FLOWGORITHM DOCUMENTATION

Data Types

Integer Data Type

The Integer data type is one of the most commonly used types in programming. An integer can store a positive or negative whole number, but can't store fractional values. So, it can store values such as 5, 42, 1947, but can't store numbers such as 3.2, 4.5, etc...

If a number with a fractional value is stored into a integer, the fractional value will be discarded. Hence, if 3.2 is stored into an integer, it will only retain 3.

The Variable Watch Window displays integers in blue.

Real Data Type

The Real data type can store any number - both whole numbers and ones with fractional values. In many languages, this is called a "double" after the implementation standard known as "double-precision floating point".

The Variable Watch Window displays reals in purple.

String Data Type

The String data type is used to store any textual data. This includes words, letters, or anything else you would send in a text message. In programming, the text is delimited with double quotes. For example: "CSU, Sacramento", "computer", and "Year 1947" are all strings.

The Variable Watch Window displays strings in red.

Boolean Data Type

The Boolean Data Type can store either "true" or "false". These are the basis of decision making in a computer program.

The Variable Watch Window displays Booleans in teal.

Summary Chart

Data Type	Notes
Boolean	Stores either Boolean true or false
Real	Stores a real number.
Integer	Stores an integer number.
String	Stores textual data.

Identifiers

Any time you define a function or variable, it is given a unique name called an "identifier". To prevent identifiers from being confused with other items in an expression, they must follow a naming convention. Every programming language has one and it is fairly consistent from language to language.

In Flowgorithm, identifiers must adhere to the following rules:

- They must start with a letter.
- After the first letter, the identifier can contain additional letters or numbers.
- Spaces are not allowed.
- They cannot be reserved words or words already defined by Flowgorithm (please see below)

Also note:

- Languages such as Visual Basic and C also allow the underscore character "_".
  Flowgorithm, however, does not allow it.
- Identifiers are not case-sensitive.

The following are some simple example identifiers.

Valid Identifiers	Notes
x	Identifiers can be single letter.
name	
noun2	Numbers are allowed after the first letter

Keywords

Overview

Many words using in programming languages overlap the naming convention used by identifiers. In these cases, the word is "reserved" and cannot be used for Identifiers. In addition, many programming languages predefine functions and other constants. These also cannot be used.

Reserved Words

Flowgorithm only has a few reserved words that are used in expressions.

and	not true
false	or
mod	pi

Data Type Keywords

To prevent confusion, the system also prevents identifiers from using the data type names.

boolean	real
integer	string

Illegal Keywords (used in functions)

Flowgorithm does not permit the names of intrinsic functions to be used.

abs	int	sin	tofixed
arccos	len	size	tointeger
arcsin	log	sqrt	tostring
arctan	log10	tan	toreal
char	random	tochar	
cos	sgn	tocode	

Reserved for Future Use

Future versions of Flowgorithm will expand the number of intrinsic functions. The following were reserved if they are included.

arccosh	cosh
arcsinh	sinh
arctanh	tanh

Operators

About

Expressions combine operators used in the two major families of programming languages. The "BASIC-family" contains English keywords and operators. The "C-family" (which includes C, Java, C#) is far more symbolic.

Since both families are supported, there are a number of redundant operators. These are:

Operator	C Family	BASIC Family
Negation	!	not
Modulo	%	mod
Equality	==	=
Inequality	!=	<>
Logical And	&&	and
Logical Or	||	or

Flowgorithm also adds a few unique Visual Basic operators since if they have helpful, clearly defined, semantics

Visual Basic Operator	Name
&	String Concatenation
^	Exponent

In Java and C#, the "+" operator is used for both string concatenation and addition. This can be quite confusing given the rather complex semantics. In Flowgorithm, addition will only work with numbers. The ampersand "&" is used for concatenation.

Also, C# and Java lack an exponent operator - instead relying their respective Math classes. Flowgorithm uses the Visual Basic "^".

Precedence

The following are the precedence levels from high (evaluated first) to low.

Level	Name	Operators	Notes
8	Unary	- ! not	In Visual Basic, "not" precedence level is far lower - above "and", but below all relational operators.
7	Exponent	^	The exponent operator does not exist in C# or Java.
6	Multiply	* / % mod	Division will always be high-precision (floating point)
5	Addition	+ -	"+" will only work with numbers.
4	Concatenate	&	C# and Java use the ambiguous "+" operator for addition and concatenation.
3	Relational	> >= < <= == = != <>	
2	Logical And	and &&	
1	Logical Or	or ||	

Examples

Expression	Result	Notes
1 + 3 ^ 2	10	
10 * 2 + 5 * 6	50	10 * 2 and 5 * 6 have higher precedence than addition. The addition is done last.
7 * (4 - 1)	21	Parenthesis are used for subexpressions, which are evaluated as a whole.
6 / 3 * 2	4	In mathematics, multiplication and division have the same precedence levels. So, they are evaluated left-to-right. The "PEMDAS" acronym, used in high-school, is a tad misleading.
10 mod 3	1	Modulo math gives the remainder from division
10 % 3	1	Same expression, but using the C-Family operator

Intrinsic Functions

Mathematics

Function	Description	Version Added
Abs(n)	Absolute Value	
Arcsin(n)	Trigonometric Arcsine	1.7
Arccos(n)	Trigonometric Arccos	1.7
Arctan(n)	Trigonometric Arctangent	
Cos(n)	Trigonometric Cosine	
Int(n)	Integer of a real number	
Log(n)	Natural Log	
Log10(n)	Log Base 10	
Sgn(n)	Mathematical sign (-1 if n is negative, 0 if zero, 1 if positive)	
Sin(n)	Trigonometric Sine	
Sqrt(n)	Square Root	
Tan(n)	Trigonometric Tangent	

Strings

Function	Description
Len(s)	Length of a string
Char(s, i)	Returns a character from the string s at index i. Characters are indexed starting at 0.

Data Type Conversion

Function	Description	Version Added
ToChar(n)	Convert a character code n into an character	1.5
ToCode(c)	Convert a character c into a character code (integer).	1.8
ToFixed(r, i)	Convert real number r to a string with i digits after the decimal point.	1.8
ToInteger(n)	Convert a string to an integer	
ToReal(n)	Convert a string to an real	
ToString(n)	Convert a number to a string	

Other

Function	Description	Version Added
Random(n)	A random number between 0 and (n - 1)	
Size(a)	The size (number of elements) in an array	1.7

Built-in Constants

Flowgorithm predefines three commonly used constants. True and False are often used to initialize Boolean variables. Pi is commonly used in mathematics.

Constant	Notes
true	Boolean True
false	Boolean False
pi	Mathematical PI. Approximately 3.1415.