32,768 to 32,767, or if the date specified by the three arguments, either directly or by expression, falls outside the acceptable range of dates (12/31/1840 through 12/31/9999), an error occurs.

**See Also**
- **Date** function
- **Day** function
- **Month** function
- **Now** function
- **TimeSerial** function
- **Weekday** function
- **Year** function
DateTimeConvert

Converts date/time between internal and external formats.

**DateTimeConvert***(datetime,vbToInternal)***  
**DateTimeConvert***(datetime,vbToExternal)***

**Arguments**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>datetime</td>
<td>The date and time to be converted. An external date/time is represented as a string, such as “10–22–1980 12:35:56”. An internal date/time is represented by the Cache $HOROLOG ($H) date/time format: two five-digit integer values separated by a comma.</td>
</tr>
<tr>
<td>vbToInternal</td>
<td>This keyword specifies converting an external date/time to internal ($H) format.</td>
</tr>
<tr>
<td>vbToExternal</td>
<td>This keyword specifies converting an internal date/time ($H format) to external date and time format.</td>
</tr>
</tbody>
</table>

**Description**

The **DateTimeConvert** function returns an external date/time in the following format:

```
mm/dd/yyyy hh:mm:ss
```

Leading zeros are displayed. The year is displayed as four digits.

The **DateTimeConvert** function returns an internal date/time in the following format:

```
ddddd,sssss.ff
```

Where “ddddd” is the date count (number of days since 12/31/1840), “sssss” is the time count (number of elapsed seconds in the specified day), and “ff” is optional fractional seconds. Fractional seconds are preserved in converting from external to internal format; fractional seconds are truncated when converting from internal to external format. For further details, see $HOROLOG in the Cache ObjectScript Reference.

An omitted year value defaults to 2000; the two-digit year defaults are 2000 through 2029 (for 00 through 29) and 1930 through 1999 (for 30 through 99).

An omitted time value defaults to 00:00:00.

**Examples**

In the following example the **DateTimeConvert** function returns a date/time in internal format.

```
Dim InDateTime
InDateTime = DateTimeConvert("Nov 11 1953 12:35:00", vbToInternal)
Println InDateTime
```

The following example takes an external date/time value with fractional seconds, converts it to an internal format (SHOROLOG) value, then converts this internal value back to an external format date and time.

```
Dim GetDate, InDate, ExDate
GetDate = "1-12-1953 11:45:23.99"
Println GetDate
InDate = DateTimeConvert(GetDate, vbToInternal)
Println InDate
ExDate = DateTimeConvert(InDate, vbToExternal)
Println ExDate
```

The values printed are as follows:
See Also

- Basic: DateConvert function
- Basic: TimeConvert function
- ObjectScript: $HOROLOG special variable
Day

Returns the day of the month as an integer between 1 and 31, inclusive.

\[
\text{Day}(\text{date})
\]

**Arguments**

The *date* argument is any expression that represents a date as a string.

**Description**

The **Day** function locates and returns the numeric day portion of a date string as an integer. It performs no range validation on this number. The **Day** function accepts blanks, slashes (/), hyphens (-), or commas (,) (in any combination) as date component separators. Leading zeros and plus or minus signs may be included or omitted in the input string; leading zeros and signs are omitted from the output integer. The **Day** function accepts blanks, slashes (/), hyphens (-), or commas (,) (in any combination) as date component separators. Leading zeros and plus or minus signs may be included or omitted in the input string; leading zeros and signs are omitted from the output integer. The **Day** function locates the day portion in either of two ways:

- In American format, the month precedes the day. For example, “9/27/2005” or “September 27, ’05.” In this format, the **Day** function identifies the day portion by position. It does not parse the month or year components of the date string. These can be any alphanumeric value, and can include or omit punctuation characters such as periods or apostrophes. The year component may be 4-digits, less than 4 digits, or omitted.
- In European written format, the day precedes the name of the month. For example, “27 September 2005” or “27 Sept” In this case, the month name is validated; the first three letters must correspond to a valid month name. Validation is not case-sensitive.

If the **Day** function is unable to identify a day portion of a string, it returns 0.

**Examples**

The following example uses the **Day** function to return the current day of the month:

```
Dim MyDay
MyDay = Day(Date)
Print MyDay
```

The following examples use the **Day** function to obtain the day of the month from a specified date:

```
Dim MyDay
Print MyDay

Dim MyDay
MyDay = Day("09/19/05")  'MyDay contains 19.
Print MyDay

Dim MyDay
Print MyDay

Dim MyDay
MyDay = Day("19 October")  'MyDay contains 19.
Print MyDay

Dim MyDay
Print MyDay
```

**See Also**

- Basic: Date function, Hour function, Minute function, Month function, Now function, Second function, Weekday function, Year function
• ObjectScript: $ZDATE function
• SQL: DAYOFMONTH function
# Derived Math Functions

The following non-intrinsic math functions can be derived from the intrinsic math functions:

## Description

Caché Basic supplies four trigonometric functions: `Sin` (sine), `Cos` (cosine), `Tan` (tangent), and `Atn` (arctangent); two logarithmic functions: `Log` (natural e logarithm) and `Exp` (e exponential); the `Sqr` (square root) function and the `Sgn` (sign) function. From these many other functions and constants can be derived.

<table>
<thead>
<tr>
<th>Function</th>
<th>Derived Equivalents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secant</td>
<td>Sec(X) = 1 / Cos(X)</td>
</tr>
<tr>
<td>Cosecant</td>
<td>Cosec(X) = 1 / Sin(X)</td>
</tr>
<tr>
<td>Cotangent</td>
<td>Cotan(X) = 1 / Tan(X)</td>
</tr>
<tr>
<td>Inverse Sine</td>
<td>Arcsin(X) = Atn(X / Sqr(-X * X + 1))</td>
</tr>
<tr>
<td>Inverse Cosine</td>
<td>Arccos(X) = Atn(-X / Sqr(-X * X + 1)) + 2 * Atn(1)</td>
</tr>
<tr>
<td>Inverse Secant</td>
<td>Arcsec(X) = Atn(X / Sqr(X * X - 1)) + Sgn((X) - 1) * (2 * Atn(1))</td>
</tr>
<tr>
<td>Inverse Cosecant</td>
<td>Arccosec(X) = Atn(X / Sqr(X * X - 1)) + (Sgn(X) - 1) * (2 * Atn(1))</td>
</tr>
<tr>
<td>Inverse Cotangent</td>
<td>Arccotan(X) = Atn(X) + 2 * Atn(1)</td>
</tr>
<tr>
<td>Hyperbolic Sine</td>
<td>HSin(X) = (Exp(X) - Exp(-X)) / 2</td>
</tr>
<tr>
<td>Hyperbolic Cosine</td>
<td>HCos(X) = (Exp(X) + Exp(-X)) / 2</td>
</tr>
<tr>
<td>Hyperbolic Tangent</td>
<td>HTan(X) = (Exp(X) - Exp(-X)) / (Exp(X) + Exp(-X))</td>
</tr>
<tr>
<td>Hyperbolic Secant</td>
<td>HSec(X) = 2 / (Exp(X) + Exp(-X))</td>
</tr>
<tr>
<td>Hyperbolic Cosecant</td>
<td>HCosec(X) = 2 / (Exp(X) - Exp(-X))</td>
</tr>
<tr>
<td>Hyperbolic Cotangent</td>
<td>HCotan(X) = (Exp(X) + Exp(-X)) / (Exp(X) - Exp(-X))</td>
</tr>
<tr>
<td>Inverse Hyperbolic Sine</td>
<td>HArcsin(X) = Log(X + Sqr(X * X + 1))</td>
</tr>
<tr>
<td>Inverse Hyperbolic Cosine</td>
<td>HArcos(X) = Log(X + Sqr(X * X - 1))</td>
</tr>
<tr>
<td>Inverse Hyperbolic Tangent</td>
<td>HArcatan(X) = Log((1 + X) / (1 - X)) / 2</td>
</tr>
<tr>
<td>Inverse Hyperbolic Secant</td>
<td>HArcsec(X) = Log((Sqr(-X * X + 1) + 1) / X)</td>
</tr>
<tr>
<td>Inverse Hyperbolic Cosecant</td>
<td>HArcccosec(X) = Log((Sgn(X) * Sqr(X * X + 1) + 1) / X)</td>
</tr>
<tr>
<td>Inverse Hyperbolic Cotangent</td>
<td>HArccotan(X) = Log((X + 1) / (X - 1)) / 2</td>
</tr>
<tr>
<td>Base-10 Logarithm</td>
<td>Log10(X) = Log(X) / Log(10)</td>
</tr>
<tr>
<td>Logarithm to base N</td>
<td>LogN(X) = Log(X) / Log(N)</td>
</tr>
</tbody>
</table>
ObjectScript Equivalents

ObjectScript supplies the following nine trigonometric functions: $ZSIN sine function; $ZCOS cosine function; $ZARCSIN inverse (arc) sine function; $ZARCCOS inverse (arc) cosine function; $ZTAN tangent function; $ZARCTAN inverse (arc) tangent function; $ZCOT cotangent function; $ZSEC secant function; and $ZCSC cosecant function.

ObjectScript supplies the following three logarithmic functions: $ZEXP e exponential function; $ZLN natural logarithm function; and $ZLOG base-10 logarithm function.

ObjectScript supplies the following two exponential functions: $ZPOWER exponent function; and $ZSQR square root function.

See Also

- Atn function
- Cos function
- Exp function
- Log function
- Sgn function
- Sin function
- Sqr function
- Tan function
Exists

Returns the existence status of variables and their array subnodes.

**Exists**(varname)

**Arguments**

<table>
<thead>
<tr>
<th>varname</th>
<th>Name of a variable to test for existence, and/or the presence of array subnodes.</th>
</tr>
</thead>
</table>

**Description**

The **Exists** function returns an integer code indicating whether a variable is defined (1) or not (0). If the variable is an array, **Exists** returns an integer code indicating that the specified node’s value is undefined but the node has defined subnodes (2), or that the specified node’s value is defined and the node has defined subnodes (3).

These values can also be represented by the following constants: 0 = vbUndef; 1 = vbHasValue; 2 = vbHasArray. The 3 value is equivalent to vbHasValue and vbHasArray. Refer to the Node Constants page of this manual.

The **varname** argument must contain a variable, not an expression. For example, ME is an expression, so **Exists(ME)** generates a compile error. However, **Exists(ME.Property)** is a valid use of **Exists**.

**Examples**

The following example demonstrates the use of the **Exists** function:

```plaintext
Println "x is: ", Exists(x)  ' x is undefined
x = 7
Println "x is: ", Exists(x)  ' x is defined
x(1) = 6
Println "x(1) is: ", Exists(x)  ' x & x(1) defined
y(1) = 55
Println "y(1) is: ", Exists(y)  ' y(1) defined, y not
```

The above example returns (in sequence): 0, 1, 3, 2.

The following example further demonstrate use of the **Exists** function with array nodes:

```plaintext
  ' Erase previously existing data
Erase "User.TestData"

  ' Create some demonstration global data
"User.TestData(1)="data"  ' Node 1 is defined but no subnodes
"User.TestData(2,1)="data"  ' Node 2 is not defined but has subnodes
"User.TestData(3)="data"  ' Node 3 is defined and has subnodes
"User.TestData(3,1)="data"

  Status = Exists("User.TestData(1,1)")  ' prints vbUndef  0
Println Status," Undefined subnode"
Status = Exists("User.TestData(1)")  ' prints vbHasValue  1
Println Status," Defined node without subnodes"
Status = Exists("User.TestData(2,1)")  ' prints vbHasValue  1
Println Status," Defined subnode without subnodes"
Status = Exists("User.TestData(2)")  ' prints vbHasArray  2
Println Status," Valueless node with defined subnode(s)"
Status = Exists("User.TestData(3)")  ' prints 3,  
  (vbHasValue + vbHasArray)
Println Status," Defined node with defined subnode(s)"
```

**See Also**

- Node Constants
Exp

Returns e (the base of natural logarithms) raised to a power.

Exp(number)

Arguments

The number argument can be any valid numeric expression. On a Windows system, if the value of number is greater than 335, a runtime error occurs; if the value of number is less than -295, Exp returns zero (0).

Description

The Exp function takes the natural log constant e and raises it to the power specified by the number argument. The constant e (Exp(1)) is approximately 2.718282.

The Exp function complements the action of the Log function and is sometimes referred to as the antilogarithm.

In ObjectScript, the corresponding function is $ZEXP.

Examples

The following example uses the Exp function to calculate e raised to the power of each of the integers -10 through 10:

For x = -10 To 10
Println "Natural log of ",x," = ",Exp(x)
Next

The following example uses the Exp function to return the hyperbolic sine of an angle:

Dim MyAngle, MyHSin  ' Define angle in radians.
MyAngle = 1.3        ' Calculate hyperbolic sine.
MyHSin = (Exp(MyAngle) - Exp(-1 * MyAngle)) / 2
Println MyHSin

See Also

• Log function
• Derived Math Functions
Fix

Returns the integer portion of a number.

**Fix**(number)

**Arguments**

The *number* argument can be any valid numeric expression.

**Description**

Fix removes the fractional part of *number* and returns the resulting integer value. The **Fix** and **Int** functions are almost functionally identical:

For positive values, both **Fix** and **Int** truncate *number*. If you wish to round a number to the nearest integer, use the **Round** function.

For negative values, **Fix** returns the first negative integer greater than or equal to *number*. **Int** returns the first negative integer less than or equal to *number*. For example, **Fix** converts -8.4 to -8 and **Int** converts -8.4 to -9.

Both **Fix** and **Int** remove leading zeros and plus signs from *number*.

**Examples**

The following examples illustrate how the **Fix** and **Int** functions return integer portions of numbers:

```
Println Int(99.8)      ' Returns 99.
Println Fix(99.8)      ' Returns 99.
Println Int(+99.20)    ' Returns 99.
Println Fix(+0099.2)   ' Returns 99.
Println Int(0.00)      ' Returns 0.
Println Fix(0.00)      ' Returns 0.
Println Int(-99.8)     ' Returns -100.
Println Fix(-99.8)     ' Returns -99.
Println Int(-99.2)     ' Returns -100.
Println Fix(-99.2)     ' Returns -99.
```

**See Also**

- **Abs** function
- **Int** function
- **Round** function
Hex

Returns a string representing the hexadecimal value of a number.

**Hex**(number)

**Arguments**

The *number* argument is any valid expression that resolves to a positive or negative number. If *number* is a decimal fraction, it is truncated to a whole number before being evaluated.

**Description**

The *Hex* function converts a number from decimal (base 10) to hexadecimal (base 16). To convert a number from hexadecimal to decimal, represent hexadecimal numbers directly by preceding numbers in the proper range with &H For example, &H10 is the hexadecimal notation for decimal 16.

<table>
<thead>
<tr>
<th>If Number Is</th>
<th>Hex Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty</td>
<td>Zero (0).</td>
</tr>
<tr>
<td>Any other number</td>
<td>Up to eight hexadecimal characters.</td>
</tr>
</tbody>
</table>

**Examples**

The following example uses the *Hex* function to return the hexadecimal value of a decimal (base-10) number:

```plaintext
Println Hex(0)     ' Returns 0.
Println Hex(4)     ' Returns 4.
Println Hex(10)    ' Returns A.
Println Hex(16)    ' Returns 10.
Println Hex(459)   ' Returns 1CB.
```

The following example uses the &H prefix to return the decimal (base-10) value for a hexadecimal number:

```plaintext
Println &H000    ' Returns 0.
Println &H4      ' Returns 4.
Println &HA     ' Returns 10.
Println &H10    ' Returns 16.
```

**See Also**

- Oct function
Hour

Returns a whole number between 0 and 23, inclusive, representing the hour of the day.

**Hour**(time)

**Arguments**

The time argument is any expression that can represent a time. This includes a time value such as “12:30” or “1:27:55”, a time/date value such as “11/12/1999 12:33:00”, or a date value such as “11/12/1999”. If only a date is specified, the time defaults to 00:00:00. Fractional seconds are permitted, but ignored; they are truncated, not rounded.

**Examples**

The following example uses the **Hour** function to obtain the hour from the current time:

```plaintext
Dim MyTime, MyHour
MyTime = Now
MyHour = Hour(MyTime) ' MyHour contains the number representing the current hour.
Println MyHour
```

The following example returns an hour value of 13:

```plaintext
Dim MyHour
MyHour = Hour("13:59:59.999")
Println MyHour
```

**See Also**

- **Day** function
- **Minute** function
- **Now** function
- **Second** function
- **Time** function
### Increment

Atomically increments the value of a variable and returns the new value.

**Increment (varname[,change])**

#### Arguments

<table>
<thead>
<tr>
<th>varname</th>
<th>The name of the variable to be incremented (or decremented).</th>
</tr>
</thead>
<tbody>
<tr>
<td>change</td>
<td>Optional — A numeric that specifies by how much the value should be incremented. The value of change can be negative for decrements. This value can be a fractional number. If specified as 0 (zero), no increment or decrement occurs. If not specified, varname is incremented by 1.</td>
</tr>
</tbody>
</table>

#### Description

The virtual machine ensures that during the increment the variable is locked and after the increment unlocked. Because of the atomic nature of this function, this operation is very efficient especially in network environments.

#### Examples

The following example demonstrates the use of the **Increment** function:

```
^PersonRecords = 1000
NewPersId = Increment(^PersonRecords)
Println NewPersId 'prints 1001
NewPersId = Increment(^PersonRecords, 10)
Println NewPersId 'prints 1011
```

The following example demonstrates the use of the **Increment** function to decrement a number:

```
countdown = 10
While countdown > 0
    Println countdown
    countdown = Increment(countdown,-1)
Wend
    Println "Blast off!"
```

The following example demonstrates the use of the **Increment** function with a fractional value to represent successive sevenths of a circle:

```
angle = 0
sevenths = 51.428572
While angle < 360
    angle = Increment(angle,sevenths)
    Println angle," degrees"
Wend
```
InStr

Returns the position of the first occurrence of one string within another.

\[
\text{InStr}([\text{start},] \text{string1}, \text{string2}[, \text{compare}])
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>start</code></td>
<td><em>Optional</em> — Numeric expression that sets the starting position for each search. If omitted, search begins at the first character position. The <code>start</code> argument is required if <code>compare</code> is specified.</td>
</tr>
<tr>
<td><code>string1</code></td>
<td>String expression being searched.</td>
</tr>
<tr>
<td><code>string2</code></td>
<td>String expression being searched for.</td>
</tr>
<tr>
<td><code>compare</code></td>
<td><em>Optional</em> — Numeric value indicating the kind of comparison to use when evaluating substrings. See Description section for values. If omitted, a binary comparison is performed.</td>
</tr>
</tbody>
</table>

**Note:** The order of the arguments in the syntax for the `InStr` function is not the same as the `InStrRev` function syntax.

**Description**

The `InStr` function searches a string from left-to-right, and returns the location of the first occurrence of `string2` encountered. The location returned is a positive integer counting from left-to-right, with the first (leftmost) character of the string being location 1.

If the `start` value is equal to or less than the location of the first (leftmost) character of `string2`, `InStr` finds the first instance of `string2`, searching forwards from that point, and returns the location of the first (leftmost) character of `string2`. If the `start` value is greater than the location of the first (leftmost) character of `string2`, `InStr` returns 0. If the `start` value is omitted, `InStr` searches the entire string and returns the first `string2` location found. If the `start` value is greater than the `string1` length, `InStr` returns 0. If the `start` value is a negative number, `InStr` returns 0.

The `compare` argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>vbBinaryCompare</code></td>
<td>0</td>
<td>Perform a binary comparison.</td>
</tr>
<tr>
<td><code>vbTextCompare</code></td>
<td>1</td>
<td>Perform a textual comparison.</td>
</tr>
</tbody>
</table>

The `InStr` function returns the following values:

<table>
<thead>
<tr>
<th>Condition</th>
<th><code>InStr</code> Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>string1</code> is zero-length</td>
<td>0</td>
</tr>
<tr>
<td><code>string2</code> is zero-length</td>
<td><code>start</code></td>
</tr>
<tr>
<td><code>string2</code> is not found</td>
<td>0</td>
</tr>
<tr>
<td><code>string2</code> is found within <code>string1</code></td>
<td>Position at which match is found</td>
</tr>
<tr>
<td><code>start</code> &gt; <code>Length(string2)</code></td>
<td>0</td>
</tr>
</tbody>
</table>

**Examples**

The following examples use `InStr` to search a string:
Dim SearchString, SearchChar
SearchString = "XXpXXpXXPXXP"        ' String to search in.
SearchChar = "P"                    ' Search for "P".

Println Instr(4, SearchString, SearchChar, 1)

' A binary comparison starting at position 1. Returns 9.
Println Instr(1, SearchString, SearchChar, 0)

' Comparison is binary by default (last argument is omitted).
Println Instr(SearchString, SearchChar)    ' Returns 9.

' A binary comparison starting at position 1. Returns 0 ("W" is not found).
Println Instr(1, SearchString, "W")

The following example shows the use of the start argument.

Println "-1: ",InStr(-1,"abcdefg","bc")  ' Returns 2
Println "0: ",InStr(0,"abcdefg","bc")  ' Returns 2
Println "1: ",InStr(1,"abcdefg","bc")  ' Returns 2
Println "2: ",InStr(2,"abcdefg","bc")  ' Returns 2
Println "3: ",InStr(3,"abcdefg","bc")  ' Returns 0
Println "6: ",InStr(6,"abcdefg","bc")  ' Returns 0
Println "7: ",InStr(7,"abcdefg","bc")  ' Returns 0
Println "8: ",InStr(8,"abcdefg","bc")  ' Returns 0

See Also

• InStrRev function
InStrRev

Returns the position of the first occurrence of one string within another, searching from the end of string.

InStrRev(string1,string2[,start[,compare]])

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string1</td>
<td>String expression being searched.</td>
</tr>
<tr>
<td>string2</td>
<td>String expression being searched for.</td>
</tr>
<tr>
<td>start</td>
<td>Optional — An integer that sets the starting position for the reverse direction search. The start position is counted from left to right (counting from 1); the search is done from right to left. Thus you should specify a positive integer specifying a start position to the right of the expected location of string2. The start position can be the actual position of string2. To search the entire string, from right to left, specify -1. If start is omitted, -1 is the default.</td>
</tr>
<tr>
<td>compare</td>
<td>Optional — Numeric value indicating the kind of comparison to use when evaluating substrings. If omitted, a binary comparison is performed. See Description section for values.</td>
</tr>
</tbody>
</table>

Note: The order of the arguments in the syntax for the InStrRev function is not the same as the InStr function syntax.

Description

The InStrRev function searches a string from right-to-left, and returns the location of the first occurrence of string2 encountered. The location returned is a positive integer counting from left-to-right, with the first (leftmost) character of the string being location 1. The location returned specifies the beginning (leftmost) character of string2.

If the start value is equal to or greater than the location of the last (rightmost) character of string2, InStrRev finds the first instance of string2, searching backwards from that point, and returns the location of the first (leftmost) character of string2. If the start value is less than the location of the last (rightmost) character of string2, InStrRev returns 0. If the start value is -1 or omitted, InStrRev searches the entire string and returns the first string2 location found, searching backwards from the end of the string. If the start value is greater than the string1 length, InStrRev returns 0. If the start value is a negative number other than -1, InStrRev returns 0.

The compare argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbBinaryCompare</td>
<td>0</td>
<td>Perform a binary comparison.</td>
</tr>
<tr>
<td>vbTextCompare</td>
<td>1</td>
<td>Perform a textual comparison.</td>
</tr>
</tbody>
</table>

The InStrRev function returns the following values:

<table>
<thead>
<tr>
<th>Condition</th>
<th>InStr Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>string1 is zero-length</td>
<td>0</td>
</tr>
<tr>
<td>string2 is zero-length</td>
<td>start</td>
</tr>
<tr>
<td>string2 is not found</td>
<td>0</td>
</tr>
<tr>
<td>string2 is found within string1</td>
<td>Position at which match is found</td>
</tr>
<tr>
<td>start &gt; Len(string2)</td>
<td>0</td>
</tr>
</tbody>
</table>
Examples

The following examples use **InstrRev** to search a string:

```cachébasics
Dim SearchString, SearchChar, MyPos
SearchString = "XXpXXpXXPXXP" ' String to search in.
SearchChar = "P" ' Search for "P".

Println InstrRev(SearchString, SearchChar, 10, 0)

' A textual comparison starting at the last position. Returns 12.
Println InstrRev(SearchString, SearchChar, -1, 1)

' Comparison is binary by default (last argument is omitted). Returns 0.
Println InstrRev(SearchString, SearchChar, 8)
```

The following example shows the use of the **start** argument.

```cachébasics
Println ";-1: ",InstrRev("abcdefg","bc",-1) ' Returns 2
Println ";0: ",InstrRev("abcdefg","bc",0) ' Returns 0
Println ";1: ",InstrRev("abcdefg","bc",1) ' Returns 0
Println ";2: ",InstrRev("abcdefg","bc",2) ' Returns 0
Println ";3: ",InstrRev("abcdefg","bc",3) ' Returns 2
Println ";6: ",InstrRev("abcdefg","bc",6) ' Returns 2
Println ";7: ",InstrRev("abcdefg","bc",7) ' Returns 2
Println ";8: ",InstrRev("abcdefg","bc",8) ' Returns 0
```

See Also

- **Instr** function
Int

Returns the integer portion of a number.

\[ \text{Int}(\text{number}) \]

Arguments

The \textit{number} argument can be any valid numeric expression.

Description

\texttt{Int} removes the fractional part of \textit{number} and returns the resulting integer value. The \texttt{Int} and \texttt{Fix} functions are almost functionally identical:

For positive values, both \texttt{Int} and \texttt{Fix} truncate \textit{number}. If you wish to round a number to the nearest integer, use the \texttt{Round} function.

For negative values, \texttt{Int} returns the first negative integer less than or equal to \textit{number}. \texttt{Fix} returns the first negative integer greater than or equal to \textit{number}. For example, \texttt{Int} converts -8.4 to -9, and \texttt{Fix} converts -8.4 to -8.

Both \texttt{Int} and \texttt{Fix} remove leading zeros and plus signs from \textit{number}.

Examples

The following examples illustrate how the \texttt{Int} and \texttt{Fix} functions return integer portions of numbers:

\begin{verbatim}
Println Int(99.8)   ' Returns 99.
Println Fix(99.8)   ' Returns 99.
Println Int(+99.20) ' Returns 99.
Println Fix(+0099.2) ' Returns 99.
Println Int(0.00)   ' Returns 0.
Println Fix(0.00)   ' Returns 0.
Println Int(-99.8)  ' Returns -100.
Println Fix(-99.8)  ' Returns -99.
Println Int(-99.2)  ' Returns -100.
Println Fix(-99.2)  ' Returns -99.
\end{verbatim}

See Also

- \texttt{Abs} function
- \texttt{Fix} function
- \texttt{Round} function
IsObject

Returns a value indicating whether an expression references a valid Automation object.

IsObject(expression)

Arguments

The expression argument can be any kind of expression (such as a numeric or string expression).

Description

<table>
<thead>
<tr>
<th>Expression Evaluates To</th>
<th>IsObject Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>valid Object Reference</td>
<td>1</td>
</tr>
<tr>
<td>invalid Object Reference</td>
<td>−1</td>
</tr>
<tr>
<td>not an Object Reference</td>
<td>0</td>
</tr>
</tbody>
</table>

IsObject returns a −1 value if expression is a reference to an invalid object. Invalid objects should not occur in normal operations; an invalid object could be caused, for example, by recompiling the class while instances of the class are active.

Examples

The following example uses the IsObject function to determine if an identifier represents an object variable:

```basic
o = New Sample.Person
Println IsObject(o)         ' Returns 1.
Println IsObject("hello")  ' Returns 0.
o = ""
Println IsObject(o)         ' Returns 0.
```

See Also

- New statement
- OpenId statement
Join

Returns a string created by joining a number of array elements.

\[
\text{Join}(\text{list}[,\text{delimiter}])
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list</td>
<td>A one-dimensional array containing substrings to be joined.</td>
</tr>
<tr>
<td>delimiter</td>
<td>Optional — String character used to separate the substrings in the returned string. Usually a single character, but can be a multi-character string. If omitted, the space character (&quot; &quot;) is used. If delimiter is a zero-length string, all items in the list are concatenated with no delimiters.</td>
</tr>
</tbody>
</table>

**Description**

The \texttt{Join} function joins array elements into a string. The \texttt{Split} function does the opposite; it splits a string into array elements.

The array elements in \textit{list} must be one-dimensional (for example, A(1), A(6), etc.). Elements are returned in ascending numeric order; elements do not have to be sequential.

**Examples**

The following example uses the \texttt{Join} function to join the substrings of MyArray. By default, it supplies blank spaces between elements.

```
Dim MyString, MyString2
Dim MyArray
MyArray(0) = "Mr."
MyArray(1) = "John"
MyArray(2) = "Doe"
MyArray(3) = "III"
Println Join(MyArray)   ' Returns "Mr. John Doe III".
```

The following example demonstrates the \textit{delimiter} argument. The first \texttt{Join} function specifies a empty string; resulting in concatenated elements. The second \texttt{Join} function specifies a single-character delimiter. The third \texttt{Join} function specifies a multi-character delimiter.

```
Dim MyString, MyString2
Dim MyArray
MyArray(0) = "Mr."
MyArray(1) = "John"
MyArray(2) = "Doe"
Println Join(MyArray,"")   ' Returns "Mr. John Doe III".
Println Join(MyArray,"^")   ' Returns "Mr.^John^Doe^III".
Println Join(MyArray,"^x^")   ' Returns "Mr.^x^John^x^Doe^x^III".
```

The following example demonstrate non-sequential array elements:

```
Dim MyString, MyString2
Dim MyArray
MyArray(6) = "Mr."
MyArray(4) = "John"
MyArray(3) = "Doe"
MyArray(7) = "III"
Println Join(MyArray,",")   ' Returns "Doe,John,Mr.,III".
```

**See Also**

- \texttt{Split} function
LCase

Returns a string that has been converted to lowercase.

LCase(string)

Arguments

The string argument is any valid string expression.

Description

Only uppercase letters are converted to lowercase. Lowercase letters and non-letter characters remain unchanged.

Examples

The following example uses the LCase function to convert uppercase letters to lowercase:

Dim MyString
MyString = "Caché from InterSystems"
Println LCase(MyString) ' Returns "caché from intersystems"

The following example converts the first four letters of the Greek alphabet from uppercase to lowercase:

Dim MyString
MyString = Chr(913)&Chr(914)&Chr(915)&Chr(916)
Println MyString
Println LCase(MyString)

(Note that the above example requires a Unicode installation of Caché.)

See Also

• UCcase function
Left

Returns or replaces a specified number of characters from the left end of a string.

\[
\text{Left}(\text{string, length})\\
\text{Left}(\text{string, length})=\text{value}
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>String expression from which the leftmost characters are returned.</td>
</tr>
<tr>
<td>length</td>
<td>Numeric expression that evaluates to a positive integer indicating how many characters from the beginning of ( \text{string} ) to return or replace. Fractional numbers are truncated to an integer. If ( \text{length} ) is 0 or a negative number, Left returns a zero-length string (&quot;&quot;). If ( \text{length} ) is 0 or a negative number, Left performs no replacement. If ( \text{length} ) is greater than or equal to the number of characters in ( \text{string} ), the entire string is returned (or replaced). No padding is performed.</td>
</tr>
<tr>
<td>value</td>
<td>The value used to replace the specified character(s) at the beginning of ( \text{string} ). An expression that evaluates to a string.</td>
</tr>
</tbody>
</table>

**Description**

The **Left** function can be used in two ways:

- To return a substring from the beginning (left end) of \( \text{string} \). This uses the Left(\text{string, length}) syntax.
- To replace a substring from the beginning (left end) of \( \text{string} \). The replacement substring may be the same length, longer, or shorter than the original substring. This uses the Left(\text{string, length})=value syntax.

\( \text{Left}(\text{string, length}) \) returns the leftmost character(s) of \( \text{string} \). The \( \text{length} \) argument specifies how many characters of \( \text{string} \) to return. If \( \text{length} \) is 0 or a negative number, Left returns the empty string (""). If you specify a \( \text{length} \) greater than the length of \( \text{string} \), the entire string is returned.

\( \text{Left}(\text{string, length})=\text{value} \) replaces the leftmost character(s) of \( \text{string} \) with \( \text{value} \). The \( \text{length} \) argument specifies how many characters of \( \text{string} \) to replace. If \( \text{length} \) is 0 or a negative number, \( \text{string} \) is unchanged. This is true even when \( \text{string} \) is the empty string ("""). If \( \text{length} \) is greater than the length of \( \text{string} \), \( \text{string} \) is replaced by \( \text{value} \).

To determine the number of characters in \( \text{string} \), use the **Len** function.

The **Right** function returns (or replaces) the specified number of characters from the end (right end) of a string. The **Mid** function returns (or replaces) the specified number of characters from a specified starting point within a string.

**Examples**

The following example uses the **Left** function to return the first three characters of \( \text{mystr} \), the first 99 characters (in this case, all of the characters), and the first 0 characters:

```basic
Dim mystr
mystr = "InterSystems"
Println "length 3:" , Left(mystr,3) ' Returns "Int"
Println "length 99:" , Left(mystr,99) ' Returns "InterSystems"
Println "length 0:" , Left(mystr,0)  ' Returns ""
```

The following example uses the **Left** function to replace the first three characters of \( \text{mystr} \) with a five-character string:

```basic
Dim mystr
mystr = "NtrSystems"
Println mystr
Left(mystr,3)="Inter"
Println mystr
```

Caché Basic Reference
The following example deletes (replaces with the null string) the first three characters of mystr:

```cachébasic
Dim mystr
mystr = "NtrSystems"
PrintLn mystr
Left(mystr,3)="
PrintLn mystr
```

The following example replaces all of the characters of mystr, because length is greater than the length of mystr:

```cachébasic
Dim mystr
mystr = "Oracle"
PrintLn mystr
Left(mystr,99)="InterSystems"
PrintLn mystr
```

The following example shows that length=0 has no effect on mystr:

```cachébasic
Dim mystr
Dim empstr
mystr = "InterSystems"
empstr = ""
PrintLn mystr
Left(mystr,0)="Bongo"
PrintLn "string out:",mystr
Left(empstr,0)="BongoSystems"
PrintLn "string out:",empstr
```

**See Also**

- **Len** function
- **Mid** function
- **Right** function
Len

Returns the number of characters in a string or the number of bytes required to store a variable.

**Len**(string | varname [,delimiter])

**Arguments**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>Any valid string expression.</td>
</tr>
<tr>
<td>varname</td>
<td>Any valid variable name.</td>
</tr>
</tbody>
</table>
| delimiter | Optional — A valid string expression which demarcates separate substrings in the target string. If the delimiter is specified but is not part of the string, the Len function returns 1.

**Description**

The **Len** function returns the number of characters in a specified string or in the value of a specified variable. Numbers are converted to canonical form, with leading and trailing zeroes and plus signs removed. An empty string (""") returns a length of 0. An undefined variable returns a length of 0.

**Examples**

The following example uses the **Len** function to return the number of characters in a string:

```cache
Println Len("InterSystems") ' Returns 12
Println Len(+0099.900)        ' Returns 4
Println Len(“0099.900”)       ' Returns 8
Println Len("")              ' Returns 0
```

The following example uses the **Len** function to return the number bytes required to store a variable.

```cache
x = 0099.900
y = Now
Println Len(x)        ' Returns 4
Println Len(y)        ' Returns 21: ' mm/dd/yyyy 00:00:00PM
Println Len(z)        ' Returns 0
```

The following example uses the **Len** function to return the number of substrings delimited by the "/" character in a string:

```cache
Dim MyPieces
MyPieces = Len("09/02/1994", "/") 'MyPieces contains 3
Println MyPieces," pieces of the string"
```

**See Also**

- **InStr** function
- **Piece** function
Returns elements from a list.

**List**\(\text{(list[,position[,end]])}\)

**List**\(\text{(list[,position[,end]])}=\text{value}\)

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>list</strong></td>
<td>An expression that evaluates to a valid list. A Caché list must be created using \text{ListBuild} or \text{ListFromString}, or extracted from another list using \text{List}.</td>
</tr>
<tr>
<td><strong>position</strong></td>
<td>Optional — An integer that specifies the position of the list element to return, or the beginning of a sublist range if \text{end} is specified. Specify an expression that evaluates to a non-zero positive integer. You can use (-1) to specify the last element in the list. If \text{position} is not specified, it defaults to 1 (the first element in \text{list}).</td>
</tr>
<tr>
<td><strong>end</strong></td>
<td>Optional — An integer that specifies the position of the list element which is the final element in the sublist range. Specify an expression that evaluates to an integer. Use (-1) to specify the last element in the list.</td>
</tr>
</tbody>
</table>

**Description**

\text{List} returns elements from a list. The elements returned depend on the specified arguments.

- \text{List(list)} returns the first element string in the list.
- \text{List(list,position)} returns the element indicated by the specified position. The \text{position} argument must evaluate to an integer. List elements are numbered beginning with 1.
- \text{List(list,position,end)} returns a “sublist” containing the elements of the list from the specified start \text{position} through the specified \text{end} position, inclusive.

You can also use \text{ListNext} to sequentially return elements from a list.

**Arguments**

\text{list}

An encoded list string containing one or more elements. Lists can be created using \text{ListBuild} or \text{ListFromString}, or extracted from another list by using the \text{List} function. The following are valid \text{list} arguments:

```caché
myList = ListBuild("Red", "Blue", "Green", "Yellow")
Println List(myList, 2) 'prints Blue
subList = List(myList,2,4)
Println List(subList, 2) 'prints Green
```

In the following example, \text{subList} is not a valid \text{list} argument, because a \text{List} returns a single element as an ordinary string, not an encoded list string:

```caché
myList = ListBuild("Red", "Blue", "Green", "Yellow")
subList = List(myList,2)
Println List(subList,1) ' INVALID OPERATION
```

Attempting to use the \text{List} function on an ordinary string generates a runtime error.
position

The position of a list element to return. List elements are counted from 1. If position is omitted, the first element is returned.

If the value of position is 0 or greater than the number of elements in the list, Caché issues a <NULL VALUE> error. If the value of position is negative one (–1), List returns the final element in the list.

If the end argument is specified, position specifies the first element in a range of elements. Even when only one element is returned (when position and end are the same number) this value is returned as an encoded list string. Thus, List(x,2) is not identical to List(x,2,2), as shown in the following example:

```
MyList = ListBuild("A","B","C")
x = List(MyList,2)
y = List(MyList,2,2)
If x=y Then
    Println "Lists are identical"
Else
    Println "Lists not identical"
End If
```

end

The position of the last element in a range of elements. You must specify position to specify end. When end is specified, the value returned is an encoded list string. Because of this encoding, such strings should only be processed by other List functions.

If the value of end is:

- greater than position, an encoded string containing a list of elements is returned.
- equal to position, an encoded string containing the one element is returned.
- less than position, the null string ("") is returned.
- greater than the number of elements in list, it is equivalent to specifying the final element in the list.
- negative one (–1), it is equivalent to specifying the final element in the list.

When specifying end, you can specify a position value of zero (0). In this case, 0 is equivalent to 1.

Note that List(list,1) is not equivalent to List(list,1,1) because the former returns a string, while the latter returns a single-element list. Furthermore, the first can receive a <NULL VALUE> error, whereas the second cannot; if there are no elements to return, it returns a null string.

```
fruit = ListBuild("apple","banana","pear")
PrintLn List(fruit,1)
PrintLn List(fruit,1,1)
```

List Errors

The following List argument values generate an error:

- If the list parameter does not evaluate to a valid list, List generates a <LIST> error. You can use the ListValid function to determine if a list is valid.
- If the list parameter evaluate to a valid list that contains a null value, or concatenates a list and a null value, List generates a <NULL VALUE> error. All of the following are valid lists (according to ListValid) for which List generate a <NULL VALUE> error:

```
PrintLn List(""
PrintLn List(ListBuild())
PrintLn LIST(ListBuild(NULL))
PrintLn LIST(ListBuild(,))
PrintLn LIST(ListBuild()) & ListBuild("a","b","c")
```

- If the position parameter is 0 or a fractional number less than 1 and no end parameter is used, List generates a <NULL VALUE> error.
• If the value of the *position* parameter refers to a nonexistent list member and no *end* parameter is used, **List** generates a <NULL VALUE> error.

• If the value of the *position* parameter identifies an element with an undefined value, and no *end* parameter is used, **List** generates a <NULL VALUE> error.

• If the value of the *position* parameter or the *end* parameter is less than -1, **List** generates a <RANGE> error.

**Setting List**

You can use **List** on the left of the equal sign to replace a specified element in a list with another element value. You can perform the following operations:

• Replace one element value with a new value:

```csharp
fruit = ListBuild("apple","banana","pear")
PrintLn List(fruit,2)
List(fruit,2) = "orange"
PrintLn List(fruit,2)
```

• Replace a range of element values with the same number of new values:

```csharp
fruit = ListBuild("apple","peach","pear","plum")
PrintLn List(fruit,2), " ", List(fruit,3)
List(fruit,2,3) = ListBuild("orange","banana","peach")
PrintLn List(fruit,2), " ", List(fruit,3)
```

• Replace a range of element values with a larger or smaller number of new values:

```csharp
fruit = ListBuild("apple","pear","plum","tangerine")
PrintLn List(fruit,2), " ", List(fruit,3), " ", List(fruit,4)
List(fruit,2,3) = ListBuild("orange")
PrintLn List(fruit,2), " ", List(fruit,3), " ", List(fruit,4), " ", List(fruit,5)
```

• Remove an element or a range of element values:

```csharp
fruit = ListBuild("apple","pear","plum","tangerine")
PrintLn List(fruit,2), " ", List(fruit,3), " ", List(fruit,4)
List(fruit,2,3)="
PrintLn List(fruit,2)
```

To replace the final element in a list use a *position* of -1. Note that **List(inlint,-1)=value** and **List(inlint,-1,-1)=value** perform different operations: **List(inlint,-1)=value** replaces the value of the last element; **List(inlint,-1,-1)=value** deletes the last element, then appends the specified list.

To remove the final element of a list, use **List(inlint,-1,-1)=""**.

**Examples**

The following examples demonstrates how to use the **List** function:

```csharp
myList = ListBuild("Red","Blue","Green","Yellow")
color4 = List(myList,4) ′ returns value of the 4th element
PrintLn color4 ′ prints Yellow
 subscript = List(myList,2,3) ′ returns the 2nd and 3rd elements as a list
PrintLn List(subscript,1) ′ prints Blue
```

Because multi-element lists contain non-printing list encoding characters, **PrintLn** should only be used to display single list items.

**See Also**

• **ListBuild** function

• **ListExists** function
• ListFind function
• ListFromString function
• ListGet function
• ListLength function
• ListNext function
• ListSame function
• ListToString function
• ListValid function
ListBuild

Creates a list of elements.

\[
\text{ListBuild}(\text{element[,element][,element][...])}
\]

Arguments

| element | Any expression or comma-separated list of expressions. To include a comma within an element, make the element a quoted string. |

Description

ListBuild takes one or more expressions and returns a list with one element for each expression.

Omitting an element expression yields an element whose value is undefined. For example, the following ListBuild statement produces a three-element list whose second element has an undefined value; referencing the second element with the List function will produce a Null Value error.

\[
\text{Println \ List(ListBuild("Red",,"Green"),2)}
\]

Invoking the ListBuild function with no arguments returns a list with one element whose data value is undefined.

An element of a list may itself be a list. For example, the following statement produces a three-element list whose third element is the two-element list, “Walnut,Pecan”: 

\[
\text{MyList = ListBuild("Apple","Pear",ListBuild("Walnut","Pecan"))}
\]

\[
\text{Println \ List(MyList,3)}
\]

Note that multi-element lists contain non-printing list encoding characters.

The result of concatenating two lists with the Binary Concatenate operator is another list. For example, the following two ListBuild statements produce the same list, “A,B,C”:

\[
x = \text{ListBuild("A","B") \ & \ ListBuild("C")}
\]

\[
y = \text{ListBuild("A","B","C")}
\]

\[
\text{If \ x=y \ Then}
\]

\[
\text{Println \ "Lists are identical"}
\]

\[
\text{Else}
\]

\[
\text{Println \ "Lists not identical"}
\]

\[
\text{End If}
\]

However, concatenating a string to a list does not create a valid list.

ListBuild uses an optimized binary representation to store data elements. For this reason, equivalency tests may not work as expected with some list data. Data that might, in other contexts, be considered equivalent, may have a different internal representation. For example, ListBuild(1) is not equal to ListBuild(“1”). This is shown in the following example:

\[
x = \text{ListBuild("1","2")}
\]

\[
y = \text{ListBuild(1,2)}
\]

\[
\text{If \ x=y \ Then}
\]

\[
\text{Println \ "Lists are identical"}
\]

\[
\text{Else}
\]

\[
\text{Println \ "Lists not identical"}
\]

\[
\text{End If}
\]

A Caché list can also be created using the ListFromString function, or extracted from another list using the List function.

Examples

The following examples demonstrates how to use the ListBuild function:
myList = ListBuild("Red","Blue","Green","Yellow")
color4 = List(myList,4) 'returns value of the 4th element
Println color4
sublist = List(myList,2,3) 'returns the 2nd and 3rd elements as a list
Println List(sublist,1) 'prints Blue

Because multi-element lists contain non-printing list encoding characters, Println should only be used to display single list items.

See Also

- List function
- ListExists function
- ListFind function
- ListFromString function
- ListGet function
- ListLength function
- ListNext function
- ListSame function
- ListToString function
- ListValid function
ListExists

Indicates whether an element is present in the list and has a value.

```
ListExists(list,position)
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list</td>
<td>An expression that evaluates to a valid list. A Caché list must be created using <code>ListBuild</code> or <code>ListFromString</code>, or extracted from another list using <code>List</code>.</td>
</tr>
<tr>
<td>position</td>
<td>An integer specifying a position in <code>list</code> (counting from 1).</td>
</tr>
</tbody>
</table>

**Description**

The `ListExists` function returns a value of 1 if the element at the indicated `position` in the list exists and has a data value. Otherwise `ListExists` returns zero.

**Examples**

The following example demonstrates the `ListExists` function. It defines a six-element list, in which the third and fourth elements do not have a defined value:

```plaintext
Erase Y ' Y is now undefined
myList = ListBuild("Red","Blue",Y,"Yellow","")
Println ListExists(myList,0) ' 0: positions are numbered from 1
Println ListExists(myList,1) ' 1: "Red"
Println ListExists(myList,2) ' 1: "Blue"
Println ListExists(myList,3) ' 0: missing element
Println ListExists(myList,4) ' 0: undefined element
Println ListExists(myList,5) ' 1: "Yellow"
Println ListExists(myList,6) ' 1: empty string OK
Println ListExists(myList,7) ' 0: beyond end of list
Println ListExists(myList,-1) ' 1: last element in list
```

**See Also**

- List function
- ListBuild function
- ListFind function
- ListFromString function
- ListGet function
- ListLength function
- ListNext function
- ListSame function
- ListToString function
- ListValid function
ListFind

Finds an element in a list.

**ListFind(list,value[,startafter])**

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list</td>
<td>An expression that evaluates to a valid list. A Caché list must be created using <code>ListBuild</code> or <code>ListFromString</code>, or extracted from another list using <code>List</code>.</td>
</tr>
<tr>
<td>value</td>
<td>An expression which evaluates to the value of the element to find.</td>
</tr>
<tr>
<td>startafter</td>
<td>Optional — An expression interpreted as a list position. The search starts with the element after this position.</td>
</tr>
</tbody>
</table>

**Description**

The `ListFind` function searches the specified `list` for the first instance of the requested `value`. The search begins with the element after the position indicated by the `startafter` argument. If you omit the `startafter` argument, `ListFind` assumes a `startafter` value of 0 and starts the search with the first element. If the value is found, `ListFind` returns the position of the first matching element. If the value is not found, `ListFind` returns zero (0). The `ListFind` function will also return a 0 if the value of the `startafter` argument refers to a nonexistent list member.

The `ListFind` function only matches complete elements. Thus, the following example returns 0 because no element of the list is equal to the string “B”, though all of the elements contain “B”:

```caché
mylist = ListBuild("ABC","BCD","BBB")
Println ListFind(mylist,"B")
```

**Examples**

The following example demonstrates how to use the `ListFind` function:

```caché
myList = ListBuild("Red", "Blue", "Green", "Yellow","Green")
Println ListFind(myList,"Green")   ' prints 3
Println ListFind(myList,"Green",3) ' prints 3
Println ListFind(myList,"Red")    ' prints 1
Println ListFind(myList,"Red",1)  ' prints 0 (not found)
```

**See Also**

- `List` function
- `ListBuild` function
- `ListExists` function
- `ListFromString` function
- `ListGet` function
- `ListLength` function
- `ListNext` function
- `ListSame` function
- `ListToString` function
- `ListValid` function
ListFromString

Creates a list from a string.

ListFromString(string[, delimiter])

**Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>A string to be converted into a Caché list. This string contains one or more elements, separated by a <em>delimiter</em>. The <em>delimiter</em> does not become part of the resulting Caché list.</td>
</tr>
<tr>
<td>delimiter</td>
<td><em>Optional</em> — The delimiter used to separate substrings (elements) in <em>string</em>. Specify <em>delimiter</em> as a quoted string. If no <em>delimiter</em> is specified, the default is the comma (,) character.</td>
</tr>
</tbody>
</table>

**Description**

ListFromString takes a quoted string containing delimited elements and returns a list. A list represents data in an encoded format which does not use delimiter characters. Thus a list can contain all possible characters, and is ideally suited for bitstring data. Lists are handled using the Caché Basic List functions.

A Caché list can also be created using the ListBuild function, or extracted from another list using the List function.

**Parameters**

**string**

A string literal (enclosed in quotation marks), a numeric, or a variable or expression that evaluates to a string. This string can contain one or more substrings (elements), separated by a *delimiter*. The string data elements must not contain the *delimiter* character (or string), because the *delimiter* character is not included in the output list.

**delimiter**

A character (or string of characters) used to delimit substrings within the input string. It can be a numeric or string literal (enclosed in quotation marks), the name of a variable, or an expression that evaluates to a string.

Commonly, a delimiter is a designated character which is never used within string data, but is set aside solely for use as a delimiter separating substrings. A delimiter can also be a multi-character string, the individual characters of which can be used within string data.

If you specify no delimiter, the default delimiter is the comma (,) character. You cannot specify a null string (""") as a delimiter.

**Example**

The following example takes a string containing names that are separated by blank spaces, and creates a list:

```c
namestring="Deborah Noah Martha Bowie"
namelist=ListFromString(namestring," ")
Println "1st element: ",List(namelist,1)
Println "2nd element: ",List(namelist,2)
Println "3rd element: ",List(namelist,3)
```

The blank spaces are the string *delimiter* and are not included in the newly created list.

The following example takes a string containing names that are separated by a <sp> delimiter, and creates a list:

```c
namestring="Deborah<sp>Noah<sp>Martha<sp>Bowie"
namelist=ListFromString(namestring,"<sp>"
Println "1st element: ",List(namelist,1)
Println "2nd element: ",List(namelist,2)
Println "3rd element: ",List(namelist,3)
```
The following example uses the default delimiter (a comma) and creates a list. Note that the second element of this list contains no value:

```csharp
namestring="Deborah,,Noah,Martha"
namelist=ListFromString(namestring)
Println "1st element: ",List(namelist,1)
Println "2nd element: ",List(namelist,2)
Println "3rd element: ",List(namelist,3)
```

**See Also**

- List function
- ListBuild function
- ListExists function
- ListFind function
- ListGet function
- ListLength function
- ListNext function
- ListSame function
- ListToString function
- ListValid function
- Piece function
ListGet

Returns an element from a list.

ListGet(list[,position[,default]])

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list</td>
<td>An expression that evaluates to a valid list. A Caché list must be created using ListBuild or ListFromString, or extracted from another list using List.</td>
</tr>
<tr>
<td>position</td>
<td>Optional — An integer specifying the position of the element (counting from 1).</td>
</tr>
<tr>
<td>default</td>
<td>Optional — An expression that provides the value to return if the list element has an undefined value.</td>
</tr>
</tbody>
</table>

Description

ListGet returns the requested element in the specified list. If the value of position refers to a nonexistent member or identifies an element with an undefined value, the specified default value is returned.

The ListGet function is identical to the one- and two-argument forms of the List function except that, under conditions that would cause List to produce a <NULL VALUE> error, ListGet returns a default value. See the description of the List function for more information on conditions that return <NULL VALUE> errors.

Arguments

position

An integer that specifies the target list element. If it is omitted, the function defaults to examine the first element of the list. If the value of position is -1, ListGet examines the last element of the list.

default

Supplies a default value to return when the element has no value. For example, an omitted element (1,,3) or an undefined variable (1,x,3). The default is not returned for an empty (zero-length) string value. If you omit the default argument, a zero-length string is assumed for the default value.

Examples

The following example demonstrates how to use the ListGet function:

myList = ListBuild("Red","Blue",,"Yellow")
Println ListGet(myList)  ' prints Red
Println ListGet(myList,2,"White")  ' prints Blue
Println ListGet(myList,3,"White")  ' prints White

The following example shows the difference between an undefined value and an empty string value:

myList = ListBuild("Red","","Yellow")
Println "Empty: ",ListGet(myList,2,"White")  ' prints empty string
Println "Default: ",ListGet(myList,3,"White")  ' prints White

See Also

- List function
- ListBuild function
- ListExists function
• ListFind function
• ListFromString function
• ListLength function
• ListNext function
• ListSame function
• ListToString function
• ListValid function
ListLength

Returns the number of elements in a list.

**ListLength(list)**

**Arguments**

| list | An expression that evaluates to a valid list. A Caché list must be created using **ListBuild** or **ListFromString**, or extracted from another list using **List**. The null string ("") is also treated as a valid list. |

**Description**

**ListLength** returns the number of elements in list. It counts all elements in a list, regardless of whether the element has a data value.

**Examples**

The following example demonstrates how to use the **ListLength** function:

```caché
myList = ListBuild("Red","Blue","Green","Yellow")
Println ListLength(myList) 'prints 4
```

The following example shows that **ListLength** counts all list elements:

```caché
GapList = ListBuild("Red", "Green", "Yellow")
UndefVarList = ListBuild("Red",x, "Green", "Yellow")
NullStrList = ListBuild("Red",",", "Green", "Yellow")
Println ListLength(GapList) ' prints 4
Println ListLength(UndefVarList) ' prints 4
Println ListLength(NullStrList) ' prints 4
```

The following example shows how **ListLength** handles the null string and a list containing only a null string element:

```caché
Println ListLength("") ' prints 0
NullList = ListBuild("")
Println ListLength(NullList) ' prints 1
```

**See Also**

- **List** function
- **ListBuild** function
- **ListExists** function
- **ListFind** function
- **ListFromString** function
- **ListGet** function
- **ListNext** function
- **ListSame** function
- **ListToString** function
- **ListValid** function
ListNext

Retrieves elements sequentially from a list.

ListNext (list, ptr, value)

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list</td>
<td>An expression that evaluates to a valid list. A Caché list must be created using ListBuild or ListFromString, or extracted from another list using List.</td>
</tr>
<tr>
<td>ptr</td>
<td>A pointer to the next element in the list. You must specify ptr as a local variable initialized to 0 to point to the beginning of list. Caché increments ptr using an internal address value algorithm (not a predictable integer counter). Therefore, the only value you can use to set ptr is 0. ptr cannot be a global variable or a subscripted variable.</td>
</tr>
<tr>
<td>value</td>
<td>A local variable used to hold the data value of a list element. value does not have to be initialized before invoking ListNext. value cannot be a global variable or a subscripted variable.</td>
</tr>
</tbody>
</table>

Description

ListNext sequentially returns elements from list. You initialize ptr to 0 before the first invocation of ListNext. This causes ListNext to begin returning elements from the beginning of the list. Each successive invocation of ListNext advances ptr and returns the next list element value to value. The ListNext function returns 1, indicating that a list element has been successfully retrieved.

When ListNext reaches the end of the list, it returns 0, resets ptr to 0, and leaves value unchanged from the previous invocation. Because ptr has been reset to 0, the next invocation of ListNext would start at the beginning of the list.

Caché Basic increments ptr using an internal address algorithm. Therefore, the only value you should use to set ptr is 0.

You can use ListValid to determine if list is a valid list. An invalid list causes ListNext to generate a <LIST> error.

Not all lists validated by ListValid can be used successfully with ListNext. When ListNext encounters a list element with a null value, it returns 1 indicating that a list element has been successfully retrieved, advances ptr to the next element, and resets value to be an undefined variable. This can happen with any of the following valid lists: value=ListBuild(), value=ListBuild(NULL), value=ListBuild(,), or when encountering an omitted list element, such as the second invocation of ListNext on value=ListBuild("a", "b").

ListNext ("", ptr, value) returns 0, and does not advance the pointer or set value.
ListNext (ListBuild(""), ptr, value) returns 1, advances the pointer, and set value to the null string (""").

ListNext and Nested Lists

The following example returns three elements, because ListNext does not recognize the individual elements in nested lists:

```cachébasic
mylist = ListBuild("Apple", "Pear", ListBuild("Walnut", "Pecan"))
ptr = 0
count = 0
While ListNext (mylist, ptr, value)
    count = count + 1
    PrintLn value
Wend
PrintLn "End of list: ", count, " elements found"
```

Examples

The following example sequentially returns all the elements in the list:
mylist = ListBuild("Red","Blue","Green")
ptr = 0
count = 0
While ListNext(mylist,ptr,value)
    count = count+1
    PrintLn value
Wend
PrintLn "End of list: ",count," elements found"

See Also

- List function
- ListBuild function
- ListExists function
- ListFind function
- ListFromString function
- ListGet function
- ListLength function
- ListSame function
- ListToString function
- ListValid function
**ListSame**

Compares two lists and returns a boolean value.

```
ListSame(list1, list2)
```

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list1</td>
<td>An expression that evaluates to a valid list. A Caché list must be created using <code>ListBuild</code> or <code>ListFromString</code>, or extracted from another list using <code>List</code>. The null string (&quot;&quot;) is also treated as a valid list.</td>
</tr>
<tr>
<td>list2</td>
<td>An expression that evaluates to a valid list. A Caché list must be created using <code>ListBuild</code> or <code>ListFromString</code>, or extracted from another list using <code>List</code>. The null string (&quot;&quot;) is also treated as a valid list.</td>
</tr>
</tbody>
</table>

### Description

`ListSame` compares the contents of two lists and returns 1 if the lists are identical. If the lists are not identical, `ListSame` returns 0. `ListSame` compares list elements using their string representations. `ListSame` comparisons are case-sensitive.

`ListSame` compares the two lists element-by-element in left-to-right order. Therefore `ListSame` returns a value of 0 when it encounters the first non-identical pair of list elements; it does not check subsequent items to determine if they are valid list elements. If a `ListSame` comparison encounters an invalid item, it issues a `<LIST>` error.

### Examples

The following example returns 1, because the two lists are identical:

```
x = ListBuild("Red","Blue","Green")
y = ListBuild("Red","Blue","Green")
PrintLn ListSame(x,y)
```

The following example returns 0, because the two lists are not identical:

```
x = ListBuild("Red","Blue","Yellow")
y = ListBuild("Red","Yellow","Blue")
PrintLn ListSame(x,y)
```

### Identical Lists

`ListSame` considers two lists to be identical if the string representations of the two lists are identical.

When comparing a numeric list element and a string list element, the string list element must represent the numeric in canonical form; this is because Caché always reduces numerics to canonical form before performing a comparison. In the following example, `ListSame` compares a string and a numeric. The first three `ListSame` functions return 1 (identical); the fourth `ListSame` function returns 0 (not identical) because the string representation is not in canonical form:

```
PrintLn ListSame(ListBuild("365"), ListBuild(365))
PrintLn ListSame(ListBuild("365"), ListBuild(365.0))
PrintLn ListSame(ListBuild("365.5"), ListBuild(365.5))
PrintLn ListSame(ListBuild("365.0"), ListBuild(365.0))
```

`ListSame` comparison is not the same equivalence test as the one used by other list operations, which test using the internal representation of a list. This distinction is easily seen when comparing a number and a numeric string, as in the following example:
The equality (=) comparison tests the internal representations of these lists (which are not identical). **ListSame** performs a string conversion on both lists, compares them, and finds them identical.

The following example shows two lists with various representations of numeric elements. **ListSame** considers these two lists to be identical:

```plaintext
x = ListBuild("360","361","362","363","364","365","366")
y = ListBuild(00360.000,(19*19),+"362",363,364.0,+365,"3" & "66")
PrintLn ListSame(x,y)," lists are identical"
```

**Null String and Null List**

A list containing the null string (an empty string) as its sole element is a valid list. The null string by itself is also considered a valid list. However these two (a null string and a null list) are not considered identical, as shown in the following example:

```plaintext
PrintLn ListSame(ListBuild(""),ListBuild(""))," null lists"
PrintLn ListSame("","")," null strings"
PrintLn ListSame(ListBuild(""),"")," null list and null string"
```

Normally, a string is not a valid **ListSame** argument, and **ListSame** issues a <LIST> error. However, the following **ListSame** comparisons complete successfully and return 0 (values not identical). The null string and the string “abc” are compared and found not to be identical. These null string comparisons do not issue a <LIST> error:

```plaintext
PrintLn ListSame("","abc")
PrintLn ListSame("abc","")
```

The following **ListSame** comparisons do issue a <LIST> error, because a list (even a null list) cannot be compared with a string:

```plaintext
x = ListBuild("")
PrintLn ListSame("abc",x)
PrintLn ListSame(x,"abc")
```

**Comparing “Empty” Lists**

**ListValid** considers all of the following as valid lists:

```plaintext
PrintLn ListValid("")
PrintLn ListValid(ListBuild())
PrintLn ListValid(ListBuild(NULL))
PrintLn ListValid(ListBuild(""))
PrintLn ListValid(ListBuild(Chr(0)))
PrintLn ListValid(ListBuild(,))
```

**ListSame** considers only the following pairs as identical:

```plaintext
PrintLn ListSame(ListBuild(),ListBuild(NULL))
PrintLn ListSame(ListBuild(),ListBuild(NULL,NULL))
PrintLn ListSame(ListBuild(),ListBuild() & ListBuild())
```

**Empty Elements**

A **ListBuild** can create empty elements by including extra commas between elements or appending one or more commas to either end of the element list. **ListSame** is aware of empty elements, and does not treat them as equivalent to null string elements.
The following **ListSame** examples all return 0 (not identical):

```
PrintLn ListSame(ListBuild(365,,367),ListBuild(365,367))
PrintLn ListSame(ListBuild(365,366,),ListBuild(365,366))
PrintLn ListSame(ListBuild(365,,367),ListBuild(365,"",367))
```

### Nested and Concatenated Lists

**ListSame** does not support nested lists. It cannot compare two lists that contain lists, even if their contents are identical.

```
x = ListBuild("365")
y = ListBuild(365)
PrintLn ListSame(x,y)," lists identical"
PrintLn ListSame(ListBuild(x),ListBuild(y))," nested lists not identical"
```

In the following example, both **ListSame** comparisons returns 0, because these lists are not considered identical:

```
x=ListBuild("Apple","Pear","Walnut","Pecan")
y=ListBuild("Apple","Pear",ListBuild("Walnut","Pecan"))
z=ListBuild("Apple","Pear","Walnut","Pecan","")
PrintLn ListSame(x,y)," nested list"
PrintLn ListSame(x,z)," null string is list item"
```

**ListSame** does support concatenated lists. The following example returns 1, because the lists are considered identical:

```
x=ListBuild("Apple","Pear","Walnut","Pecan")
y=ListBuild("Apple","Pear") & ListBuild("Walnut","Pecan")
PrintLn ListSame(x,y)," concatenated list"
```

### See Also

- **List** function
- **ListBuild** function
- **ListExists** function
- **ListFind** function
- **ListFromString** function
- **ListGet** function
- **ListLength** function
- **ListNext** function
- **ListToString** function
- **ListValid** function
ListToString

Creates a string from a list.

ListToString(list[,delimiter])

Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list</td>
<td>An expression that evaluates to a valid list. A Caché list must be created using ListBuild or ListFromString, or extracted from another list using List. The null string (&quot;&quot;&quot;) is also treated as a valid list.</td>
</tr>
<tr>
<td>delimiter</td>
<td>Optional — A delimiter used to separate substrings. Specify delimiter as a quoted string. If no delimiter is specified, the default is the comma (,) character.</td>
</tr>
</tbody>
</table>

Description

ListToString takes a Caché list and converts it to a string. In the resulting string, the elements of the list are separated by the delimiter.

A list represents data in an encoded format which does not use delimiter characters. Thus a list can contain all possible characters, and is ideally suited for bitstring data. ListToString converts this list to a string with delimited elements. It sets aside a specified character (or character string) to serve as a delimiter. These delimited elements can be handled using the Piece function.

Note: The delimiter specified here must not occur in the source data. Caché makes no distinction between a character serving as a delimiter and the same character as a data character.

Parameters

list

A Caché list, which contains one or more elements. A list is created using ListBuild or ListFromString, or extracted from another list using List.

delimiter

A character (or string of characters) used to delimit substrings within the output string. It can be a numeric or string literal (enclosed in quotation marks), the name of a variable, or an expression that evaluates to a string.

Commonly, a delimiter is a designated character which is never used within string data, but is set aside solely for use as a delimiter separating substrings. A delimiter can also be a multi-character string, the individual characters of which can be used within string data.

If you specify no delimiter, the default delimiter is the comma (,) character. You can specify a null string (""") as a delimiter; in this case, substrings are concatenated with no delimiter. To specify a quote character as a delimiter, specify the quote character twice ("""") or use Char(34).

Examples

The following example creates a list of four elements, then converts it to a string with the elements delimited by the colon (:) character:

```
namelist=ListBuild("Deborah","Noah","Martha","Bowie")
PrintLn ListToString(namelist,":")
returns "Deborah:Noah:Martha:Bowie"
```
The following example creates a list of four elements, then converts it to a string with the elements delimited by the *sp* string:

```plaintext
namelist=ListBuild("Deborah","Noah","Martha","Bowie")
PrintLn ListToString(namelist,"*sp*")
returns "Deborah*sp*Noah*sp*Martha*sp*Bowie"
```

**See Also**

- List function
- ListBuild function
- ListExists function
- ListFind function
- ListFromString function
- ListGet function
- ListLength function
- ListNext function
- ListSame function
- ListValid function
- Piece function
ListValid

Determines if an expression is a list.

ListValid(exp)

Parameters

| exp | Any valid expression. A valid list must be created using ListBuild or ListFromString, or extracted from another list using List. The null string ("") is also treated as a valid list. |

Description

ListValid determines whether exp is a list, and returns a Boolean value: If exp is a list, ListValid returns 1; if exp is not a list, ListValid returns 0.

A list can be created using ListBuild or ListFromString, or extracted from another list using List. A list containing the empty string ("") as its sole element is a valid list. The empty string ("") by itself is also considered a valid list.

Examples

The following examples all return 1, indicating a valid list:

```bas
w = ListBuild("Red","Blue","Green")
x = ListBuild("Red")
y = ListBuild(365)
z = ListBuild("")
Println ListValid(w)
Println ListValid(x)
Println ListValid(y)
Println ListValid(z)
```

The following examples all return 0. Numbers and strings (with the exception of the null string) are not valid lists:

```bas
x = "Red"
y = 44
Println ListValid(x)
Println ListValid(y)
```

The following examples all return 1. Concatenated, nested, and omitted value lists are all valid lists:

```bas
w = ListBuild("Apple","Pear")
x = ListBuild("Walnut","Pecan")
y = ListBuild("Apple","Pear",ListBuild("Walnut","Pecan"))
z = ListBuild("Apple","Pear","Pecan")
Println ListValid(w & x) ' concatenated
Println ListValid(y) ' nested
Println ListValid(z) ' omitted element
```

The following examples all return 1. ListValid considers all of the following “empty” lists as valid lists:

```bas
Println ListValid(""
Println ListValid(ListBuild())
Println ListValid(ListBuild(NULL))
Println ListValid(ListBuild("")
Println ListValid(ListBuild(Chr(0)))
Println ListValid(ListBuild(,))
```

See Also

- List function
- ListBuild function
- ListExists function
• ListFind function
• ListFromString function
• ListGet function
• ListLength function
• ListNext function
• ListSame function
• ListToString function
Lock

Obtains a logical lock on a variable name.

**Lock(varname[,timeout])**

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>varname</td>
<td>Name of the variable to be locked.</td>
</tr>
<tr>
<td>timeout</td>
<td>Optional — A numeric expression indicating the number of seconds to wait to obtain the lock.</td>
</tr>
</tbody>
</table>

**Description**

Returns true if the lock was obtained, false otherwise.

Each time a lock is obtained on a `varname` a lock count is incremented for this `varname`. **Unlock** decrements this count. Only when the lock count falls to zero will the logical lock be released. For this reason, you should balance each call to **Lock** with a corresponding call to **Unlock**.

If a `timeout` is not specified, **Lock** will wait indefinitely for the lock to be obtained. Specifying a `timeout` causes the lock attempt to wait up to the `timeout` number of seconds to obtain the lock.

**Example**

The following example uses the **Lock** function to obtain a logical lock on a `varname` with a timeout of 10 seconds.

```basic
If Lock("PatientData(PatientID), 10) = True Then
    Println "Got the Lock"
    Unlock("PatientData(PatientID))
Else
    Println "Couldn't get the lock"
End If
```

**See Also**

- Unlock function
**Log**

Returns the natural logarithm of a number.

```
Log(number)
```

**Arguments**

The number argument can be any valid numeric expression greater than 0. Specifying 0 or a negative number results in a runtime error.

**Description**

The natural logarithm is the logarithm to the base e. The constant e (\(\text{Exp}(1)\)) is approximately 2.718282.

You can calculate base-\(n\) logarithms for any number \(x\) by dividing the natural logarithm of \(x\) by the natural logarithm of \(n\) as follows:

\[
\log_n(x) = \frac{\log(x)}{\log(n)}
\]

**Note:** In ObjectScript, the equivalent function is the \(\text{SZLN}\) function, which returns the natural logarithm. The \(\text{SZLOG}\) function returns the base-10 logarithm. Please note that \(\text{Log}\) and \(\text{SZLOG}\) are not equivalent functions.

**Examples**

The following example uses the \(\text{Log}\) function to calculate the natural logarithm for each of the integers 1 through 10:

```cache
For x = 1 To 10
   Println "Natural log of",x," = ",Log(x)
Next
```

The following example uses the \(\text{Log}\) function to calculate the base-10 logarithms for the numbers 10 through 100, counting by tens. For 100, it returns 2 (10 to the power of \(x = 100\)).

```cache
x = 10
For y = 1 To 10
   Base10 = Log(x) / Log(10)
   Println "Base-10 log of",x," = ",Base10
   x = x + 10
Next
```

**See Also**

- Exp function

- Derived Math Functions
**Mid**

Returns or replaces a specified number of characters from a string.

\[
\text{Mid}(\text{string, start[, length]})
\]

\[
\text{Mid}(\text{string, start[, length]})=\text{value}
\]

**Arguments**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>String expression from which characters are returned.</td>
</tr>
<tr>
<td>start</td>
<td>A positive integer specifying the character position in string (counting from 1) at which the substring begins.</td>
</tr>
<tr>
<td>length</td>
<td>Optional — A positive integer specifying the number of characters to return (or replace) from the start location (inclusive). If length is omitted, all characters from the start position to the end of the string are returned (or replaced).</td>
</tr>
<tr>
<td>value</td>
<td>The value used to replace the specified character(s) in string. An expression that evaluates to a string.</td>
</tr>
</tbody>
</table>

**Description**

The **Mid** function can be used in two ways:

- To return a substring from string. The substring is determined by specifying the start position and, optionally, the length. This uses the \text{Mid(string, start, length)} syntax.
- To replace a substring within string. The replacement substring may be the same length, longer, or shorter than the original substring. The substring is determined by specifying the start position and, optionally, the length. This uses the \text{Mid(string, start, length)=value} syntax.

**Mid(string, start, length)** returns the character(s) of string specified by the start and length arguments. The length argument specifies how many characters of string to return. If length is 0 or a negative number, **Mid** returns the empty string (""). If you specify a length greater than the number of available characters, all of the characters to the right of start are returned.

**Mid(string, start, length)=value** replaces the specified character(s) of string with value.

The start argument specifies where to begin the replacement. If start is 1, begin at the beginning of string. If start is greater than the length of string, the string is padded with blank spaces until start is reached, then value is appended. If start is 0 or a negative number, the number of characters replaced is start plus length minus 1.

The optional length argument specifies how many characters of string to replace. If length is omitted, all of the characters to the right of start are replaced. If length is 0 or a negative number, string is unchanged. This is true even when string is the empty string ("").

To determine the number of characters in string, use the Len function.

Note that the length argument refers to the source length, not the replacement length, which may be longer or shorter than the substring replaced.

You can perform similar substring return and replace operations in ObjectScript using the $EXTRACT function.

**Examples**

The following example returns a substring without specifying a length. It begins with the twelfth character (inclusive) and returns the rest of the string:
Dim MyVar
MyVar = Mid("Caché is a powerful database!",12)
Println MyVar  ' Returns "powerful database!"

The following example returns a substring specifying a *length*. It begins with the twelfth character in a string, and returns eight characters:

Dim MyVar
MyVar = Mid("Caché is a powerful database!",12,8)
Println MyVar  ' Returns "powerful"

In the following example, all of the **Mid** functions return the empty string:

Dim MyVar
MyVar = Mid("Caché is a powerful database!",0,8)
Println "0,n=",MyVar
MyVar = Mid("Caché is a powerful database!",8,0)
Println "n,0=",MyVar
MyVar = Mid("Caché is a powerful database!",8,-1)
Println "n,-1=",MyVar

The following example show the difference between specifying a numeric as the string argument, and specifying the same value as a string. Numerics are converted to canonical form, which in this case means that leading zeros are omitted.

Println Mid(00123456,3,2)    ' Returns 34
Println Mid("00123456",3,2)  ' Returns 12

**Replacement Examples**

The following example replaces characters starting with specified *start* location to the end of the string:

```plaintext
var1="ABCD"
var2="ABCD"
var3="ABCD"
var4="ABCD"
var5="ABCD"
PrintLn var
Mid(var1,2)="Z"
PrintLn "start 2: ",var1
Mid(var2,8)="Z"
PrintLn "start 8: ",var2
Mid(var3,1)="Z"
PrintLn "start 1: ",var3
Mid(var4,0)="Z"
PrintLn "start 0: ",var4
Mid(var5,-1)="Z"
PrintLn "start -1: ",var5
```

The following example starts at various specified *start* locations and replaces *length=2* characters:

```plaintext
var1="ABCD"
var2="ABCD"
var3="ABCD"
Mid(var1,2,2)="xyz"
PrintLn "start 2: ",var1
Mid(var2,8,2)="xyz"
PrintLn "start 8: ",var2
Mid(var3,1,2)="xyz"
PrintLn "start 1: ",var3
```

The following example starts at *start=2* and replaces various *length* values:
The following example demonstrates replacement with *start* locations less than 1. The formula is \( start + length - 1 \):

```basic
var1="ABCD"
var2="ABCD"
var3="ABCD"

Mid(var1,-2,5)="xyz"
PrintLn "start -2 for 5: ",var1
Mid(var2,0,1)="xyz"
PrintLn "start 0 for 1: ",var2
Mid(var3,0,2)="xyz"
PrintLn "start 0 for 2: ",var3
```

See Also

- Left function
- Len function
- LTrim, RTrim and Trim functions
- Right function
Minute

Returns a whole number between 0 and 59, inclusive, representing the minute of the hour.

**Minute**(time)

**Arguments**

The *time* argument is any expression that can represent a time. This includes a time value such as “12:30” or “1:27:55”, a time/date value such as “11/12/1999 12:33:00”, or a date value such as “11/12/1999”. If only a date is specified, the time defaults to 00:00:00. Fractional seconds are permitted, but ignored; they are truncated, not rounded.

**Examples**

The following example uses the **Minute** function to obtain the minute from the current time:

```basic
Dim MyTime, MyMin
MyTime = Now
MyMin = Minute(MyTime)
Println MyMin
```

The following example returns a minute value of 59:

```basic
Dim MyMin
MyMin = Minute("13:59:59.999")
Println MyMin
```

**See Also**

- **Day** function
- **Hour** function
- **Now** function
- **Second** function
- **Time** function
Month

Returns the month of the year as an integer between 1 and 12, inclusive.

\[ \text{Month}(\text{date}) \]

**Arguments**

The *date* argument is any expression that represents a date as a string.

**Description**

The **Month** function locates and returns the month portion of a date string as an integer. It performs no range validation on this number. The **Month** function accepts blanks, slashes (/), hyphens (-), or commas (,) (in any combination) as date component separators. Leading zeros and plus and minus signs may be included or omitted in the input string; leading zeros and signs are omitted from the output integer. The **Month** function locates the month portion in one of the following three ways:

- In American numeric format, the month precedes the day. For example, “9/27/2005” or “9–27.” In this format, the **Month** function identifies the month portion by position. It accepts any non-numeric character as a date component separator and returns the number that precedes this first non-numeric character. It does not parse the day or year components of the date string. However, there must be at least one non-numeric character following the number specifying the month. The day and year can be any alphanumeric value, and can include or omit punctuation characters such as periods or apostrophes. The year component may be 4-digits, less than 4 digits, or omitted. If the **Month** function is unable to identify the month portion of the string, it returns 0.

- In American written format, the name of the month precedes the day. For example, “September 27 2005” or “Sept 27” In this case, the month name is validated; the first three letters must correspond to a valid month name. Validation is not case-sensitive. The month name must be followed by a valid date component separator; it cannot be followed by a period; thus “Sep” or “Sept”, but not “Sept.” If the **Month** function is unable to identify the month portion of the string, it returns 0.

- In European written format, the day precedes the name of the month. For example, “27 September 2005” or “27 Sept” In this case, the month name is validated; the first three letters must correspond to a valid month name. Validation is not case-sensitive. If the **Month** function is unable to identify the month portion of the string, it returns the day portion of the string.

**Examples**

The following example uses the **Month** function to return the current month:

```basic
Dim MonthNum
MonthNum = Month(Now)
Print MonthNum
```

The following examples uses the **Month** function to return the month from the specified date:

```basic
Dim MyMonth
MyMonth = Month("09/19/05") 'MyMonth contains 9.
Print MyMonth

Dim MyMonth
MyMonth = Month("Sept 19, 2005") 'MyMonth contains 9.
Print MyMonth

Dim MyMonth
MyMonth = Month("19 October 2005") 'MyMonth contains 10.
Print MyMonth
```
Dim MyMonth
MyMonth = Month("19 Feb")  'MyMonth contains 2.
Print MyMonth

**See Also**

- Basic: Date function, Day function, Hour function, Minute function, Now function, Second function, Weekday function, Year function
- ObjectScript: $ZDATE function
- SQL: MONTH function
MonthName

Returns a string indicating the specified month.

```
MonthName(month[,abbreviate])
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>month</code></td>
<td>The numeric designation of the month. For example, January is 1, February is 2, and so on.</td>
</tr>
<tr>
<td><code>abbreviate</code></td>
<td>Optional — Boolean value that indicates if the month name is to be abbreviated. If omitted, the default is False (0), which means that the month name is not abbreviated.</td>
</tr>
</tbody>
</table>

**Examples**

The following example uses the `MonthName` and `Month` functions to return the month name for a date expression:

```cava
Dim MName
Mydate = "1/12/1953"
MName = MonthName(Month(Mydate))
Println MName
```

The following example uses the `MonthName` and `Date` functions to return the abbreviated month name for the current date:

```cava
Dim MName
CurrDate = Date
MNum = Month(CurrDate)
MName = MonthName(MNum,1)
Println MName
```

In the following example, a month number is out of the range of 1 through 12. `MonthName` returns a question mark:

```cava
Dim MyVar
MyVar = MonthName(13)
Println MyVar
```

**See Also**

- `Month` function
- `WeekdayName` function
Now

Returns the current date and time according to the setting of your computer's system date and time.

Arguments

none

Description

The Now function returns the current date and time in a format such as the following:

\[ \text{mm/dd/yyyy 00:00:00PM} \]

The exact display format depends on your system configuration. Leading zeros are displayed. The year is displayed as four digits.

To return just the current date, use the Date function. To return just the current time, use the Time function.

Examples

The following example uses the Now function to return the current date and time:

```basic
Dim MyVar
MyVar = Now
Println MyVar
```

See Also

- Basic: Sleep statement, Date function, Time function
- ObjectScript: SHOROLOG special variable
- SQL: NOW function
Oct

Returns a string representing the octal value of a number.

Oct(number)

Arguments

The number argument is any valid expression that resolves to a positive or negative number. If number is a decimal fraction, it is truncated to a whole number before being evaluated.

Description

The Oct function converts a number from decimal (base 10) to octal (base 8). To convert a number from octal to decimal, represent octal numbers directly by preceding numbers in the proper range with &O For example, &O10 is the octal notation for decimal 8.

<table>
<thead>
<tr>
<th>If Number Is</th>
<th>Oct Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty</td>
<td>Zero (0).</td>
</tr>
<tr>
<td>Any other number</td>
<td>Up to 11 octal characters.</td>
</tr>
</tbody>
</table>

Examples

The following example uses the Oct function to return the octal value of a decimal (base-10) number:

Println Oct(4)       ' Returns 4.
Println Oct(8)       ' Returns 10.
Println Oct(459)     ' Returns 713.

The following example uses the &O prefix to return the decimal (base-10) value for an octal number:

Println &O4        ' Returns 4.
Println &O10       ' Returns 8.
Println &O713      ' Returns 459.

See Also

• Hex function
Piece

Returns the specified substring, using a delimiter.

```
Piece(string,delimiter[,from[,to]])
Piece(string,delimiter[,from[,to]])=value
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>String expression containing substrings to be extracted.</td>
</tr>
<tr>
<td>delimiter</td>
<td>A delimiter used to identify substrings within string.</td>
</tr>
<tr>
<td>from</td>
<td>Optional — An integer that specifies the substring, or the beginning of a range of substrings, to return from the target string. Specified as a substring count from the beginning of string. Substrings are separated by a delimiter, and counted from 1. If omitted, the first substring is returned.</td>
</tr>
<tr>
<td>to</td>
<td>Optional — An integer that specifies the ending substring for a range of substrings to return from the target string. Specified as a substring count from the beginning of string. Must be used with from.</td>
</tr>
</tbody>
</table>

**Description**

The **Piece** function can be used in two ways:

- To return a substring or a range of substrings from string. The substring is determined by specifying a delimiter character (or character string) that is found in string. This uses the **Piece(string,delimiter,from,to)** syntax.
- To replace a substring within string. The replacement substring may be the same length, longer, or shorter than the original substring. The substring is determined by specifying a delimiter character (or character string) that is found in string. This uses the **Piece(string,delimiter,from,to)=value** syntax.

When returning a specified substring (piece) from string, the substring returned depends on the arguments used:

- **Piece(string,delimiter)** returns the first substring in string. If delimiter occurs in string, this is the substring that precedes the first occurrence of delimiter. If delimiter does not occur in string, the returned substring is string.
- **Piece(string,delimiter,from)** returns the substring which is the $n$th piece of string, where the integer $n$ is specified by the from argument, and pieces are separated by a delimiter. The delimiter is not returned.
- **Piece(string,delimiter,from,to)** returns a range of substrings including the substring specified in from through the substring specified in to. This four-argument form of **Piece** returns a string that includes any intermediate occurrences of delimiter that occur between the from and to substrings. If to is greater than the number of substrings, the returned substring includes all substrings to the end of string.

The values for from and to must be positive integers when specified, otherwise the **Piece** function will return an empty string.

**Arguments**

**string**

The target string from which the substring is to be returned. It can be a string literal, a variable name, or any valid Caché Basic expression that evaluates to a string. If you specify a null string (""") as the target string, **Piece** returns the null string.
A target string usually contains instances of a character (or character string) which are used as delimiters. This character or string cannot also be used as a data value within string.

When **Piece** is used on the left hand side of the equals sign, string must evaluate to a valid variable name.

**delimiter**

The search string to be used to delimit substrings within string. It can be a numeric or string literal (enclosed in quotation marks), the name of a variable, or an expression that evaluates to a string.

Commonly, a delimiter is a designated character which is never used within string data, but is set aside solely for use as a delimiter separating substrings. A delimiter can also be a multi-character search string, the individual characters of which can be used within string data.

If the specified delimiter is not in string, **Piece** returns the entire the string string. If the specified delimiter is the null string (""), **Piece** returns the null string.

**from**

The number of a substring within string, counting from 1. It must be a positive integer, the name of an integer variable, or an expression that evaluates to a positive integer. Substrings are separated by delimiters.

- If the from argument is omitted or set to 1, **Piece** returns the first substring of string. If string does not contain the specified delimiter, a from value of 1 returns string.
- If the from argument identifies by count the last substring in string, this substring is returned, regardless of whether it is followed by a delimiter.
- If the value of from is the null string (""), zero, a negative number, or greater than the number of substrings in string, **Piece** returns a null string.

If the from argument is used with the to argument, it identifies the start of a range of substrings to be returned as a string, and should be less than the value of to.

**to**

The number of the substring within string that ends the range initiated by the from argument. The returned string includes both the from and to substrings, as well as any intermediate substrings and the delimiters separating them. The to argument must be a positive integer, the name of an integer variable, or an expression that evaluates to a positive integer. The to argument must be used with from and should be greater than the value of from.

- If from is less than to, **Piece** returns a string consisting of all of the delimited substrings within this range, including the from and to substrings. This returned string contains the substrings and the delimiters within this range.
- If to is greater than the number of delimited substrings, the returned string contains all the string data (substrings and delimiters) beginning with the from substring and continuing to the end of the string string.
- If from is equal to to, the from substring is returned.
- If from is greater than to, **Piece** returns a null string.
- If to is the null string (""), **Piece** returns a null string.

**Replacing a Substring Using Piece**

You can use **Piece** to the left of the equals sign to replace a substring within string. When used to the left of the equals sign, **Piece** designates a substring to be replaced by the assigned value.

The use of **Piece** (and **List**) in this context differs from other standard functions because it modifies an existing value, instead of just returning a value.
Replacing a Delimited Substring

The following example changes the value of `colorlist` to "Red,Cyan,Yellow,Green,Orange,Purple,Black":

```
colorlist="Red,Blue,Yellow,Green,Orange,Purple,Black"
PrintLn colorlist
Piece(colorlist,",",2)="Cyan"
PrintLn colorlist
```

The replacement substring may, of course, be longer or shorter than the original.

If you do not specify a `from` argument, the first substring is replaced:

```
colorlist="Red,Blue,Yellow,Green,Orange,Purple,Black"
PrintLn colorlist
Piece(colorlist,)="Crimson"
PrintLn colorlist
```

If you specify a `from` and `to` argument, the included substrings are replaced by the specified value, in this case the 4th, 5th, and 6th delimited substrings:

```
colorlist="Red,Blue,Yellow,Green,Orange,Purple,Black"
PrintLn colorlist
Piece(colorlist,,4,6)="non-primary colors"
PrintLn colorlist
```

If `Piece` specifies more occurrences of the delimiter than exist in the target variable, it appends additional delimiters to the end of the value, up to one less than the specified number. The following example changes the value of `smallcolor` to "Green;Blue;;Red". The number of delimiter characters added is equal to the `from` value, minus the number of existing delimiters, minus one:

```
smallcolor="Green;Blue"
PrintLn smallcolor
Piece(smallcolor,";",4)="Red"
PrintLn smallcolor
```

If `delimiter` doesn't appear in `string`, `Piece` treats `string` as a single piece and performs the same substitutions described above. If there is no `from` argument specified, the new value replaces the original `string`:

```
colorlist="Red,Green,Blue"
PrintLn colorlist
Piece(colorlist,"")="Purple"Orange"
PrintLn colorlist
```

If `delimiter` doesn't appear in `string`, and `from` is specified, `Piece` may append delimiters to the end of `string` and append the new value to `string`, to fulfill the `from` value:

```
colorlist="Red,Green,Blue"
PrintLn colorlist
Piece(colorlist,"",3)="Purple"Orange"
PrintLn colorlist
```

**Delimiter is Null String**

If the delimiter is the null string, the new value replaces the original `string`, regardless of the values of the `from` and `to` arguments.

The following two examples both set `colorlist` to “Purple”:

```
colorlist="Red,Green,Blue"
PrintLn colorlist
Piece(colorlist,"")="Purple"
PrintLn colorlist
```

```
colorlist="Red,Green,Blue"
PrintLn colorlist
Piece(colorlist,"",3,5)="Purple"
PrintLn colorlist
```
**Initializing a String Variable**

The string variable does not need to be defined before being assigned a value. The following example initializes `newvar` to the character pattern ">>>>>>TOTAL":

```c
Piece(newvar,">",7)="TOTAL"
PrintLn newvar
```

**Piece with Parameters over 32,768 Characters**

If you wish to use `Piece` with a parameter greater than 32767 characters, long strings must be enabled. Long string support is enabled by default. In the Management Portal navigate to [System] > [Configuration] > [Memory and Startup] from the System Administration > Configuration > System Configuration menu. To enable support for long strings system-wide, select the Enable Long Strings check box. Then click the Save button.

**Examples**

The following example returns designated substrings from a string using the "|" character as a delimiter:

```c
MyString = "InterSystems|One Memorial Drive|Cambridge|MA 02142"
PrintLn Piece(MyString, "|") 'InterSystems
PrintLn Piece(MyString, "|", 2) 'One Memorial Drive
PrintLn Piece(MyString, "|", 3, 4) 'Cambridge|MA 02142
PrintLn Piece(Piece(MyString, "|", 4), "") 'MA
```

The following example performs the same operation using a multicharacter delimiter string:

```c
MyString = "InterSystems\nOne Memorial Drive\nCambridge MA\n02142"
PrintLn Piece(MyString, "\n") 'InterSystems
PrintLn Piece(MyString, "\n", 2) 'One Memorial Drive
PrintLn Piece(MyString, "\n", 3) 'Cambridge MA
PrintLn Piece(MyString, "\n", 4,4) '02142
```

**See Also**

- Split function
**Replace**

Returns a string in which a specified substring has been replaced with another substring a specified number of times.

```
Replace(string, find, replacewith [, start [, count [, compare]]])
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>string</code></td>
<td>String expression containing substring to replace.</td>
</tr>
<tr>
<td><code>find</code></td>
<td>Substring being searched for. If found, it is replaced by <code>replacewith</code>.</td>
</tr>
<tr>
<td><code>replacewith</code></td>
<td>Replacement substring.</td>
</tr>
<tr>
<td><code>start</code></td>
<td>Optional — Position within <code>string</code> where substring search is to begin. If omitted, 1 is assumed.</td>
</tr>
<tr>
<td><code>count</code></td>
<td>Optional — Number of substring substitutions to perform. If omitted, the default value is -1, which means make all possible substitutions. Must be used in conjunction with <code>start</code>.</td>
</tr>
<tr>
<td><code>compare</code></td>
<td>Optional — Numeric value indicating the kind of comparison to use when evaluating substrings. See Description section for values. If omitted, the default value is 0, which means perform a binary comparison.</td>
</tr>
</tbody>
</table>

**Description**

The `compare` argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>vbBinaryCompare</code></td>
<td>0</td>
<td>Perform a case-sensitive (binary) comparison.</td>
</tr>
<tr>
<td><code>vbTextCompare</code></td>
<td>1</td>
<td>Perform a not case-sensitive textual comparison.</td>
</tr>
</tbody>
</table>

**Note:** The not case-sensitive comparison works as expected for all Caché-supported locales.

The `Replace` function returns the following values:

<table>
<thead>
<tr>
<th>If</th>
<th>Replace Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>string</code> is zero-length</td>
<td>A zero-length string (&quot;&quot;).</td>
</tr>
<tr>
<td><code>find</code> is zero-length</td>
<td>A copy of <code>string</code>.</td>
</tr>
<tr>
<td><code>replacewith</code> is zero-length</td>
<td>A copy of <code>string</code> with all occurrences of <code>find</code> removed.</td>
</tr>
<tr>
<td><code>start</code> &gt; Len(<code>string</code>)</td>
<td>A zero-length string (&quot;&quot;).</td>
</tr>
<tr>
<td><code>count</code> is 0</td>
<td>A copy of <code>string</code>.</td>
</tr>
</tbody>
</table>

The return value of the `Replace` function is a substring, with substitutions made, that begins at the position specified by `start` and concludes at the end of the expression string.

**Examples**

The following example starts at the beginning of the string and replaces all (by default), or the specified number of `find` substrings:
Println Replace("To ski or not to ski","ski","be")
Println Replace("To ski or not to ski","ski","be",1,2)
Println Replace("To ski or not to ski","ski","be",1,1)

The following example starts at the specified location in the string and replaces all (by default), or the specified number of find substrings:

Println Replace("To ski or not to ski","ski","be",4,2)
Println Replace("To ski or not to ski","ski","be",4,1)

Note that the returned value is not the original string with substitutions; it is a substring that starts at the point specified by the fourth (start) parameter.

The following example performs binary and textual comparisons:

' A binary comparison starting at the beginning
' of the string. Returns "XXYXXPXXY".
Println Replace("XXpXXPXXp", "p", "Y")

' A textual comparison starting at position 3.
' Returns "YXXYXXY".
Println Replace("XXpXXPXXp", "p", "Y", 3, -1, 1)
**Right**

Returns or replaces a specified number of characters from the right end of a string.

Right (string, length)

Right (string, length)=value

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>String expression from which the rightmost characters are returned.</td>
</tr>
<tr>
<td>length</td>
<td>Numeric expression that evaluates to an integer indicating how many characters from the end of string to return or replace. Fractional numbers are truncated to an integer. If length is greater than or equal to the number of characters in string, the entire string is returned (or replaced). No padding is performed. For length=0, see below.</td>
</tr>
<tr>
<td>value</td>
<td>An expression that evaluates to a string. Specifies the value used to either replace or append. If length is 0, value is appended to the end of string. If length is greater than zero, value replaces the specified character(s) at the end of string.</td>
</tr>
</tbody>
</table>

**Description**

The **Right** function can be used in three ways:

- To return a substring from the end (right end) of string. This uses the `Right(string, length)` syntax.
- To replace a substring from the end (right end) of string. The replacement substring may be the same length, longer, or shorter than the original substring. This uses the `Right(string, length)=value` syntax, with `value>0`.
- To append a substring to the end (right end) of string. This uses the `Right(string, length)=value` syntax, with `value=0`.

`Right(string, length)` returns the rightmost character(s) of string. The substring is determined by counting length characters backwards from the end (right end) of the string. If length is 0 or a negative number, **Right** returns the empty string ("""). If you specify a length greater than the length of string, the entire string is returned.

`Right(string, length)=value` replaces the rightmost character(s) of string with value. The length argument specifies how many characters of string to replace by counting length characters backwards from the end (right end) of the string. If length is a negative number, string is unchanged. This is true even when string is the empty string ("""). If length is greater than the length of string, string is replaced by value. If length=0, the value is appended to the end (right end) of string.

To determine the number of characters in string, use the **Len** function.

The **Left** function returns the specified number of characters from the beginning (left end) of a string. The **Mid** function returns the specified number of characters from a specified starting point within a string.

**Examples**

The following example uses the **Right** function to return the last seven characters of mystr, the last 99 characters (in this case, all of the characters), and the last 0 characters:

```cachek
Dim mystr
mystr = "InterSystems"
Println "length 7:",Right(mystr,7) ' Returns "Systems"
Println "length 99:",Right(mystr,99) ' Returns "InterSystems"
Println "length 0:",Right(mystr,0) ' Returns ""
```

The following example uses the **Right** function to replace the last three characters of mystr with a seven-character string:
Dim mystr
mystr = "Interest"
PrintLn mystr
Right(mystr,3)="Systems"
PrintLn mystr

The following example deletes (replaces with the null string) the last three characters of mystr:

Dim mystr
mystr = "Interest"
PrintLn mystr
Right(mystr,3)="
PrintLn mystr

The following example replaces all of the characters of mystr, because length is greater than the length of mystr:

Dim mystr
mystr = "Oracle"
PrintLn mystr
Right(mystr,99)="InterSystems"
PrintLn mystr

The following example appends a string to mystr. To append a string, length must be equal to zero (0):

Dim mystr
mystr = "Inter"
PrintLn mystr
Right(mystr,0)="Systems"
PrintLn mystr

The following example shows that a length less than 0 has no effect on mystr:

Dim mystr
Dim empstr
mystr = "InterSystems"
empstr = ""
PrintLn mystr
Right(mystr,-1)="Bongo"
PrintLn "string out: ",mystr
Right(empstr,-1)="BongoSystems"
PrintLn "string out: ",empstr

See Also

- Left function
- Len function
- Mid function
Rnd

Returns a random number.

**Rnd[(number)]**

**Arguments**

The optional *number* argument can be any valid numeric expression.

**Description**

The **Rnd** function returns a value less than 1 but greater than or equal to 0. The number of digits in this number is platform-dependent. Trailing zeros are deleted.

**Rnd** generates a pseudo-random number by calculating successive numbers from a seed number supplied by the *number* argument. Thus, the value of *number* determines how **Rnd** generates a random number. **Rnd** with no argument or **Rnd** with a positive *number* generate random numbers from a randomized seed. Therefore, successive executions of **Rnd** with the same positive *number* return different values. However, if *number* is zero or a negative number, each successive call to the **Rnd** function uses the same seed, and thus generates a predictable value.

<table>
<thead>
<tr>
<th>If Number Is</th>
<th>Rnd Generates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than zero</td>
<td>The same number every time, using <em>number</em> as the seed. Thus, for example, -7 always generates .5976062.</td>
</tr>
<tr>
<td>Greater than zero</td>
<td>The next random number in the sequence.</td>
</tr>
<tr>
<td>Equal to zero</td>
<td>The most recently generated random number.</td>
</tr>
<tr>
<td>Not supplied</td>
<td>The next random number in the sequence.</td>
</tr>
</tbody>
</table>

To maximize randomness, use the **Randomize** statement without an argument to initialize the random-number generator with a seed based on the system timer. Then call **Rnd**.

**Notes**

To repeat sequences of random numbers, call **Rnd** with a negative argument immediately before using **Randomize** with a numeric argument. Using **Randomize** with the same value for *number* does not repeat the previous sequence.

**Examples**

The following example generates twenty random numbers.

```
For I = 1 To 20
    Println Rnd
Next
Println "Done"
```

The following example generates a random integer in the range 1 through 10, inclusive:

```
Dim upperbound, lowerbound
upperbound = 10
lowerbound = 1
Println Int((upperbound - lowerbound + 1) * Rnd + lowerbound)
```

The following example shows the effects of specifying 0 as the *number* argument:
For I = 1 To 10
Println Rnd
Println Rnd(0)
Next
Println "Done"

In this case, the argumentless `Rnd` generates a random number, and the `Rnd(0)` repeats the most-recently-generated random number.

The following example shows the effects of specifying a negative number as the `number` argument:

For I = 1 To 10
Println Rnd
Println Rnd(-7)
Next
Println "Done"

In this case, the first argumentless `Rnd` generates a random number, and the `Rnd(-7)` calculates its corresponding value and provides this as the seed for the next random number. Thus in the above example, the first call to `Rnd` is actually random; all subsequent calls are based on the seed of -7, and therefore repeat predictably in each loop.

**See Also**

- Randomize statement
Round

Returns a number rounded to a specified number of decimal places.

**Round**(expression[,numdecimalplaces])

**Arguments**

<table>
<thead>
<tr>
<th>expression</th>
<th>The numeric expression being rounded.</th>
</tr>
</thead>
<tbody>
<tr>
<td>numdecimalplaces</td>
<td><em>Optional</em> — Number indicating how many places to the right of the decimal are included in the rounding. If omitted, expression rounded to an integer is returned.</td>
</tr>
</tbody>
</table>

**Description**

The **Round** function always rounds the number 5 up. Leading and trailing zeros are deleted.

**Round** returns *expression* rounded to:

- An integer if the *numdecimalplaces* argument is omitted, or specified as 0, the empty string (""), or a negative number.
- The specified number of decimal places (excluding trailing zeros). A fractional value for *numdecimalplaces* is truncated to an integer.
- The actual number of decimal places (excluding trailing zeros) if the *numdecimalplaces* argument is greater than or equal to the actual number of decimal places

**Examples**

The following example uses the **Round** function to round a number to three decimal places:

```
Dim MyVar, pi
pi = 3.14159
MyVar = Round(pi,3)  ' MyVar contains 3.142.
Println MyVar
```

**See Also**

- Int, Fix functions
Second

Returns a whole number between 0 and 59, inclusive, representing the second of the minute.

\textbf{Second(time)}

**Arguments**

The time argument is any expression that can represent a time. This includes a time value such as “12:30” or “1:27:55”, a time/date value such as “11/12/1999 12:33:00”, or a date value such as “11/12/1999”. If only a date is specified, the time defaults to 00:00:00. Fractional seconds are permitted, but ignored; they are truncated, not rounded.

**Examples**

The following example uses the \texttt{Second} function to obtain the second from the current time:

```basic
Dim MyTime, MySec
MyTime = Now
MySec = Second(MyTime)
Println MySec
```

The following example returns a second value of 59:

```basic
Dim MySec
MySec = Second("13:59:59.999")
Println MySec
```

**See Also**

- \texttt{Day} function
- \texttt{Hour} function
- \texttt{Minute} function
- \texttt{Now} function
- \texttt{Time} function
**Sgn**

Returns an integer indicating the sign of a number.

\[
\text{Sgn}(\text{number})
\]

**Arguments**

The number argument can be any valid numeric expression.

**Description**

The \texttt{Sgn} function has the following return values:

<table>
<thead>
<tr>
<th>If Number Is</th>
<th>Sgn Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than zero</td>
<td>1</td>
</tr>
<tr>
<td>Equal to zero</td>
<td>0</td>
</tr>
<tr>
<td>Less than zero</td>
<td>-1</td>
</tr>
</tbody>
</table>

The sign of the \textit{number} argument determines the return value of the \texttt{Sgn} function. If \textit{number} is the empty string ("") or a non-numeric value, \texttt{Sgn} returns 0. \texttt{Sgn} resolves multiple sign values; for example, $-7$ is equivalent to $+7$, and thus returns 1.

**Examples**

The following example uses the \texttt{Sgn} function to determine the sign of a number:

```cachébasic
Dim MyVar1, MyVar2, MyVar3
MyVar1 = 12: MyVar2 = -2.4: MyVar3 = 0
Println Sgn(MyVar1)    ' Returns 1.
Println Sgn(MyVar2)    ' Returns -1.
Println Sgn(MyVar3)    ' Returns 0.
Println Sgn("")        ' Returns 0.
Println Sgn("a")       ' Returns 0.
```

**See Also**

- \texttt{Abs function}
Sin

Returns the sine of an angle.

\textbf{Sin(number)}

\textbf{Arguments}

The \textit{number} argument can be any valid numeric expression that expresses an angle in radians.

\textbf{Description}

The \textbf{Sin} function takes an angle and returns the ratio of two sides of a right triangle. The ratio is the length of the side opposite the angle divided by the length of the hypotenuse. The result lies in the range -1 to 1.

To convert degrees to radians, multiply degrees by \pi/180. To convert radians to degrees, multiply radians by 180/\pi.

\textbf{Examples}

The following example uses the \textbf{Sin} function to return the sine of an angle:

\begin{verbatim}
Dim MyAngle
MyAngle = 1.3          ' Define angle in radians.
Println Sin(MyAngle)
\end{verbatim}

The following example uses the \textbf{Sin} function to return the cosecant of an angle:

\begin{verbatim}
Dim MyAngle, MyCosecant
MyAngle = 1.3                   ' Define angle in radians.
MyCosecant = 1 / Sin(MyAngle)   ' Calculate cosecant.
Println MyCosecant
\end{verbatim}

\textbf{See Also}

- \textbf{Atn} function
- \textbf{Cos} function
- \textbf{Tan} function
- \textbf{Derived Math Functions}
Space

Returns a string consisting of the specified number of spaces.

Space(number)

Arguments

The number argument is the number of spaces you want in the string.

Examples

The following example uses the Space function to return a string consisting of a specified number of spaces:

```
Dim MyString
MyString = Space(10)  ' Defines a string of 10 spaces.
Println "Hello" & MyString & "World"  ' Insert 10 spaces between two strings.
```

See Also

- String function
Split

Returns a zero-based, one-dimensional array containing a specified number of substrings.

\[
\text{Split}(\text{string}[, \text{delimiter}[,, \text{count}[,, \text{compare}]])}
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\text{string}</td>
<td>String expression containing substrings and delimiters. If expression is a zero-length string, \text{Split} returns an empty array, that is, an array with no elements and no data.</td>
</tr>
<tr>
<td>\text{delimiter}</td>
<td>Optional — String character used to identify substring limits. Usually a single character, but can be a multi-character string. If omitted, the space character (&quot; &quot;) is assumed to be the delimiter. If delimiter is a zero-length string, a single-element array containing the entire expression string is returned.</td>
</tr>
<tr>
<td>\text{count}</td>
<td>Optional — Number of substrings to be returned. If -1, or an integer equal to or greater than number of substrings in \text{string}, all substrings are returned.</td>
</tr>
<tr>
<td>\text{compare}</td>
<td>Optional — Numeric value indicating the kind of comparison to use when evaluating substrings. See Description section for values.</td>
</tr>
</tbody>
</table>

**Description**

The \text{Split} function splits a string into array elements. The \text{Join} function does the opposite; it joins array elements into a string.

The \text{compare} argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>\text{vbBinaryCompare}</td>
<td>0</td>
<td>Perform a binary comparison.</td>
</tr>
<tr>
<td>\text{vbTextCompare}</td>
<td>1</td>
<td>Perform a textual comparison.</td>
</tr>
</tbody>
</table>

**Split and For Each**

A \text{Split} function cannot be directly used as an argument of a \text{For Each...Next} statement. You must first assign the \text{Split} return value to an array variable. You can then specify this array variable as the \text{group} argument of the \text{For Each...Next} statement.

**Examples**

The following example uses the \text{Split} function to return an array from a string. By default, it uses the blank space as the string delimiter character.

```caché
Dim MyString, MyArray
MyString = "Caché is fun!"
MyArray = Split(MyString)
Println MyArray(0)   ' contains "Caché".
Println MyArray(1)   ' contains "is".
Println MyArray(2)   ' contains "fun!".
```

The following example demonstrates the \text{delimiter} argument. It uses a two-character delimiter. The string is split at each occurrence of the "aa" delimiter. A single “a” is treated as a literal, as is the third “a” in the substring “aaa”.

```caché
```
Dim MyString, MyArray
MyString = "Cachéaisaaafun!"
MyArray = Split(MyString, "aa")
Println MyArray(0) ' contains "Caché".
Println MyArray(1) ' contains "is".
Println MyArray(2) ' contains "afun!".

The following example demonstrates the use of the *count* argument. It returns only the specified number of substrings (in this case, 2) into array elements. Note that in this case only part of the string is returned.

Dim MyString, MyArray, Msg
MyString = "Caché;is;fun!"
MyArray = Split(MyString, ";", 2)
Println MyArray(0) ' contains "Caché".
Println MyArray(1) ' contains "is".
Println MyArray(2) ' contains "."

The following example demonstrates the *compare* argument. It shows the difference between a binary comparison and a textual comparison. In a binary comparison, only the lowercase “x” is considered to be the delimiter; in a textual comparison, both “x” and “X” are treated as the delimiter character.

Dim MyString, MyArray
MyString = "CachéXisxfun!"
MyArray = Split(MyString, "x", -1, 0)
Println "Binary: ", MyArray(0) ' contains "CachéXis".
Println "Binary: ", MyArray(1) ' contains "fun!".
MyArray = Split(MyString, "X", -1, 1)
Println "Textual: ", MyArray(0) ' contains "Caché".
Println "Textual: ", MyArray(1) ' contains "is".
Println "Textual: ", MyArray(2) ' contains "fun!".

**See Also**

- Join function
Returns the square root of a number.

_Sqr_(number)

**Arguments**

The _number_ argument can be any valid numeric expression greater than or equal to 0. You cannot return the square root of a negative number. Attempted to do so results in a runtime error.

**Examples**

The following example uses the _Sqr_ function to calculate the square roots of the integers 0 through 16:

```caché
For x = 0 To 16
    Println "Square root of ",x," = ",Sqr(x)
Next
```

The following example uses the _Sqr_ function to calculate the square root of pi:

```caché
pi = 4 * Atn(1)
Println "Square root of pi = ",Sqr(pi)
```

**See Also**

- [Derived Math Functions](Caché Basic Reference)
StrComp

Returns a value indicating the result of a string comparison.

StrComp(string1,string2[,compare])

Arguments

| string1  | Any valid string expression. |
| string2  | Any valid string expression. |
| compare  | Optional — Numeric value indicating the kind of comparison to use when evaluating strings. If omitted, a binary comparison is performed. See Description section for values. |

Description

The StrComp function compares two strings character-by-character and returns a value when the first non-matching character is encountered, or when the end of the string has been encountered. StrComp returns one of the following values:

- 0 if the two strings are identical, or if compare=1 and the strings differ only in the case of letters.
- 1 if string1 contains a non-matching character that has a higher ANSI character code value than the corresponding character in string2. If compare=1 letters that differ in case are treated as identical. If string1 is longer than string2, StrComp returns 1.
- -1 if string1 contains a non-matching character that has a lower ANSI character code value than the corresponding character in string2. If compare=1 letters that differ in case are treated as identical. If string1 is shorter than string2, StrComp returns -1.

The compare argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbBinaryCompare</td>
<td>0</td>
<td>Perform a binary comparison. This is the default.</td>
</tr>
<tr>
<td>vbTextCompare</td>
<td>1</td>
<td>Perform a textual comparison. Uppercase and lowercase letters are equivalent.</td>
</tr>
</tbody>
</table>

The StrComp function has the following return values:

<table>
<thead>
<tr>
<th>If</th>
<th>StrComp Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>string1 is less than string2</td>
<td>-1</td>
</tr>
<tr>
<td>string1 is equal to string2</td>
<td>0</td>
</tr>
<tr>
<td>string1 is greater than string2</td>
<td>1</td>
</tr>
</tbody>
</table>

Examples

The following example compares two strings that differ only in the case of letters:

Println "default: ", StrComp(“abcd”, “ABCD”) ' Returns 1
Println "binary: ", StrComp(“abcd”, “ABCD”, 0) ' Returns 1
Println "textual: ", StrComp(“abcd”, “ABCD”, 1) ' Returns 0
Println "default: ", StrComp(“ABCD”, “abcd”) ' Returns -1
Println "binary: ", StrComp(“ABCD”, “abcd”, 0) ' Returns -1
Println "textual: ", StrComp(“ABCD”, “abcd”, 1) ' Returns 0
The following example compares two strings that differ only in length:

```basic
Println "binary: ",StrComp("abcde","abcd",0)  ' Returns 1
Println "textual: ",StrComp("abcde","abcd",1)  ' Returns 1
Println "binary: ",StrComp("abcd","abcde",0)  ' Returns -1
Println "textual: ",StrComp("abcd","abcde",1)  ' Returns -1
```
String

Returns a repeating character string of the length specified.

**String**(length, character)

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>length</strong></td>
<td>A positive integer specifying the length of the generated string. A zero length returns an empty string; a negative length returns no value. Fractional numbers are truncated.</td>
</tr>
<tr>
<td><strong>character</strong></td>
<td>Character code specifying the character, or a string expression whose first character is used to build the return string.</td>
</tr>
</tbody>
</table>

**Description**

The **String** function returns a string consisting of a single repeated character; *length* specifies the number of times to repeat the character. Use the **Space** function to return a string consisting of blank spaces.

A character code value must evaluate to a positive integer in the range 0 to 255 (inclusive). If you specify a character code for *character* greater than 255, **String** converts the number to a character code in the range 0 through 255 using the formula:

\[
\text{character Mod 256}
\]

For 16-bit characters, you can use the **Chr** function, as shown in the example below.

**Examples**

The following example uses the **String** function to return repeating character strings of the length specified:

```
Println String(5,"*")       ' Returns "*****".
Println String(5,42)        ' Returns "*****".
Println String(10,"ABC")    ' Returns "AAAAAAAAAA".
```

The following example uses character code values and the **Chr** function to specify the repeating character. Note that you must use the **Chr** function for character codes beyond 255.

```
Println String(10,65)       ' Returns "AAAAAAAAAA"
Println String(10,321)      ' Returns "AAAAAAAAAA"
Println String(10,577)      ' Returns "AAAAAAAAAA"
Println String(5,Chr(960))  ' Returns five pi symbols
```

**See Also**

- **Chr** function
- **Space** function


**StrReverse**

Retains a string in which the character order of a specified string is reversed.

**StrReverse**(string1)

**Arguments**

The **string1** argument is the string whose characters are to be reversed. If **string1** is a zero-length string (""), a zero-length string is returned.

**Examples**

The following example uses the **StrReverse** function to return a string in reverse order:

```caché
Dim RevStr
RevStr = StrReverse("Caché") ' RevStr contains "éhcaC"
Println "backwards: ",RevStr
Println "forewards: ",StrReverse(RevStr)
```
Tan

Returns the tangent of an angle.

**Tan(number)**

**Arguments**

The *number* argument can be any valid numeric expression that expresses an angle in radians.

**Description**

*Tan* takes an angle and returns the ratio of two sides of a right triangle. The ratio is the length of the side opposite the angle divided by the length of the side adjacent to the angle.

To convert degrees to radians, multiply degrees by pi/180. To convert radians to degrees, multiply radians by 180/pi.

**Examples**

The following example uses the *Tan* function to return the tangent of an angle:

```basic
Dim MyAngle
MyAngle = 1.3           ' Define angle in radians.
Println Tan(MyAngle)    ' Calculate tangent.
```

The following example uses the *Tan* function to return the cotangent of an angle:

```basic
Dim MyAngle, MyCotangent
MyAngle = 1.3                   ' Define angle in radians.
MyCotangent = 1 / Tan(MyAngle)  ' Calculate cotangent.
Println MyCotangent
```

**See Also**

- Atn function
- Cos function
- Sin function
- Derived Math Functions


**Time**

Returns the current system time.

**Arguments**

none

**Description**

The *Time* function returns the current time in a format such as the following:

```
00:00:00PM
```

In this case, time is represented by a 12–hour clock with an AM/PM indicator and no fractional seconds. The exact display format depends on your system configuration. Leading zeros are displayed.

**Examples**

The following example uses the *Time* function to return the current system time:

```vbscript
Dim MyTime
MyTime = Time
Println MyTime
```

**See Also**

- Basic: *Date* function, *Now* function
- ObjectScript: $HOROLOG special variable
- SQL: *NOW* function
TimeConvert

Converts time between internal and external formats.

**TimeConvert**(time, vbToInternal)  
**TimeConvert**(time, vbToExternal)

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>time</td>
<td>The time to be converted. An external time is represented as a string, such as “10:23:54”. An internal time is represented as a numeric value, which is the second part of the Caché $H date/time format.</td>
</tr>
<tr>
<td>vbToInternal</td>
<td>This keyword specifies converting an external time to internal ($H) format.</td>
</tr>
<tr>
<td>vbToExternal</td>
<td>This keyword specifies converting an internal time ($H format) to external time format.</td>
</tr>
</tbody>
</table>

**Description**

The **TimeConvert** function returns an external time in the following format:

00:00:00

Leading zeros are displayed.

The **TimeConvert** function returns an internal date/time in the following format:

sssss.ff

Where “sssss” is the time count (number of elapsed seconds in the specified day), and “ff” is optional fractional seconds. Fractional seconds are preserved in converting from external to internal format; fractional seconds are truncated when converting from internal to external format. For further details, see $HOROLOG in the *Caché ObjectScript Reference*.

**Examples**

The following example takes an external time value, converts the time to an internal format ($HOROLOG) value, then converts this internal value back to an external format time.

```basic
Dim GetDT, InTime, ExTime
GetDT = "21:45:23.99"
Println GetDT
InTime = TimeConvert(GetDT, vbToInternal)
Println InTime
ExTime = TimeConvert(InTime, vbToExternal)
Println ExTime
```

**See Also**

- **DateConvert** function
- **DateTimeConvert** function
Timer

Returns the number of seconds that have elapsed since midnight UTC.

**Arguments**

none

**Description**

Timer is commonly used to determine elapsed time. However, because Timer resets to zero at midnight UTC, a robust timer program cannot simply subtract the start time from the end time.

Timer returns the elapsed number of seconds since midnight in Coordinated Universal Time (UTC), which is independent of time zone. Consequently, Timer provides a time value that is uniform across time zones. This may differ from the local time value. The Timer returned value is a decimal numeric value that counts the time in seconds and fractions thereof. The number of digits in the fractional seconds may vary from zero to nine, depending on the precision of your computer’s time-of-day clock. On Windows systems the fractional precision is three decimal digits; on UNIX® systems it is six decimal digits. Timer suppresses leading and trailing zeroes. If the fractional portion is exactly zero, the trailing decimal point is also suppressed.

**Example**

The following example compares two Timer function values to determine the time it takes to iterate a For...Next loop 50 times. In this example, each iteration through the loop prints out the ASCII character set. (For the purpose of demonstration, a Sleep statement is included so that the elapsed time is not smaller than the available fractional precision.) The before and after timer values are compared, and the elapsed time displayed. The Else clause is provided to handle the midnight reset situation.

```basic
Dim StartTime, EndTime, TimeIt
StartTime = Timer
For I = 1 To 50
    Sleep .05
    x = 32
    Print I
    For N = 1 To 94
        Print Chr(x)
        x = x + 1
    Next
    Println "" Next
EndTime = Timer
Println "start time: ", StartTime
Println "end time: ", EndTime
If EndTime >= StartTime Then
    TimeIt = EndTime - StartTime
Else
    EndTime = EndTime + 86400
    TimeIt = EndTime - StartTime
End If
Println "elapse time: ", TimeIt
```

**See Also**

- Randomize statement
- Sleep statement
**TimeSerial**

Returns the time for a specific hour, minute, and second.

\[ \text{TimeSerial}(\text{hour}, \text{minute}, \text{second}) \]

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>hour</strong></td>
<td>Number between 0 (12:00AM) and 23 (11:00PM), inclusive, or a numeric expression the evaluates to a number in the range 0 through 23.</td>
</tr>
<tr>
<td><strong>minute</strong></td>
<td>Any numeric expression.</td>
</tr>
<tr>
<td><strong>second</strong></td>
<td>Any numeric expression.</td>
</tr>
</tbody>
</table>

### Description

To specify a time, such as 11:59:59, the range of numbers for each `TimeSerial` argument should be in the accepted range for the unit; that is, 0–23 for hours and 0–59 for minutes and seconds. However, you can also specify relative times for each argument using any numeric expression that represents some number of hours, minutes, or seconds before or after a certain time. When any argument exceeds the accepted range for that argument, it increments to the next larger unit as appropriate. For example, if you specify 75 minutes, it is evaluated as one hour and 15 minutes. However, you cannot specify an hour value greater than 23.

The `TimeSerial` function, by default, returns a 12-hour clock time value with an AM or PM suffix. Leading zeros are displayed. Fractional seconds are truncated.

### Examples

The following example uses expressions instead of absolute time numbers. The `TimeSerial` function returns a time for 15 minutes before (-15) six hours before noon (12 - 6), or 5:45:00AM

```csharp
Dim MyTime
MyTime = TimeSerial(12 - 6, -15, 0) ' Returns 5:45:00 AM.
Println MyTime
```

### See Also

- `DateSerial` function
- `Hour` function
- `Minute` function
- `Now` function
- `Second` function
Traverse

Traverses an array and returns the next subscript.

**Traverse**(varname[, direction[, target]])

**Arguments**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>varname</td>
<td>The name of a variable representing an array. varname must specify a subscript level.</td>
</tr>
<tr>
<td>direction</td>
<td>Optional — Numeric value, which specifies either forward (1) or backward (-1). If this parameter is omitted the Traverse function will move forward to the next subscript.</td>
</tr>
<tr>
<td>target</td>
<td>Optional — Variable which contains the data of the resulting node.</td>
</tr>
</tbody>
</table>

**Description**

The Traverse function returns the name of the next or previous subscript on the specified subscript level. Using the optional, target argument you can also return the data value of the located subscript.

To start a search from the beginning of the current level, specify a empty string ("") for the subscript. The following example returns the first subscript on the first subscript level:

```
subscript = Traverse(^Person(""))
```

When the Traverse reaches the end of the subscripts for the given level, it returns an empty string (""").

The following example demonstrates how to use the Traverse function within a loop:

```
subscript = ""
subscript = Traverse(^Person(subscript))
While subscript <> ""
    subscript = Traverse(^Person(subscript))
    Println subscript
wend
```

If a target variable is specified and the node is defined (vbHasValue) the target variable will contain the data for this node. If the resulting node does not have a value the value of the target variable is unchanged.

Caché Basic provides two constants, vbForward and vbBackward to specify the direction.

**Examples**

The following example demonstrates the use of the Traverse function to return the subscript name of the next node. The first Traverse specifies the empty string as the subscript, and returns the name of the first subscript (“A”) in the array. The second and third Traverse functions specify a subscript name and return the name of the next subscript. The fourth Traverse specifies a subscript of “C” and a direction of -1 (backwards); it returns the name of the previous subscript (“B”). The final Traverse specifies the empty string as the subscript, and a direction of -1; it returns the name of the final subscript (the first subscript reading backwards from the end of the array), in this case “D”.

```
array("A") = "A node"
array("B") = "B node"
array("B", 1) = "B,1 node"
array("B", 2) = "B,2 node"
array("C", 1) = "C node"
array("D") = "D node"
Println Traverse(array(""))  ' prints A
Println Traverse(array("A"))  ' prints B
Println Traverse(array("B"))  ' prints C
Println Traverse(array("C"),-1)  ' prints B
Println Traverse(array(""),-1)  ' prints D
```
The following example demonstrates the use of the target argument. The first myString contains the data value of the “A” node. The second myString references a node (“C”) which contains on data value at this level. In this case, myString continues to contain its previous value.

```
array("A") = "A node"
array("B") = "B node"
array("C", 1) = "C1 node"
array("D") = "D node"

Println Traverse(array("")1,myString)  ' prints A
Println myString                        ' prints A node
Println Traverse(array("B")1,myString) ' prints C
Println myString                        ' prints A node
```

See Also

- Exists function
LTrim, RTrim, and Trim

Returns a copy of a string without leading spaces (LTrim), trailing spaces (RTrim), or both leading and trailing spaces (Trim).

- **LTrim**(string)
- **RTrim**(string)
- **Trim**(string)

**Arguments**

The *string* argument is any valid string expression.

**Examples**

The following example uses the **LTrim**, **RTrim**, and **Trim** functions to trim leading spaces, trailing spaces, and both leading and trailing spaces, respectively:

```caché
Dim MyVar
MyVar = LTrim("  Caché ")  'MyVar contains "Caché ".
Println Len(MyVar),":",MyVar,":"
MyVar = RTrim("  Caché ")  'MyVar contains " Caché".
Println Len(MyVar),":",MyVar,":"
MyVar = Trim("  Caché ")   'MyVar contains "Caché".
Println Len(MyVar),":",MyVar,":"
```

**See Also**

- **Left** function
- **Right** function
UCase

Returns a string that has been converted to uppercase.

**UCase**(string)

**Arguments**

The *string* argument is any valid string expression.

**Description**

Only lowercase letters are converted to uppercase. Uppercase letters and non-letter characters remain unchanged.

**Examples**

The following example uses the *UCase* function to convert lowercase letters to uppercase:

```basic
Dim MyString
MyString = "Caché from InterSystems"
Println UCase(MyString) ' Returns "CACHÉ FROM INTERSYSTEMS"
```

The following example converts the first four letters of the Greek alphabet from lowercase to uppercase:

```basic
Dim MyString
MyString = Chr(945)&Chr(946)&Chr(947)&Chr(948)
Println MyString
Println UCase(MyString)
```

(Note that the above example requires a Unicode installation of Caché.)

**See Also**

- LCase function
Unlock

Releases a logical lock on a variable name.

**Unlock**(varname)

**Arguments**

<table>
<thead>
<tr>
<th>varname</th>
<th>Name of the variable to be unlocked.</th>
</tr>
</thead>
</table>

**Description**

Each time a lock is obtained on a `varname` a lock count is incremented. **Unlock** decrements this count. Only when the lock count falls to zero will the logical lock be released. For this reason, you should balance each call to **Lock** with a corresponding call to **Unlock**.

**Examples**

The following example uses the **Lock** function to obtain a logical lock on a global variable name (`glvn`) with a timeout of 10 seconds, and then uses the **Unlock** function to release the logical lock.

```cachébasics
If Lock(^PatientData(PatientID),10) = True Then
   Println "Got the Lock"
   Unlock(^PatientData(PatientID)) 'Release the logical lock
Else
   Println "Couldn't get the lock"
End If
```

**See Also**

- **Lock** function
**Weekday**

Returns a whole number representing the day of the week.

```plaintext
Weekday(weekday[,firstdayofweek])
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>weekday</code></td>
<td>Any expression that can represent a date.</td>
</tr>
<tr>
<td><code>firstdayofweek</code></td>
<td>Optional — A constant that specifies the first day of the week. If omitted,</td>
</tr>
<tr>
<td></td>
<td><code>vbSunday</code> is assumed. See Description section for values.</td>
</tr>
</tbody>
</table>

**Description**

The **Weekday** function returns an integer between 1 and 7 (inclusive) specifying the day of the week represented by `weekday`. The first day of the week is, by default, Sunday, or the current NLS day of week setting overriding this default system-wide.

The `firstdayofweek` argument can be used to set the first day of the week for this statement to the day of your choosing. The `firstdayofweek` argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>vbUseSystem</code></td>
<td>0</td>
<td>Use National Language Support (NLS) API setting.</td>
</tr>
<tr>
<td><code>vbSunday</code></td>
<td>1</td>
<td>Sunday</td>
</tr>
<tr>
<td><code>vbMonday</code></td>
<td>2</td>
<td>Monday</td>
</tr>
<tr>
<td><code>vbTuesday</code></td>
<td>3</td>
<td>Tuesday</td>
</tr>
<tr>
<td><code>vbWednesday</code></td>
<td>4</td>
<td>Wednesday</td>
</tr>
<tr>
<td><code>vbThursday</code></td>
<td>5</td>
<td>Thursday</td>
</tr>
<tr>
<td><code>vbFriday</code></td>
<td>6</td>
<td>Friday</td>
</tr>
<tr>
<td><code>vbSaturday</code></td>
<td>7</td>
<td>Saturday</td>
</tr>
</tbody>
</table>

The **Weekday** function can return any of these values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>vbSunday</code></td>
<td>1</td>
<td>Sunday</td>
</tr>
<tr>
<td><code>vbMonday</code></td>
<td>2</td>
<td>Monday</td>
</tr>
<tr>
<td><code>vbTuesday</code></td>
<td>3</td>
<td>Tuesday</td>
</tr>
<tr>
<td><code>vbWednesday</code></td>
<td>4</td>
<td>Wednesday</td>
</tr>
<tr>
<td><code>vbThursday</code></td>
<td>5</td>
<td>Thursday</td>
</tr>
<tr>
<td><code>vbFriday</code></td>
<td>6</td>
<td>Friday</td>
</tr>
<tr>
<td><code>vbSaturday</code></td>
<td>7</td>
<td>Saturday</td>
</tr>
</tbody>
</table>
Examples

The following example uses the Weekday function to obtain the default day of the week for the specified date:

```cachébasicscript
MyDay0 = Weekday("11/1/2005")
Println MyDay0

Nov. 1, 2005 is a Tuesday, so Weekday("11/1/2005") returns 3.
```

The following example shows the effects of the firstdayofweek argument:

```cachébasicscript
MyDay1 = Weekday("11/1/2005", vbSunday)
MyDay2 = Weekday("11/1/2005", vbMonday)
MyDay3 = Weekday("11/1/2005", vbTuesday)
MyDay4 = Weekday("11/1/2005", vbWednesday)
MyDay5 = Weekday("11/1/2005", vbThursday)
MyDay6 = Weekday("11/1/2005", vbFriday)
MyDay7 = Weekday("11/1/2005", vbSaturday)
Println "Day is: ", MyDay1, " Week begins Sunday"
Println "Day is: ", MyDay2, " Week begins Monday"
Println "Day is: ", MyDay3, " Week begins Tuesday"
Println "Day is: ", MyDay4, " Week begins Wednesday"
Println "Day is: ", MyDay5, " Week begins Thursday"
Println "Day is: ", MyDay6, " Week begins Friday"
Println "Day is: ", MyDay7, " Week begins Saturday"
```

See Also

- Date function
- Day function
- Month function
- Now function
- Year function
WeekdayName

Returns a string indicating the specified day of the week.

\[
\text{WeekdayName}(\text{weekday[, abbreviate[, firstdayofweek]]})
\]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>weekday</td>
<td>An integer 1 through 7, inclusive, designating the day of the week. The numeric value of each day depends on the firstdayofweek setting.</td>
</tr>
<tr>
<td>abbreviate</td>
<td>Optional — Boolean value that indicates if the weekday name is to be returned fully spelled out, or abbreviated. If omitted, the default is False, which means that the weekday name is returned fully spelled out.</td>
</tr>
<tr>
<td>firstdayofweek</td>
<td>Optional — Numeric value indicating the first day of the week. See Description section for values.</td>
</tr>
</tbody>
</table>

**Description**

The **WeekdayName** function returns a day name corresponding to the day of the week represented by weekday. The first day of the week is, by default, Sunday, or the current NLS day of week setting overriding this default system-wide.

The firstdayofweek argument can be used to set the first day of the week for this statement to the day of your choosing. The firstdayofweek argument can have the following values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbUseSystem</td>
<td>0</td>
<td>Use National Language Support (NLS) API setting.</td>
</tr>
<tr>
<td>vbSunday</td>
<td>1</td>
<td>Sunday</td>
</tr>
<tr>
<td>vbMonday</td>
<td>2</td>
<td>Monday</td>
</tr>
<tr>
<td>vbTuesday</td>
<td>3</td>
<td>Tuesday</td>
</tr>
<tr>
<td>vbWednesday</td>
<td>4</td>
<td>Wednesday</td>
</tr>
<tr>
<td>vbThursday</td>
<td>5</td>
<td>Thursday</td>
</tr>
<tr>
<td>vbFriday</td>
<td>6</td>
<td>Friday</td>
</tr>
<tr>
<td>vbSaturday</td>
<td>7</td>
<td>Saturday</td>
</tr>
</tbody>
</table>

**Examples**

The following example uses the **WeekDay** and **WeekDayName** functions to return the name of the day of the week for the specified date:

```vbnet
Dim WDayNum, WDayName
WDayNum = Weekday("11/1/2005")
Println WDayNum
WDayName = WeekdayName(3)
Println WDayName

November 1, 2005 is a Tuesday.
```

**See Also**

- MonthName function
• **WeekDay** function
Year

Returns the year as a four-digit integer.

**Year**(date)

**Arguments**

The *date* argument is any expression that represents a date as a string.

**Description**

The **Year** function locates and returns the year portion of a date string as a four-digit integer. The **Year** function accepts blanks, slashes (/), hyphens (-), or commas (,) (in any combination) as date component separators.

The **Year** function locates the year portion, by position, as the third portion of a date. For example, “9/27/2005” or “September 27, 2005” or “27 September 2005”. It does not validate the day or month components of the date string.

If the **Year** function is unable to identify a year portion of the string, it returns a default value of “2000”. If the year portion is provided as a two-digit year, the **Year** function returns a four-digit year. If the two-digit year is 29 or less, it supplies “20” for the missing century digits. If the two-digit year is greater than 29, it supplies 19” for the missing century digits.

**Examples**

The following example uses the **Year** function to return the current year:

```basic
Dim CurrYear
CurrYear = Year(Date)
Print CurrYear
```

The following example uses the **Year** function to obtain the year from a series of specified dates. In every case except the last, it returns the string “2005”. In the last case, the third portion of the string cannot be parsed as a year; this **Year** function instead returns the default value “2000”.

```basic
Dim YearA, YearB, YearC, YearD, YearE, YearF, YearG
YearA = Year("August 12 2005")
YearB = Year("Agosto 12 2005 11:35am")
YearC = Year("Aug 12 05 11:35am")
YearD = Year("12 Agosto 2005")
YearE = Year("8/12/2005")
YearF = Year("8-12-05 11:35am")
YearG = Year("August 12 2005")
Println YearA
Println YearB
Println YearC
Println YearD
Println YearE
Println YearF
Println YearG
```

**See Also**

- Basic: **Date** function, **Day** function, **Hour** function, **Minute** function, **Month** function, **Now** function, **Second** function, **Weekday** function,
- ObjectScript: **$ZDATE** function
- SQL: **YEAR** function
Caché Basic Operators
Operator Summary

A list of Caché Basic operators by type.

Arithmetic Operators

• Addition: + Operator
• Subtraction: – Operator
• Multiplication: * Operator
• Division: / Operator
• Integer Division: \ Operator
• Exponentiation: ^ Operator
• Modulus: Mod Operator

Assignment Operator

• = Operator

Comparison Operators

• Less Than/Greater Than: Comparison Operators
• Object Reference Comparison: Is Operator

Concatenation Operator

• & Operator

Logical Operators

• And Operator
• Not Operator
• Or Operator
• Xor Operator
• Eqv Operator
• Imp Operator

Bitwise Logical Operators

• BitAnd Operator
• BitNot Operator
• BitOr Operator
• BitXor Operator
• BitEqv Operator
- BitImp Operator
Operator Precedence

Description

When several operations occur in an expression, each part is evaluated and resolved in a predetermined order called operator precedence. Parentheses can be used to override the order of precedence and force some parts of an expression to be evaluated before other parts. Operations within parentheses are always performed before those outside. Within parentheses, however, normal operator precedence is maintained.

When expressions contain operators from more than one category, arithmetic operators are evaluated first, comparison operators are evaluated next, and logical operators are evaluated last. Comparison operators all have equal precedence; that is, they are evaluated in the left-to-right order in which they appear. Arithmetic and logical operators are evaluated in the following order of precedence:

<table>
<thead>
<tr>
<th>Arithmetic</th>
<th>Comparison</th>
<th>Logical</th>
<th>Bitwise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negation (-)</td>
<td>Equality (=)</td>
<td>Not</td>
<td>BitNot</td>
</tr>
<tr>
<td>Exponentiation (^)</td>
<td>Inequality (&lt;&gt;)</td>
<td>And</td>
<td>BitAnd</td>
</tr>
<tr>
<td>Multiplication and division (*, /)</td>
<td>Less than (&lt;)</td>
<td>Or</td>
<td>BitOr</td>
</tr>
<tr>
<td>Integer division ()</td>
<td>Greater than (&gt;)</td>
<td>Xor</td>
<td>BitXor</td>
</tr>
<tr>
<td>Modulus arithmetic (Mod)</td>
<td>Less than or equal to (&lt;=)</td>
<td>Eqv</td>
<td>BitEqv</td>
</tr>
<tr>
<td>Addition and subtraction (+, -)</td>
<td>Greater than or equal to (&gt;=)</td>
<td>Imp</td>
<td>BitImp</td>
</tr>
<tr>
<td>String concatenation (&amp;)</td>
<td>Is</td>
<td>&amp;</td>
<td></td>
</tr>
</tbody>
</table>

Note: Caché Basic gives the And logical operator precedence over the Or logical operator. This order of evaluation differs from ObjectScript and Caché MultiValue Basic, both of which give And and Or equal precedence.

When multiplication and division occur together in an expression, each operation is evaluated as it occurs from left to right. Likewise, when addition and subtraction occur together in an expression, each operation is evaluated in order of appearance from left to right.

The string concatenation operator (&) is not an arithmetic operator, but in precedence it does fall after all arithmetic operators and before all comparison operators. The Is operator is an object reference comparison operator. It does not compare objects or their values; it checks only to determine if two object references refer to the same object.

See Also

- Is Operator
- Operator Summary
Addition Operator (+)

Used to sum two numbers.

\[
\text{result} = \text{expression1} + \text{expression2}
\]

**Arguments**

The + operator syntax has these parts:

<table>
<thead>
<tr>
<th>result</th>
<th>Any numeric variable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>expression1</td>
<td>Any expression.</td>
</tr>
<tr>
<td>expression2</td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

**Description**

Although you can also use the + operator to concatenate two character strings, you should use the & operator for concatenation to eliminate ambiguity and provide self-documenting code.

When you use the + operator, you may not be able to determine whether addition or string concatenation will occur.

The underlying subtype of the expressions determines the behavior of the + operator in the following way:

<table>
<thead>
<tr>
<th>If</th>
<th>Then</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both expressions are numeric</td>
<td>Add.</td>
</tr>
<tr>
<td>Both expressions are strings</td>
<td>Concatenate.</td>
</tr>
<tr>
<td>One expression is numeric and</td>
<td>Add.</td>
</tr>
<tr>
<td>the other is a string</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

If both expressions are Empty, \textit{result} is an Integer subtype. However, if only one expression is Empty, the other expression is returned unchanged as \textit{result}.

**See Also**

- Operator Summary
- Operator Precedence
- Subtraction Operator (−)
**Subtraction Operator (–)**

Used to find the difference between two numbers or to indicate the negative value of a numeric expression.

**Syntax 1**

```
result = number1-number2
```

**Syntax 2**

```
-number
```

**Arguments**

The – operator syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>result</code></td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td><code>number</code></td>
<td>Any numeric expression.</td>
</tr>
<tr>
<td><code>number1</code></td>
<td>Any numeric expression.</td>
</tr>
<tr>
<td><code>number2</code></td>
<td>Any numeric expression.</td>
</tr>
</tbody>
</table>

**Description**

In Syntax 1, the – operator is the arithmetic subtraction operator used to find the difference between two numbers. In Syntax 2, the – operator is used as the unary negation operator to indicate the negative value of an expression.

If an expression is Empty, it is treated as if it were 0.

**See Also**

- Operator Summary
- Operator Precedence
- Addition Operator (+)
Mod Operator

Used to divide two numbers and return only the remainder.

\[ \text{result} = \text{number1} \mod \text{number2} \]

**Arguments**

The `Mod` operator syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>result</code></td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td><code>number1</code></td>
<td>Any numeric expression.</td>
</tr>
<tr>
<td><code>number2</code></td>
<td>Any numeric expression.</td>
</tr>
</tbody>
</table>

**Description**

The modulus, or remainder, operator divides `number1` by `number2` (rounding floating-point numbers to integers) and returns only the remainder as `result`. For example, in the following expression, `A` (which is `result`) equals 5.

\[ A = 19 \mod 6.7 \]

Any expression that is Empty is treated as 0.

**See Also**

- Operator Precedence
- Operator Summary
**Multiplication Operator (*)**

Used to multiply two numbers.

\[
\text{result} = \text{number1} \times \text{number2}
\]

**Arguments**

The * operator syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>result</code></td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td><code>number1</code></td>
<td>Any numeric expression.</td>
</tr>
<tr>
<td><code>number2</code></td>
<td>Any numeric expression.</td>
</tr>
</tbody>
</table>

**Description**

If an expression is Empty, it is treated as if it were 0.

**See Also**

- Operator Summary
- Operator Precedence
- Division Operator (/)
Division Operator (/)

Used to divide two numbers and return a floating-point result.

\[
\text{result} = \frac{\text{number1}}{\text{number2}}
\]

**Arguments**

The / operator syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td>number1</td>
<td>Any numeric expression.</td>
</tr>
<tr>
<td>number2</td>
<td>Any numeric expression.</td>
</tr>
</tbody>
</table>

**Description**

Any expression that is Empty is treated as 0.

**See Also**

- Operator Summary
- Operator Precedence
- Multiplication Operator (*)
- Integer Division Operator (\)
**Integer Division Operator (\)**

Used to divide two numbers and return an integer result.

```
result = number1 \ number2
```

**Arguments**

The \ operator syntax has these parts:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>result</strong></td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td><strong>number1</strong></td>
<td>Any numeric expression.</td>
</tr>
<tr>
<td><strong>number2</strong></td>
<td>Any numeric expression.</td>
</tr>
</tbody>
</table>

**Description**

Before division is performed, numeric expressions are rounded to Byte, Integer, or Long subtype expressions. Any expression that is Empty is treated as 0.

**See Also**

- Operator Summary
- Operator Precedence
- Multiplication Operator (*)
- Division Operator (/)
Exponent Operator (^)

Used to raise a number to the power of an exponent.

\[ \text{result} = \text{number} \, ^\, \text{exponent} \]

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td>number</td>
<td>Any numeric expression.</td>
</tr>
<tr>
<td>exponent</td>
<td>Any numeric expression. An exponent value is required.</td>
</tr>
</tbody>
</table>

**Description**

The caret (^) is used as the exponentiation operator.

**Note:** The exponent operator should not be confused with the base-10 exponent symbol. An uppercase letter “E”, or lowercase letter “e” can be used as a base-10 exponent (scientific notation) symbol in a numeric literal. These letters cannot be used as operators.

The **number** argument can be negative only if **exponent** is an integer value. When more than one exponentiation is performed in a single expression, the ^ operator is evaluated as it is encountered from left to right.

Caché Basic exponentiation is functionally identical to ObjectScript exponentiation. For details on valid argument values and the value returned for specific combinations of argument values, see Exponentiation Operator in the “Operators and Expressions” chapter of Using Caché ObjectScript.

**Example**

The following example shows valid uses of the exponent operator (^) and the base-10 exponent symbol (E). Note that the usage \( x \, E \, y \) is not valid, because E is a numeric literal character, not an operator.

```
SET x=3
SET y=4
Println x ^ y       ' Returns 81
Println 3E4         ' Returns 30000
```

**See Also**

- Operator Summary
- Operator Precedence
- Multiplication Operator (*)
Assignment Operator ( = )

Used to assign a value to a variable or property.

```
variable = value
```

**Arguments**

The = operator syntax has these parts:

<table>
<thead>
<tr>
<th>variable</th>
<th>Any variable or any writable property.</th>
</tr>
</thead>
<tbody>
<tr>
<td>value</td>
<td>Any numeric or string literal, constant, or expression.</td>
</tr>
</tbody>
</table>

**Description**

The name on the left side of the equal sign can be a simple scalar variable or an element of an array. Properties on the left side of the equal sign can only be those properties that are writable at runtime.

**See Also**

- Operator Summary
- Operator Precedence
- Set Statement
Comparison Operators

Used to compare expressions.

result = expression1 comparisonoperator expression2
result = object1 Is object2

Arguments

Comparison operators have these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td>expression</td>
<td>Any expression.</td>
</tr>
<tr>
<td>comparisonoperator</td>
<td>Any comparison operator.</td>
</tr>
<tr>
<td>object</td>
<td>Any object name.</td>
</tr>
</tbody>
</table>

Description

The Is operator has specific comparison functionality that differs from the operators in the following table. The following table contains a list of the comparison operators and the conditions that determine whether result is True or False:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
<th>True If</th>
<th>False if</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td>Less than</td>
<td>expression1 &lt; expression2</td>
<td>expression1 &gt;= expression2</td>
</tr>
<tr>
<td>&lt;=</td>
<td>Less than or equal to</td>
<td>expression1 &lt;= expression2</td>
<td>expression1 &gt; expression2</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater than</td>
<td>expression1 &gt; expression2</td>
<td>expression1 &lt;= expression2</td>
</tr>
<tr>
<td>&gt;=</td>
<td>Greater than or equal to</td>
<td>expression1 &gt;= expression2</td>
<td>expression1 &lt; expression2</td>
</tr>
<tr>
<td>=</td>
<td>Equal to</td>
<td>expression1 = expression2</td>
<td>expression1 &lt;&gt; expression2</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Not equal to</td>
<td>expression1 &lt;&gt; expression2</td>
<td>expression1 = expression2</td>
</tr>
</tbody>
</table>

When comparing two expressions, you may not be able to easily determine whether the expressions are being compared as numbers or as strings.

The following table shows how expressions are compared or what results from the comparison, depending on the underlying subtype:

<table>
<thead>
<tr>
<th>If</th>
<th>Then</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both expressions are numeric</td>
<td>Perform a numeric comparison.</td>
</tr>
<tr>
<td>Both expressions are strings</td>
<td>Perform a string comparison.</td>
</tr>
<tr>
<td>One expression is numeric and the other is a string</td>
<td>The numeric expression is less than the string expression.</td>
</tr>
</tbody>
</table>
Concatenation Operator (&)

Used to force string concatenation of two expressions.

\[ \text{result} = \text{expression1} \& \text{expression2} \]

**Arguments**

The & operator syntax has these parts:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><code>result</code></td>
<td>Any variable.</td>
</tr>
<tr>
<td><code>expression1</code></td>
<td>Any expression.</td>
</tr>
<tr>
<td><code>expression2</code></td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

**Description**

Whenever an expression is not a string, it is converted to a **String** subtype. Any expression that is Empty is also treated as a zero-length string.

**See Also**

- Operator Summary
- Operator Precedence
**Is Operator**

Used to compare two object reference variables.

\[
\text{result} = \text{object1} \text{ Is object2}
\]

**Arguments**

The `Is` operator syntax has these parts:

<table>
<thead>
<tr>
<th>result</th>
<th>Any numeric variable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>object1</td>
<td>Any object name.</td>
</tr>
<tr>
<td>object2</td>
<td>Any object name.</td>
</tr>
</tbody>
</table>

**Description**

If `object1` and `object2` both refer to the same object, `result` is True; if they do not, `result` is False. Two variables can be made to refer to the same object in several ways:

In the following example, A has been set to refer to the same object as B:

```plaintext
Set A = B
```

The following example makes A and B refer to the same object as C:

```plaintext
Set A = C
Set B = C
```

**See Also**

- Operator Summary
- Operator Precedence
- And operator
- Not operator
- Xor operator
And Operator

Used to perform a logical conjunction on two expressions.

result = expression1 And expression2

Arguments

The And operator syntax has these parts:

<table>
<thead>
<tr>
<th></th>
<th>Any numeric variable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>expression1</td>
</tr>
<tr>
<td></td>
<td>Any expression.</td>
</tr>
<tr>
<td></td>
<td>expression2</td>
</tr>
<tr>
<td></td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

Description

If, and only if, both expressions evaluate to True, result is True. If either expression evaluates to False, result is False. The following table illustrates how result is determined:

<table>
<thead>
<tr>
<th>If expression1 Is</th>
<th>If expression2 Is</th>
<th>The result Is</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>False</td>
<td>False</td>
</tr>
</tbody>
</table>

See Also

- Operator Summary
- Operator Precedence
- BitAnd operator
- Not operator
- Or operator
- Xor operator
BitAnd Operator

Used to perform a bitwise conjunction on two numeric expressions.

\[
\text{result} = \text{expression1} \text{ BitAnd } \text{expression2}
\]

**Arguments**

The **BitAnd** operator syntax has these parts:

<table>
<thead>
<tr>
<th>result</th>
<th>Any numeric variable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>expression1</td>
<td>Any expression.</td>
</tr>
<tr>
<td>expression2</td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

**Description**

The **BitAnd** operator performs a bitwise comparison of identically positioned bits in two numeric expressions and sets the corresponding bit in \( \text{result} \) according to the following table:

<table>
<thead>
<tr>
<th>If bit in ( \text{expression1} ) is</th>
<th>If bit in ( \text{expression2} ) is</th>
<th>The result is</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**See Also**

- Operator Summary
- Operator Precedence
- And operator
- BitNot operator
- BitOr operator
- BitXor operator
**Eqv Operator**

Used to perform a logical equivalence on two expressions.

```
result = expression1 Eqv expression2
```

### Arguments

The `Eqv` operator syntax has these parts:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><code>result</code></td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td><code>expression1</code></td>
<td>Any expression.</td>
</tr>
<tr>
<td><code>expression2</code></td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

### Description

The `result` is determined according to the following table:

<table>
<thead>
<tr>
<th>If <code>expression1</code> is</th>
<th>If <code>expression2</code> is</th>
<th>The <code>result</code> is</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>False</td>
<td>True</td>
</tr>
</tbody>
</table>

### See Also

- Operator Summary
- Operator Precedence
- BitEqv operator
- And operator
- Not operator
- Xor operator
BitEqv Operator

Used to perform a bitwise equivalence on two numeric expressions.

`result = expression1 BitEqv expression2`

**Arguments**

The `BitEqv` operator syntax has these parts:

<table>
<thead>
<tr>
<th>result</th>
<th>Any numeric variable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>expression1</td>
<td>Any expression.</td>
</tr>
<tr>
<td>expression2</td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

**Description**

The `BitEqv` operator performs a bitwise comparison of identically positioned bits in two numeric expressions and sets the corresponding bit in `result` according to the following table:

<table>
<thead>
<tr>
<th>If bit in <code>expression1</code> is</th>
<th>If bit in <code>expression2</code> is</th>
<th>The <code>result</code> is</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**See Also**

- Operator Summary
- Operator Precedence
- Eqv operator
- BitAnd operator
- BitNot operator
- BitXor operator
Imp Operator

Used to perform a logical implication on two expressions.

result = expression1 Imp expression2

Arguments

The Imp operator syntax has these parts:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td>expression1</td>
<td>Any expression.</td>
</tr>
<tr>
<td>expression2</td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

Description

The following table illustrates how result is determined:

<table>
<thead>
<tr>
<th>If expression1 is</th>
<th>If expression2 is</th>
<th>The result is</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>False</td>
<td>True</td>
</tr>
</tbody>
</table>

See Also

- Operator Summary
- Operator Precedence
- BitImp operator
- And operator
- Not operator
- Xor operator
**BitImp Operator**

Used to perform a bitwise implication on two numeric expressions.

\[
\text{result} = \text{expression1 BitImp expression2}
\]

**Arguments**

The **BitImp** operator syntax has these parts:

| result | Any numeric variable. |
| expression1 | Any expression. |
| expression2 | Any expression. |

**Description**

The **BitImp** operator performs a bitwise comparison of identically positioned bits in two numeric expressions and sets the corresponding bit in `result` according to the following table:

<table>
<thead>
<tr>
<th>If bit in <code>expression1</code> is</th>
<th>If bit in <code>expression2</code> is</th>
<th>The <code>result</code> is</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**See Also**

- Operator Summary
- Operator Precedence
- Imp operator
- BitAnd operator
- BitNot operator
- BitXor operator
Not Operator

Used to perform logical negation on an expression.

\[ \text{result} = \text{Not expression} \]

**Arguments**

The `Not` operator syntax has these parts:

<table>
<thead>
<tr>
<th><code>result</code></th>
<th>Any numeric variable.</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>expression</code></td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

**Description**

The following table illustrates how `result` is determined:

<table>
<thead>
<tr>
<th>If <code>expression</code> is</th>
<th>Then <code>result</code> is</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
</tr>
</tbody>
</table>

**See Also**

- [Operator Summary](#)
- [Operator Precedence](#)
- [BitNot operator](#)
- [And operator](#)
- [Or operator](#)
- [Xor operator](#)
**BitNot Operator**

Used to perform bitwise negation on a numeric expression.

\[
\text{result} = \text{BitNot} \ \text{expression}
\]

**Arguments**

The **BitNot** operator syntax has these parts:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td>expression</td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

**Description**

The **BitNot** operator inverts the bit values of any variable and sets the corresponding bit in \( \text{result} \) according to the following table:

<table>
<thead>
<tr>
<th>Bit in ( \text{expression} )</th>
<th>Bit in ( \text{result} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**See Also**

- [Operator Summary](#)
- [Operator Precedence](#)
- [Not operator](#)
- [BitAnd operator](#)
- [BitOr operator](#)
- [BitXor operator](#)
Or Operator

Used to perform a logical disjunction on two expressions.

\[
\text{result} = \text{expression1 Or expression2}
\]

**Arguments**

The **Or** operator syntax has these parts:

<table>
<thead>
<tr>
<th>result</th>
<th>Any numeric variable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>expression1</td>
<td>Any expression.</td>
</tr>
<tr>
<td>expression2</td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

**Description**

If either or both expressions evaluate to True, \textit{result} is True. The following table illustrates how \textit{result} is determined:

<table>
<thead>
<tr>
<th>If \textit{expression1} is</th>
<th>If \textit{expression2} is</th>
<th>The \textit{result} is</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>False</td>
<td>False</td>
</tr>
</tbody>
</table>

**See Also**

- Operator Summary
- Operator Precedence
- BitOr operator
- And operator
- Not operator
- Xor operator
BitOr Operator

Used to perform a bitwise disjunction on two numeric expressions.

\[
\text{result} = \text{expression1} \text{ BitOr } \text{expression2}
\]

**Arguments**

The BitOr operator syntax has these parts:

<table>
<thead>
<tr>
<th>result</th>
<th>Any numeric variable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>expression1</td>
<td>Any expression.</td>
</tr>
<tr>
<td>expression2</td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

**Description**

The BitOr operator performs a bitwise comparison of identically positioned bits in two numeric expressions and sets the corresponding bit in result according to the following table:

<table>
<thead>
<tr>
<th>If bit in expression1 is</th>
<th>If bit in expression2 is</th>
<th>The result is</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**See Also**

- Operator Summary
- Operator Precedence
- Or operator
- BitAnd operator
- BitNot operator
- BitXor operator
Xor Operator

Used to perform a logical exclusion on two expressions.

\[
\text{result} = \text{expression1} \text{ Xor expression2}
\]

Arguments

The Xor operator syntax has these parts:

<table>
<thead>
<tr>
<th>result</th>
<th>Any numeric variable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>expression1</td>
<td>Any expression.</td>
</tr>
<tr>
<td>expression2</td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

Description

The result is determined according to the following table:

<table>
<thead>
<tr>
<th>If expression1 is</th>
<th>If expression2 is</th>
<th>The result is</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>False</td>
<td>False</td>
</tr>
</tbody>
</table>

See Also

- Operator Summary
- Operator Precedence
- BitXor operator
- And operator
- Not operator
- Or operator
**BitXor Operator**

Used to perform a bitwise exclusion on two numeric expressions.

\[
\text{result} = \text{expression1} \text{ BitXor expression2}
\]

**Arguments**

The **BitXor** operator syntax has these parts:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>result</td>
<td>Any numeric variable.</td>
</tr>
<tr>
<td>expression1</td>
<td>Any expression.</td>
</tr>
<tr>
<td>expression2</td>
<td>Any expression.</td>
</tr>
</tbody>
</table>

**Description**

The **BitXor** operator performs a bitwise comparison of identically positioned bits in two numeric expressions and sets the corresponding bit in *result* according to the following table:

<table>
<thead>
<tr>
<th>If bit in <em>expression1</em> is</th>
<th>If bit in <em>expression2</em> is</th>
<th>The <em>result</em> is</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**See Also**

- Operator Summary
- Operator Precedence
- Xor operator
- BitAnd operator
- BitNot operator
- BitOr operator
Caché Basic Constants
**Comparison Constants**

These constants are always available.

**Predefined Constants**

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbBinaryCompare</td>
<td>0</td>
<td>Perform a binary comparison.</td>
</tr>
<tr>
<td>vbTextCompare</td>
<td>1</td>
<td>Perform a textual comparison.</td>
</tr>
</tbody>
</table>
Date Format Constants

These constants are always available.

Predefined Constants

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbGeneralDate</td>
<td>0</td>
<td>Display a date and/or time. For real numbers, display a date and time. If there is no fractional part, display only a date. If there is no integer part, display time only. Date and time display is determined by your system settings.</td>
</tr>
<tr>
<td>vbLongDate</td>
<td>1</td>
<td>Display a date using the long date format specified in your computer’s regional settings.</td>
</tr>
<tr>
<td>vbShortDate</td>
<td>2</td>
<td>Display a date using the short date format specified in your computer’s regional settings.</td>
</tr>
<tr>
<td>vbLongTime</td>
<td>3</td>
<td>Display a time using the long time format specified in your computer’s regional settings.</td>
</tr>
<tr>
<td>vbShortTime</td>
<td>4</td>
<td>Display a time using the short time format specified in your computer’s regional settings.</td>
</tr>
</tbody>
</table>
Date and Time Constants

These constants are always available.

Predefined Constants

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbSunday</td>
<td>1</td>
<td>Sunday</td>
</tr>
<tr>
<td>vbMonday</td>
<td>2</td>
<td>Monday</td>
</tr>
<tr>
<td>vbTuesday</td>
<td>3</td>
<td>Tuesday</td>
</tr>
<tr>
<td>vbWednesday</td>
<td>4</td>
<td>Wednesday</td>
</tr>
<tr>
<td>vbThursday</td>
<td>5</td>
<td>Thursday</td>
</tr>
<tr>
<td>vbFriday</td>
<td>6</td>
<td>Friday</td>
</tr>
<tr>
<td>vbSaturday</td>
<td>7</td>
<td>Saturday</td>
</tr>
</tbody>
</table>
Node Constants

These constants are always available.

**Predefined Constants**

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbUndef</td>
<td>0</td>
<td>Indicates that the referenced variable or node is undefined.</td>
</tr>
<tr>
<td>vbHasValue</td>
<td>1</td>
<td>Indicates that the referenced variable or node has a data value.</td>
</tr>
<tr>
<td>vbHasArray</td>
<td>2</td>
<td>Indicates that the referenced variable or node has sub-nodes.</td>
</tr>
</tbody>
</table>
String Constants

These constants are always available.

Predefined Constants

The following string constants can be used anywhere in your code in place of actual values:

<table>
<thead>
<tr>
<th>Constant</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vbCr</td>
<td>Chr(13)</td>
<td>Carriage return</td>
</tr>
<tr>
<td>vbCrLf</td>
<td>Chr(13) &amp; Chr(10)</td>
<td>Carriage return–linefeed combination</td>
</tr>
<tr>
<td>vbFormFeed</td>
<td>Chr(12)</td>
<td>Form feed</td>
</tr>
<tr>
<td>vbLf</td>
<td>Chr(10)</td>
<td>Line feed</td>
</tr>
<tr>
<td>vbNewLine</td>
<td>Chr(13) &amp; Chr(10)</td>
<td>Platform-specific newline character; whatever is</td>
</tr>
<tr>
<td></td>
<td>or Chr(10)</td>
<td>appropriate for the platform</td>
</tr>
<tr>
<td>vbNullChar</td>
<td>Chr(0)</td>
<td>Character having the value 0</td>
</tr>
<tr>
<td>vbNullString</td>
<td>String having value 0</td>
<td>Not the same as a zero-length string (&quot;'&quot;'); used</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for calling external procedures</td>
</tr>
<tr>
<td>vbTab</td>
<td>Chr(9)</td>
<td>Horizontal tab</td>
</tr>
<tr>
<td>vbVerticalTab</td>
<td>Chr(11)</td>
<td>Vertical tab</td>
</tr>
</tbody>
</table>
Caché Basic Objects
Err Object

Contains information about runtime errors.

Description

The **Err** object is an intrinsic object with global scope. There is no need to create an instance of it. The **Err** object contains information about runtime errors and it provides **Raise** and **Clear** methods for generating and clearing runtime errors.

The properties of the **Err** object are set by the generator of an error, either the Caché Basic runtime system in response to an error condition or by the program calling the **Raise** method.

When a runtime errors occurs, the properties of the **Err** object are filled with information that uniquely identifies and describes the error condition.

The **Err** object may be referenced anywhere in the Basic program but will only contain data for the last error.

Properties

These properties can contain a numeric or string literal, or an expression that resolves to a literal.

**Number**

A number that uniquely defines the error code. Numbers from 1 to 512 are reserved by Caché Basic for indication of runtime errors generated by the system. Numbers from 513 and up are reserved for use by the programmer.

**Description**

A textual description that describes the nature of the error.

**Source**

A textual description of the source of the error. This may be the name of the program within which the error occurred or it may be the name of an object. If possible, the location within the code where the error occurred might be included.

Methods

**Clear()**

This clears the error condition and sets the properties of the object to the empty string. The **Clear** method takes no arguments; the parentheses are optional.

**Raise(number [,description [,source]])**

The method generates a user-defined exception.

The **Raise** method has the following arguments:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>The error number.</td>
</tr>
<tr>
<td>description</td>
<td>Optional — A description of the error.</td>
</tr>
<tr>
<td>source</td>
<td>Optional — A location associated with the error.</td>
</tr>
</tbody>
</table>

When an exception is generated using the **Raise** method, the properties of the **Err** object are first cleared and then set with the corresponding arguments.

The **Raise** method and the **Err** object are commonly used with the **TRY** and **CATCH** statements.
Examples

The following example issues an error using the **Err.Raise** method. After displaying the error arguments, it uses the **Err.Clear** method to clear these error argument values:

```basic
Main:
    On Error Goto ErrorHandler
    Println "before the error"
    Err.Raise(100, "Deliberate Error", "Main line 3")
    Println "after the error"  ' should not print
ErrorHandler:
    Err.Clear()
```

The following example demonstrates how to use the **Err** object in a function:

```basic
Println ErrorTest(1)
Println ErrorTest(0)
Function ErrorTest(Arg)
    On Error Goto ErrorHandler
    return 1/Arg
ErrorHandler:
    Err.Clear()
    return 0
End Function
```

See Also

- **TRY** statement
- **CATCH** statement
- **On Error** function
System Object

The System object provides access to properties and methods of Caché components.

Description

The System object is an intrinsic object with global scope. There is no need to create an instance of it.

Through the System object programs have access to properties and methods related to the following components: Activate, CSP, Encryption, Help, OBJ, SQL and Version.

For detailed information on the System object, look at the class definitions in the %SYSTEM package.

Examples

The following example demonstrates how to use the System object:

```cachébasic
Println System.Version.GetCompBuildOS()    ' prints the OS version
   ' for which this Caché Version was built
Println System.Version.GetNumber()         ' prints the Version number
```

Please note that the System object in ObjectScript is referenced by $System and in Caché Basic by System.

Note

The System object may be referenced anywhere in the basic program.
Caché Basic General Concepts
Multidimensional Data Model

Introduction to the Multidimensional Data Model in Caché

Rich Multidimensional Data Structure

Caché’s high-performance database uses a multidimensional data model that allows efficient and compact storage of data in a rich data structure. With Caché, it is possible to access or update data without performing the complicated and time-consuming joins required by relational databases.

Although sometimes described as a “hyper-cube” or “n-dimensional space,” a more accurate description of the Caché storage model is a collection of sparse multidimensional arrays called “globals.” Data can be stored in a global with any number of subscripts. What’s more, subscripts are typeless and hence can be anything – string, integer, floating point, etc. This means one subscript might be an integer, such as 34, while another could be a meaningful name, like “LineItems”—even at the same subscript level.

For example, a stock inventory application that provides information about item, size, color, and pattern might have a structure like this:

\(^\text{Stock}(\text{item}, \text{size}, \text{color}, \text{pattern}) = \text{quantity}\)

Here’s some sample data:

\(^\text{Stock}(\text{"slip dress"}, 4, \text{"blue"}, \text{"floral"}) = 3\)

With this structure, it is very easy to determine if there are any size 4 blue slip dresses with a floral pattern – simply by accessing that data node. If a customer wants a size 4 slip dress and is uncertain about color and pattern, it is easy to display a list of all of those by cycling through all of the data nodes below \(^\text{Stock}(\text{"slip dress"}, 4)\).

In this example, all the data nodes were of a similar nature (they stored a quantity), and they were all stored at the same subscript level (4 subscripts) with similar subscripts (the 3rd subscript was always text representing a color). However, they do not have to be. Not all data nodes have to have the same number or type of subscripts, and they may contain different types of data.

Here is an example of a more complex global with invoice data that has different types of data stored at different subscript levels:

\(^\text{Invoice}(\text{invoice #}, \text{"Customer")} = \text{Customer information}\)
\(^\text{Invoice}(\text{invoice #}, \text{"Date")} = \text{Invoice date}\)
\(^\text{Invoice}(\text{invoice #}, \text{"Items")} = \# \text{ of Items in the invoice}\)
\(^\text{Invoice}(\text{invoice #}, \text{"Items", 1,"PartNum")} = \text{part number of 1st Item}\)
\(^\text{Invoice}(\text{invoice #}, \text{"Items", 1,"Quantity")} = \text{quantity of 1st Item}\)
\(^\text{Invoice}(\text{invoice #}, \text{"Items", 1,"Price")} = \text{price of 1st Item}\)
\(^\text{Invoice}(\text{invoice #}, \text{"Items", 2,"PartNum")} = \text{part number of 2nd Item}\)

Multiple Data Elements per Node

Often only a single data element is stored in a data node, such as a date or quantity, but sometimes it is useful to store multiple data elements together as a single data node. This is particularly useful when there is a set of related data that is often accessed together. It can also improve performance by requiring fewer accesses of the database, especially when networks are involved.

For example, in the previous invoice, each item included a part number, quantity, and price all stored as separate nodes, but they could be stored in a single node:

\(^\text{Invoice}(\text{invoice #}, \text{"LineItems", item #}) = \$\text{LB(PartNum,Quantity,Price)}\)

To make this simple, Caché supports a list functions which can assemble multiple data elements into a length delimited byte string and later de-assemble them, preserving datatype.
Transaction Processing with a Large Number of Users

Efficient access to data makes the multidimensional model a natural for transaction processing. Caché processes do not have to spend time joining multiple tables, so they run faster.

Logical Locking Promotes High Concurrency

In systems with thousands of users, reducing conflicts between competing processes is critical to providing high performance. One of the biggest conflicts is between transactions wishing to access the same data.

Caché processes do not lock entire pages of data while performing updates. Because transactions require frequent access or changes to small quantities of data, database locking in Caché is done at a logical level. Database conflicts are further reduced by using atomic addition and subtraction operations, which do not require locking. (These operations are particularly useful in incrementing counters used to allocate ID numbers and for modifying statistics counters, both of which are common “hot spots” in a database that would otherwise cause frequent conflicts between competing transactions.)

With Caché, individual transactions run faster, and more transactions can run concurrently.

Multidimensional Model Enables Realistic Description of Data

The multidimensional model is also a natural fit for describing and storing complex data. Developers can create data structures that accurately represent real-world data, thus making it faster to develop applications and easier to maintain them.

Variable Length Data in Sparse Arrays

Because Caché data is inherently of variable length and is stored in sparse arrays, Caché often requires less than half of the space needed by a relational database. In addition to reducing disk requirements, compact data storage enhances performance because more data can be read or written with a single I/O operation, and data can be cached more efficiently.

Declarations and Definitions are Not Required

No declarations, definitions, or allocations of storage are required to directly access or store data in the database, and there is no need to specify the number or type of subscripts or the type or size of data. The multidimensional arrays are inherently typeless, both in their data and subscripts. Global data simply pops into existence as data is inserted with the SET command.

However, to make use of the object access and SQL access of the database, data dictionary information is required. In specifying the data dictionary for objects and SQL, developers have a choice of letting wizards automatically select the multidimensional data structure best suited to their data, or they can directly specify the mapping.

Namespaces

In Caché, data and ObjectScript code are stored in disk files with the name CACHE.DAT (only one per directory). Each such file contains numerous “globals” (multidimensional arrays). Within a file, each global name must be unique, but different files may contain the same global name. These files may be loosely thought of as databases.

Rather than specifying which CACHE.DAT file to use, each Caché process uses a “namespace” to access data. A namespace is a logical map that maps the names of multidimensional global arrays and routine code to CACHE.DAT files, including the Data Server and directory name for that file. If a file is moved from one disk drive or computer to another, the namespace map is changed.

Usually a namespace specifies sharing of certain system information with other namespaces, and the rest of the namespace’s data is in a single CACHE.DAT used only by that namespace. However, this is a flexible structure that allows arbitrary mapping, and it is not unusual for a namespace to map the contents of several CACHE.DAT files.
## Reserved words

A list of Caché Basic reserved words.

<table>
<thead>
<tr>
<th>ABS</th>
<th>AND</th>
<th>AS</th>
<th>ASC</th>
<th>ATN</th>
</tr>
</thead>
<tbody>
<tr>
<td>BITAND</td>
<td>BITEQV</td>
<td>BITIMP</td>
<td>BITNOT</td>
<td>BITOR</td>
</tr>
<tr>
<td>BITXOR</td>
<td>BYREF</td>
<td>BYVAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CALL</td>
<td>CASE</td>
<td>CATCH</td>
<td>CHR</td>
<td>CONST</td>
</tr>
<tr>
<td>DATE</td>
<td>DATEADD</td>
<td>DATEDIFF</td>
<td>DATEPART</td>
<td></td>
</tr>
<tr>
<td>DAY</td>
<td>DEBUG</td>
<td>DEFAULT</td>
<td>DIM</td>
<td>DO</td>
</tr>
<tr>
<td>EACH</td>
<td>ELSE</td>
<td>ELSEIF</td>
<td>END</td>
<td></td>
</tr>
<tr>
<td>EQV</td>
<td>ERR</td>
<td>ERROR</td>
<td>EXISTS</td>
<td></td>
</tr>
<tr>
<td>EXIT</td>
<td>EXP</td>
<td>EXPLICIT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FALSE</td>
<td>FINALLY</td>
<td>FIX</td>
<td>FOR</td>
<td>FUNCTION</td>
</tr>
<tr>
<td>GOTO</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEX</td>
<td>HOUR</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>IF</td>
<td>IMP</td>
<td>IN</td>
<td>INCREMENT</td>
<td></td>
</tr>
<tr>
<td>INPUT</td>
<td>INSTR</td>
<td>INSTRREV</td>
<td>INT</td>
<td></td>
</tr>
<tr>
<td>IS</td>
<td>ISOBJECT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JOIN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCASE</td>
<td>LEFT</td>
<td>LEN</td>
<td>LET</td>
<td></td>
</tr>
<tr>
<td>LIST</td>
<td>LISTBUILD</td>
<td>LISTEXISTS</td>
<td>LISTFIND</td>
<td>LISTGET</td>
</tr>
<tr>
<td>LISTLENGTH</td>
<td>LOCK</td>
<td>LOG</td>
<td>LOOP</td>
<td>LTRIM</td>
</tr>
<tr>
<td>ME</td>
<td>MID</td>
<td>MINUTE</td>
<td>MOD</td>
<td>MONTH</td>
</tr>
<tr>
<td>NEW</td>
<td>NEXT</td>
<td>NOT</td>
<td>NOTHING</td>
<td>NOW</td>
</tr>
<tr>
<td>OBJECT</td>
<td>OCT</td>
<td>ON</td>
<td>OPEN</td>
<td>OPENID</td>
</tr>
<tr>
<td>PIECE</td>
<td>PRIVATE</td>
<td>PUBLIC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RANDOMIZE</td>
<td>REM</td>
<td>REPLACE</td>
<td>RETURN</td>
<td></td>
</tr>
<tr>
<td>RIGHT</td>
<td>RND</td>
<td>ROUND</td>
<td>RTRIM</td>
<td></td>
</tr>
<tr>
<td>SECOND</td>
<td>SELECT</td>
<td>SET</td>
<td>SGN</td>
<td>SIN</td>
</tr>
<tr>
<td>SPLIT</td>
<td>SQR</td>
<td>STRCOMP</td>
<td>STRING</td>
<td>STRREVERSE</td>
</tr>
<tr>
<td>TAN</td>
<td>TCOMMIT</td>
<td>THEN</td>
<td>THROW</td>
<td>TIMER</td>
</tr>
<tr>
<td>TRIM</td>
<td>TROLLOBACK</td>
<td>TRUE</td>
<td>TRY</td>
<td>TSTART</td>
</tr>
<tr>
<td>UCASE</td>
<td>UNLOCK</td>
<td>UNTIL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VBBACKWARD</td>
<td>VBCR</td>
<td>VBRLF</td>
<td>VBFF</td>
<td>VBFORMFEED</td>
</tr>
<tr>
<td>VBFRIDAY</td>
<td>VBHASARRAY</td>
<td>VBHASVALUE</td>
<td>VBLF</td>
<td>VBMONDAY</td>
</tr>
<tr>
<td>VBNEWLINE</td>
<td>VBNL</td>
<td>VBNULCHAR</td>
<td>VBSUNDAY</td>
<td>VBTAB</td>
</tr>
<tr>
<td>VBOTEXTERNAL</td>
<td>VBOTINTERNAL</td>
<td>VBTUESDAY</td>
<td>VBUNDEF</td>
<td></td>
</tr>
<tr>
<td>VBUSESYSTEM</td>
<td>VBV</td>
<td>VBVERTICALTAB</td>
<td>VBWEDNESDAY</td>
<td></td>
</tr>
<tr>
<td>WEEKDAY</td>
<td>WEEKDAYNAME</td>
<td>WEND</td>
<td>WHILE</td>
<td></td>
</tr>
<tr>
<td>XOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YEAR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Description

Within Caché Basic certain words are *reserved*. You cannot use a Basic reserved word as a Basic identifier (such as the name of a variable).