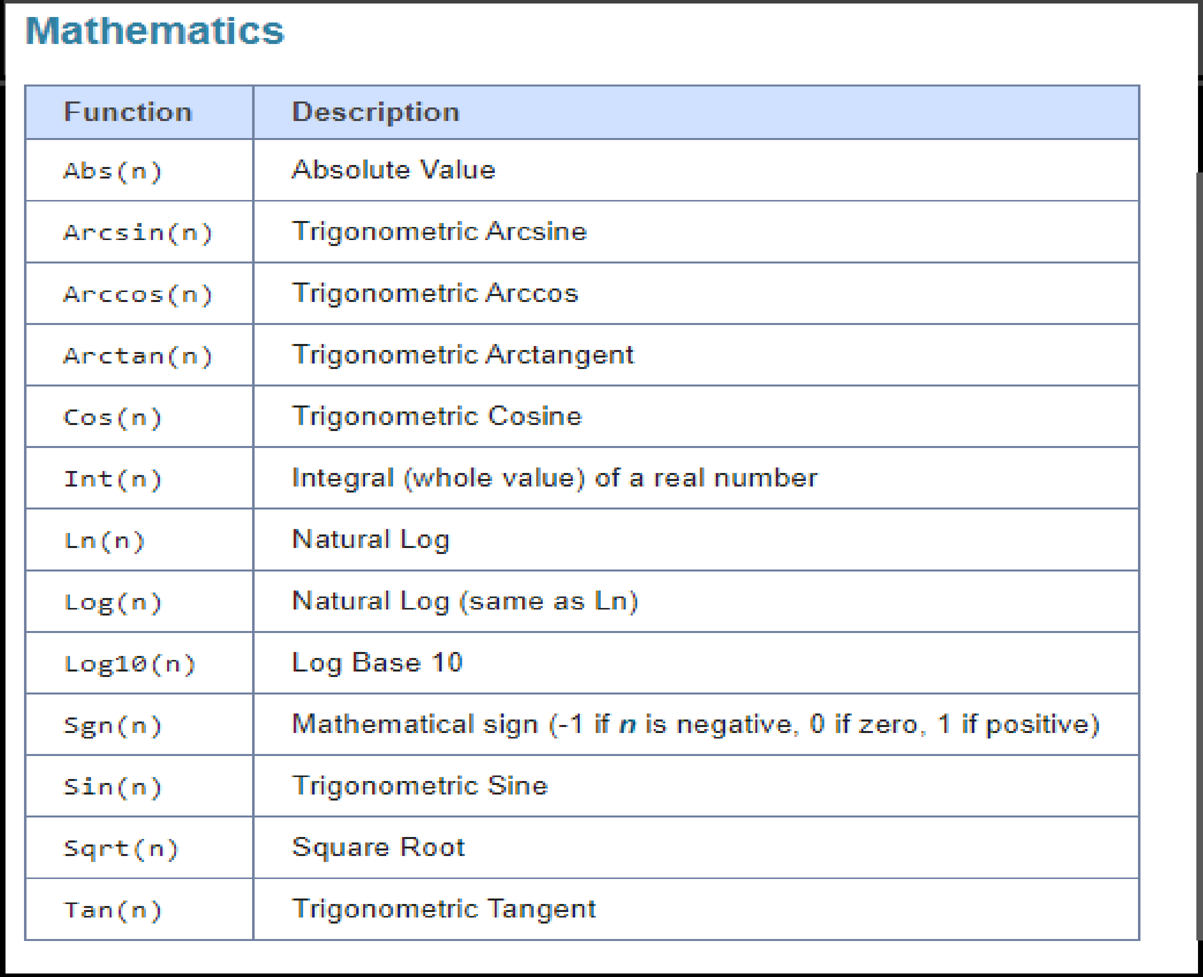
Strings

String Data Type

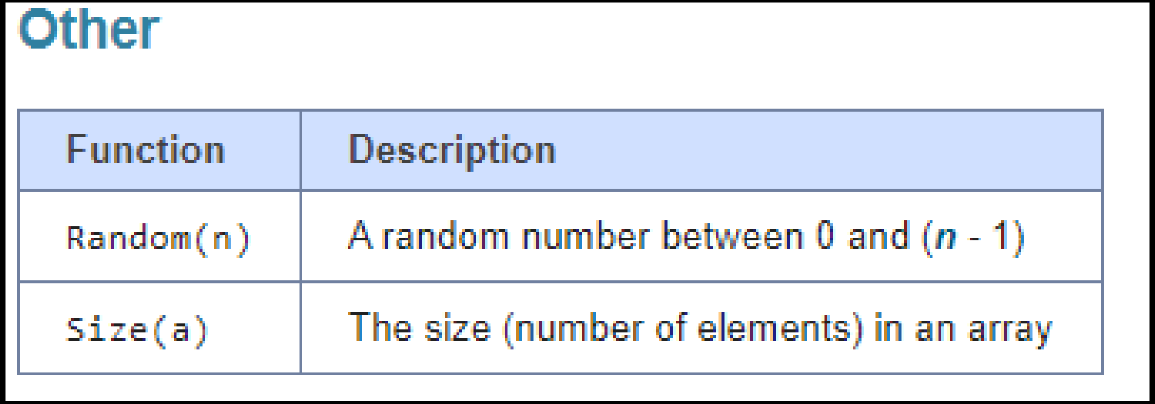
- The String data type is used to store any textual data.
- This includes words, letters, or anything else you would send in a text message.
- In programming, the text is delimited with double quotes.
- For example: "CSU, Sacramento", "computer", and "Year 1947" are all strings.

Intrinsic Functions



Mathematics

Function	Description
`Abs(n)`	Absolute Value
`Arcsin(n)`	Trigonometric Arcsine
`Arccos(n)`	Trigonometric Arccos
`Arctan(n)`	Trigonometric Arctangent
`Cos(n)`	Trigonometric Cosine
`Int(n)`	Integral (whole value) of a real number
`Ln(n)`	Natural Log
`Log(n)`	Natural Log (same as Ln)
`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

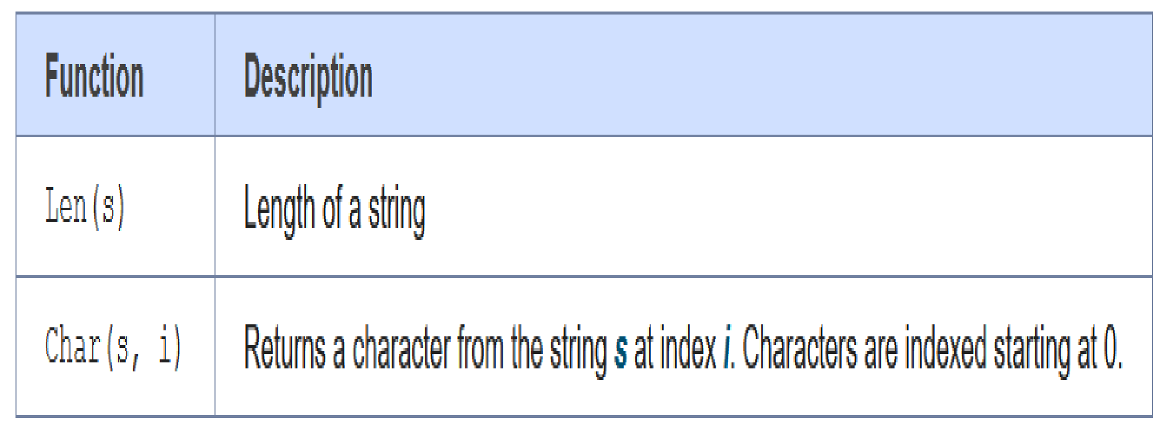


Other

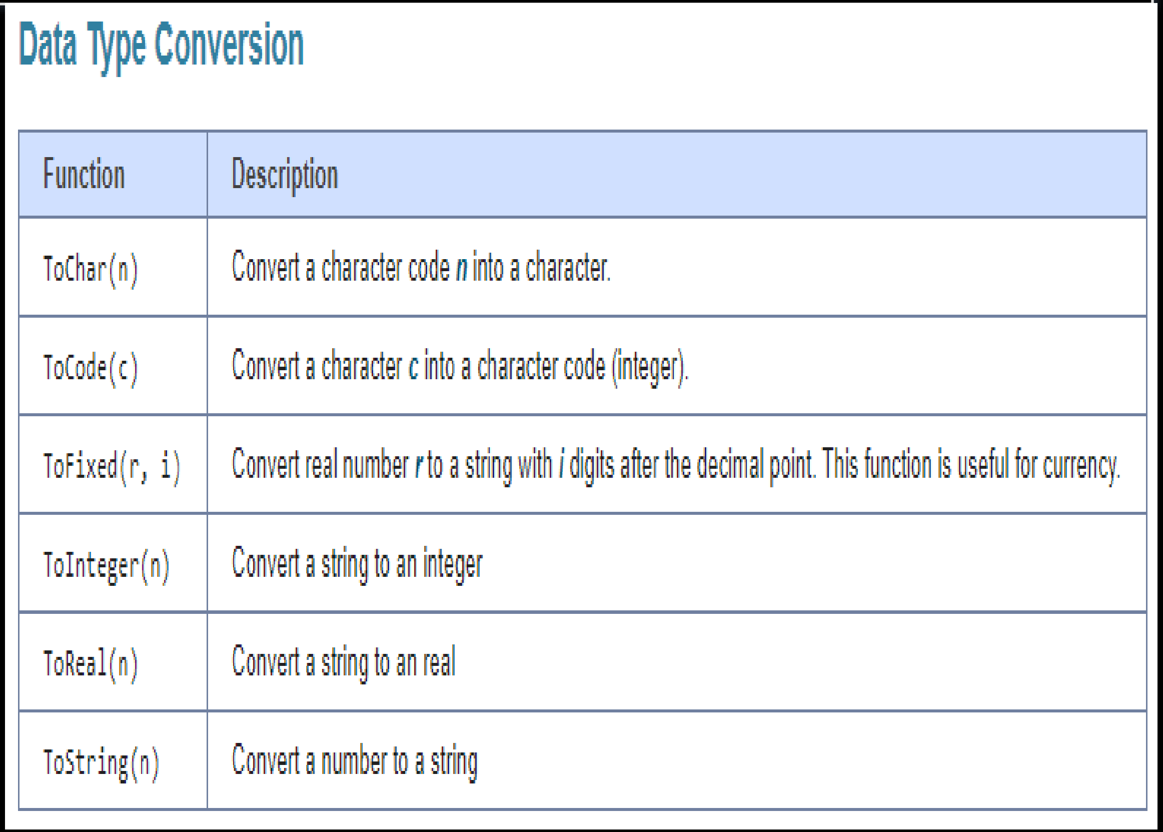
Function	Description
`Random(n)`	A random number between 0 and (*n* - 1)
`Size(a)`	The size (number of elements) in an array

String Functions

Data Type Conversion



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.

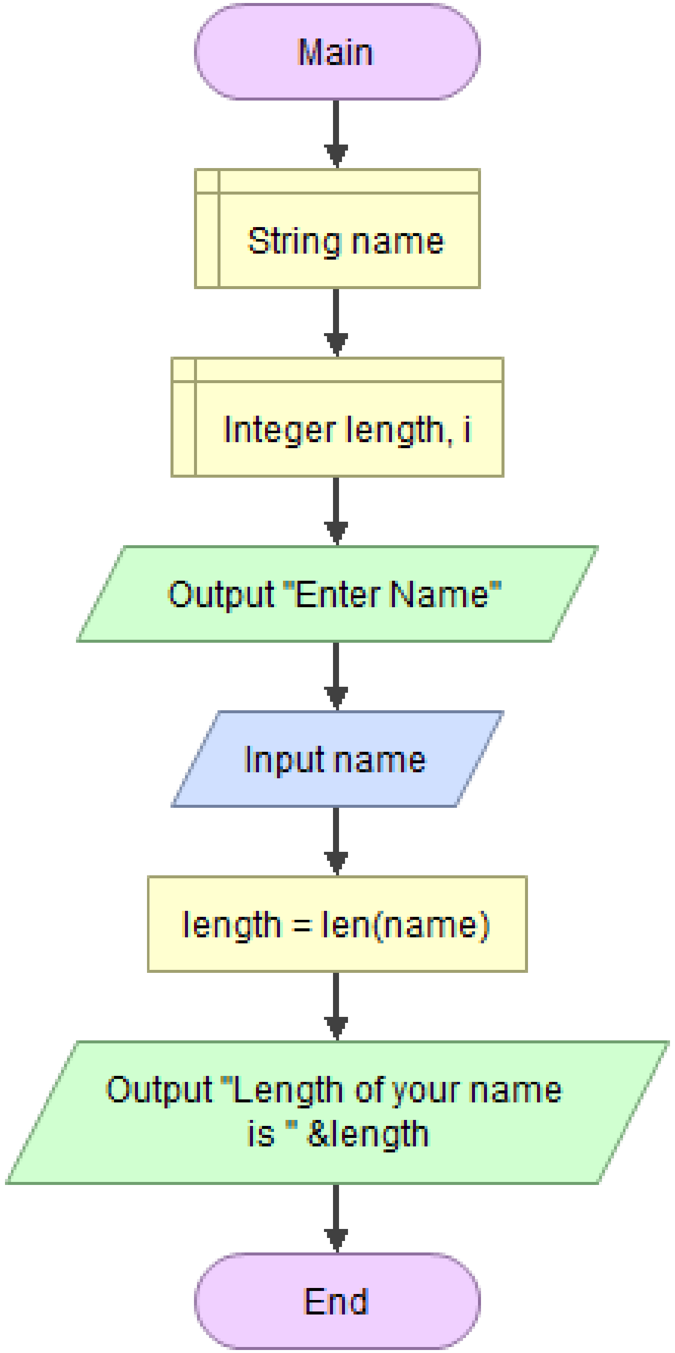


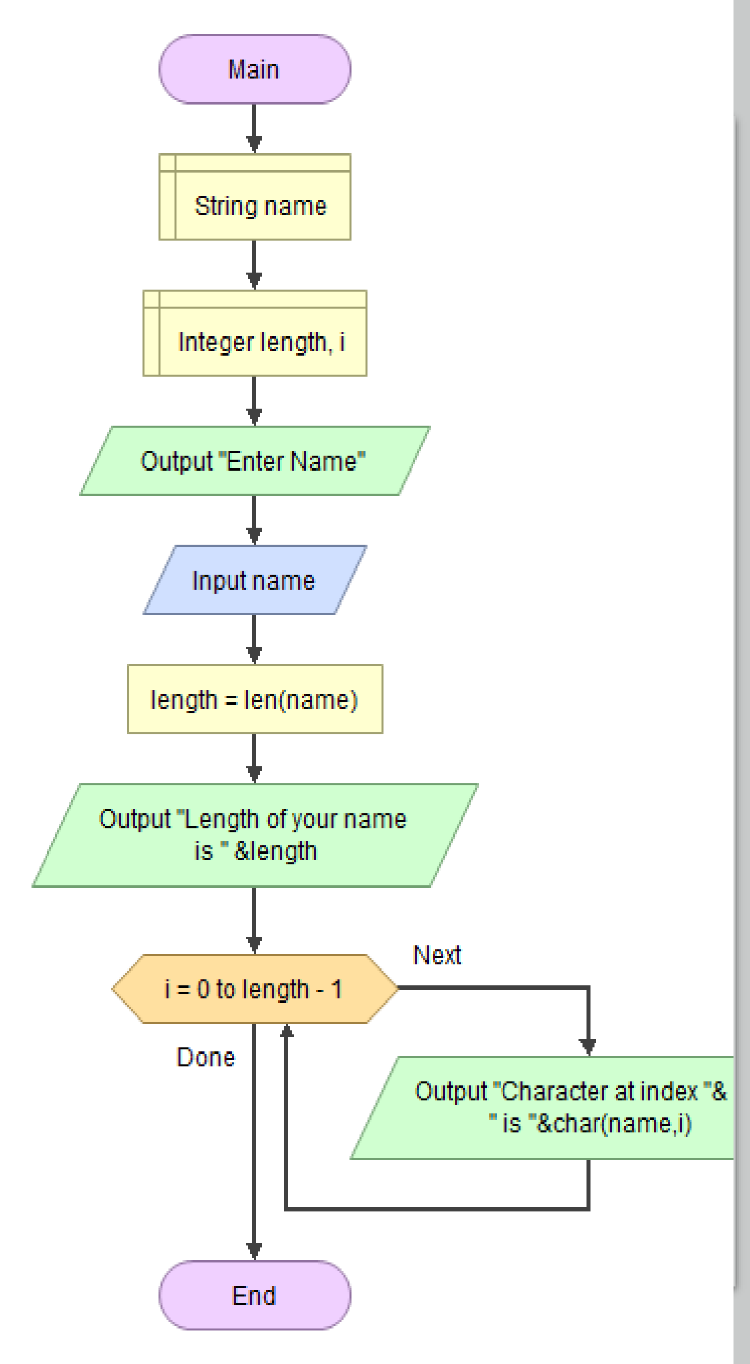
Data Type Conversion

Function	Description
`ToChar(n)`	Convert a character code *n* into a character.
`ToCode(c)`	Convert a character *c* into a character code (integer).
`ToFixed(r, i)`	Convert real number *r* to a string with *i* digits after the decimal point. This function is useful for currency.
`ToInteger(n)`	Convert a string to an integer
`ToReal(n)`	Convert a string to an real
`ToString(n)`	Convert a number to a string

Len(S)

- Length of a string



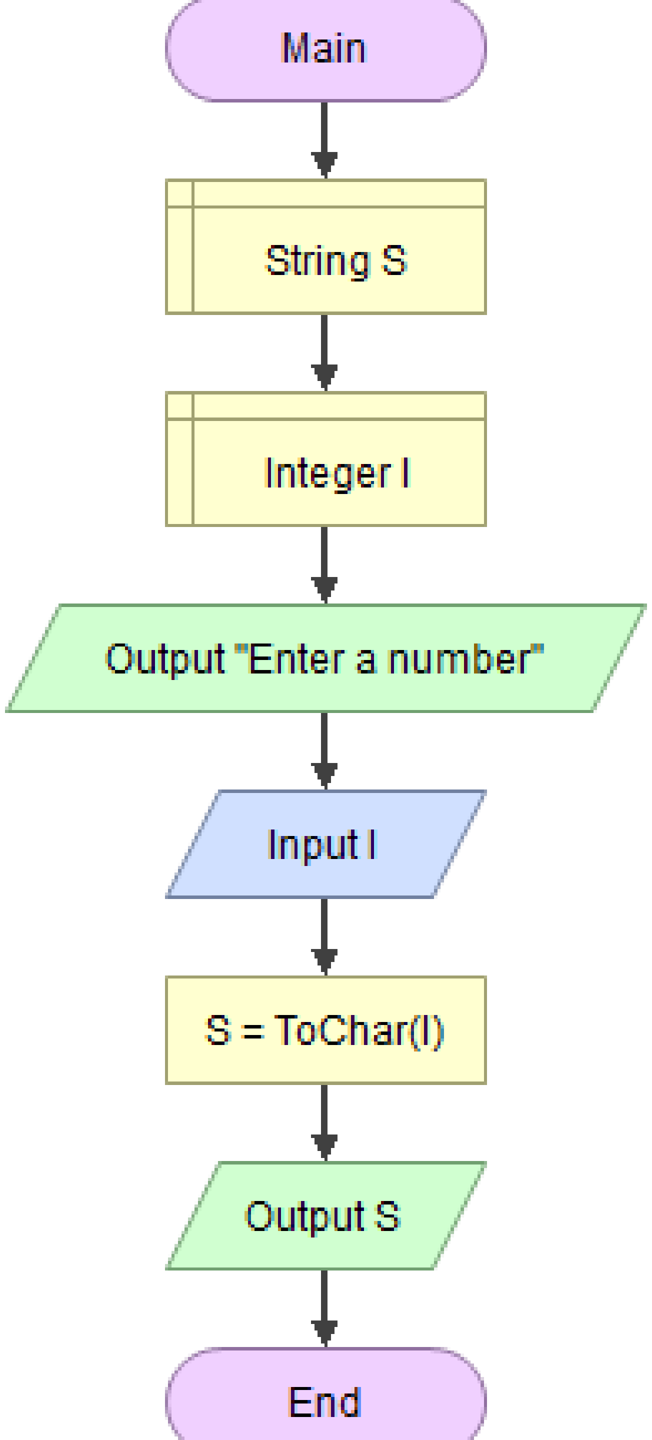


Char(s, i)

Returns a character from the string ***s*** at index ***i***.
Characters are indexed starting at 0.

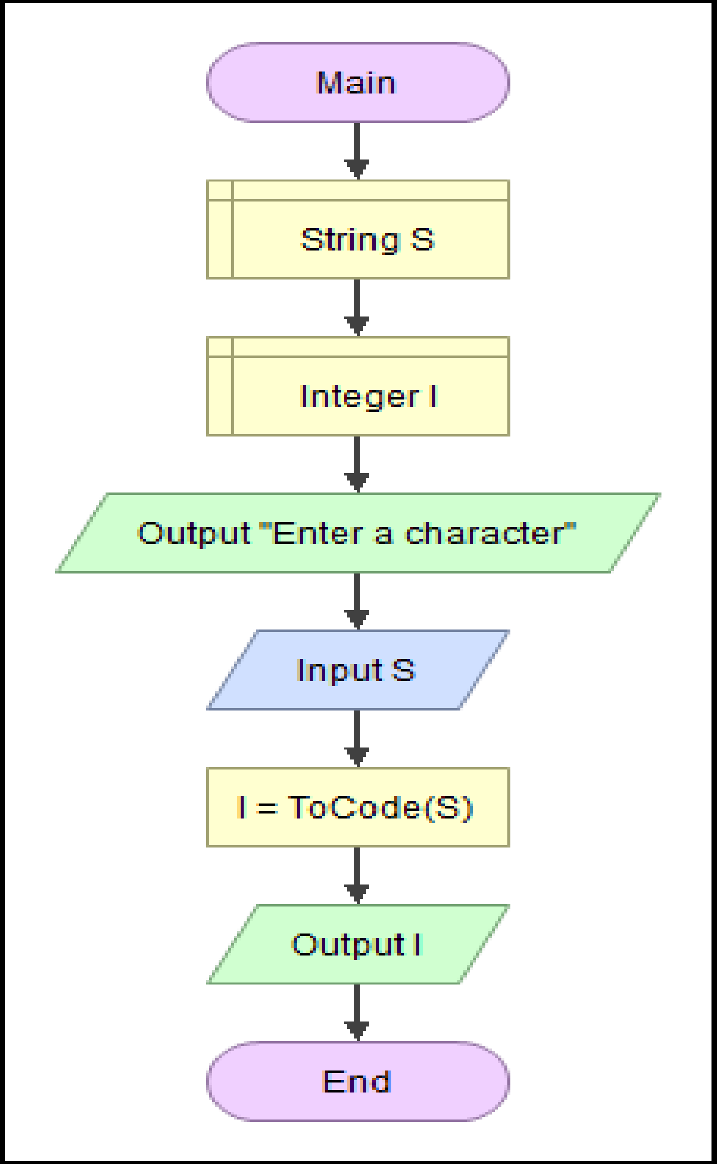
ToChar(n)

Convert a character code ***n*** into a character.



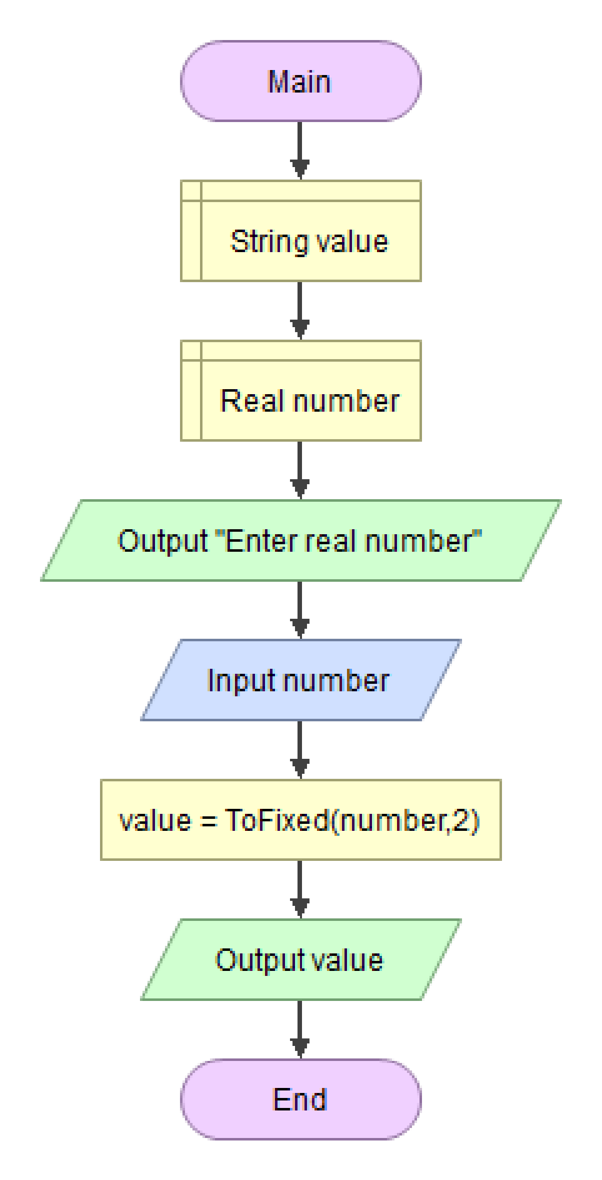
ToCode(c)

Convert a character ***c*** into a character code (integer).



ToFixed(r, i)

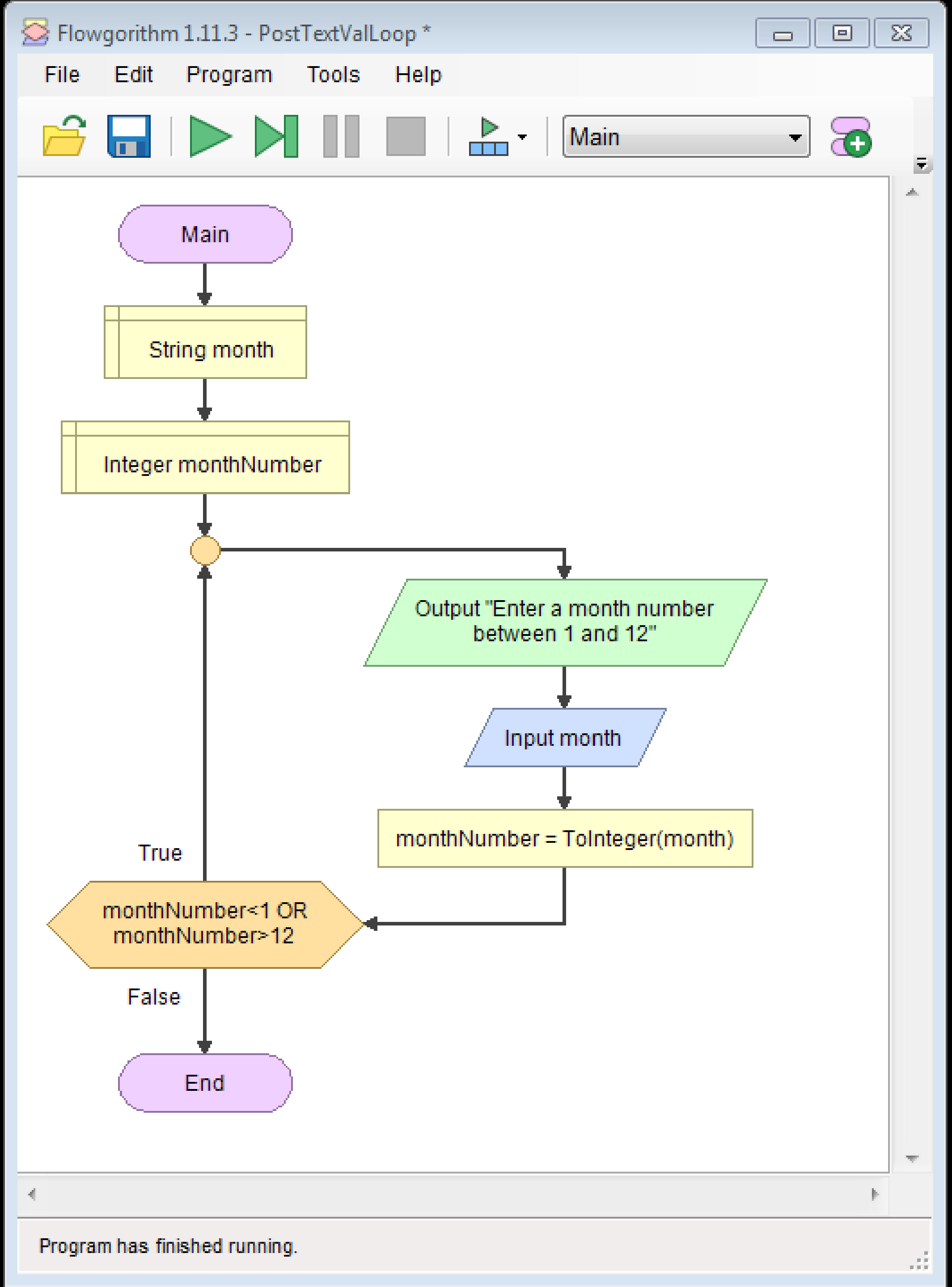
Convert real number ***r*** to a string with ***i*** digits after the decimal point. This function is useful for currency.



ToInteger(data)

```
Function String getMonth()
  Declare String month
  Declare Integer monthNumber
  Do
        // User prompt explains the valid values
        Display "Enter a month number between 1 and 12"
        Input month
        monthNumber = stringToInteger(month)
  While (monthNumber < 1 OR monthNumber > 12)
  Return month
End Function
```

ToInteger(data)


Flowgorithm 1.11.3 - PostTextValLoop *
File
Edit
Program
Tools
Help
Main
Main
String month
Integer monthNumber
Output "Enter a month number between 1 and 12"
Input month
monthNumber = ToInteger(month)
True
monthNumber<1 OR monthNumber>12
False
End
Program has finished running.

ToReal(data)

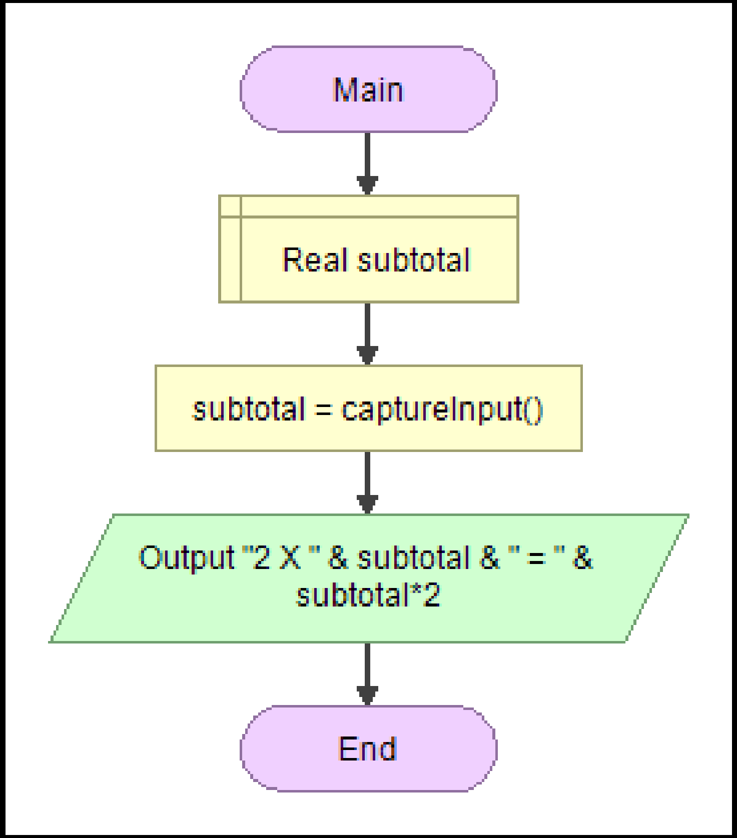
- Will enhance the captureInput function to convert the data into a numeric value

```
Module main()
        Declare Real subtotal
        subtotal = captureInput()
        Display "2 X " , subtotal, " = ", subtotal*2
End Module
```

stringToReal(data)

```
Function Real captureInput()
   Declare String data
   Declare Real numberInput
   Display “Enter a number”
   Input data
   numberInput = stringToReal(data)
   Return numberInput
End Function
```

Data Conversion - stringToReal(data)



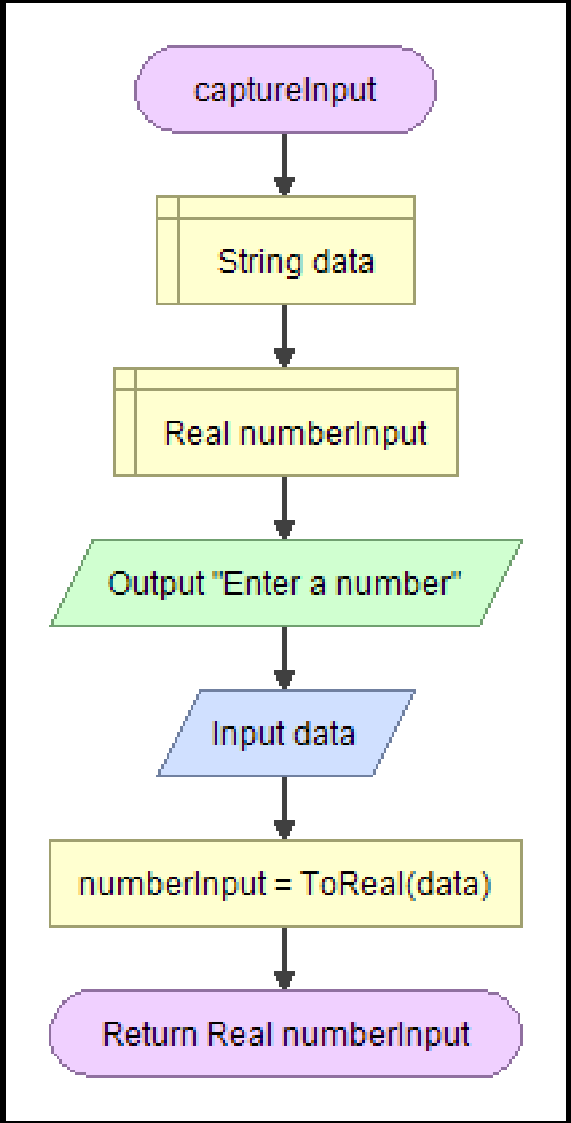
Main

Real subtotal

subtotal = captureInput()

Output "2 X " & subtotal & " = " & subtotal*2

End



captureInput

String data

Real numberInput

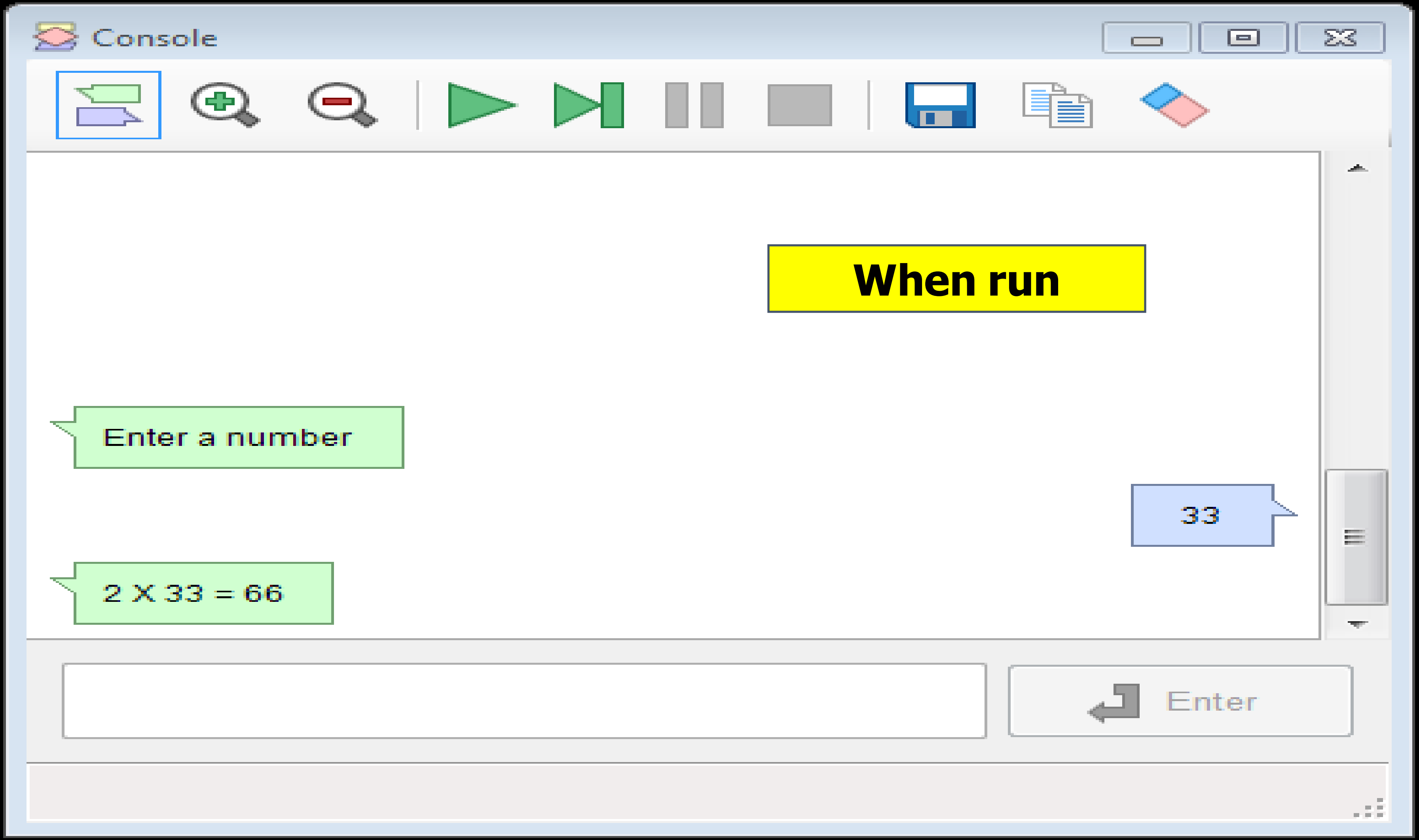
Output "Enter a number"

Input data

numberInput = ToReal(data)

Return Real numberInput

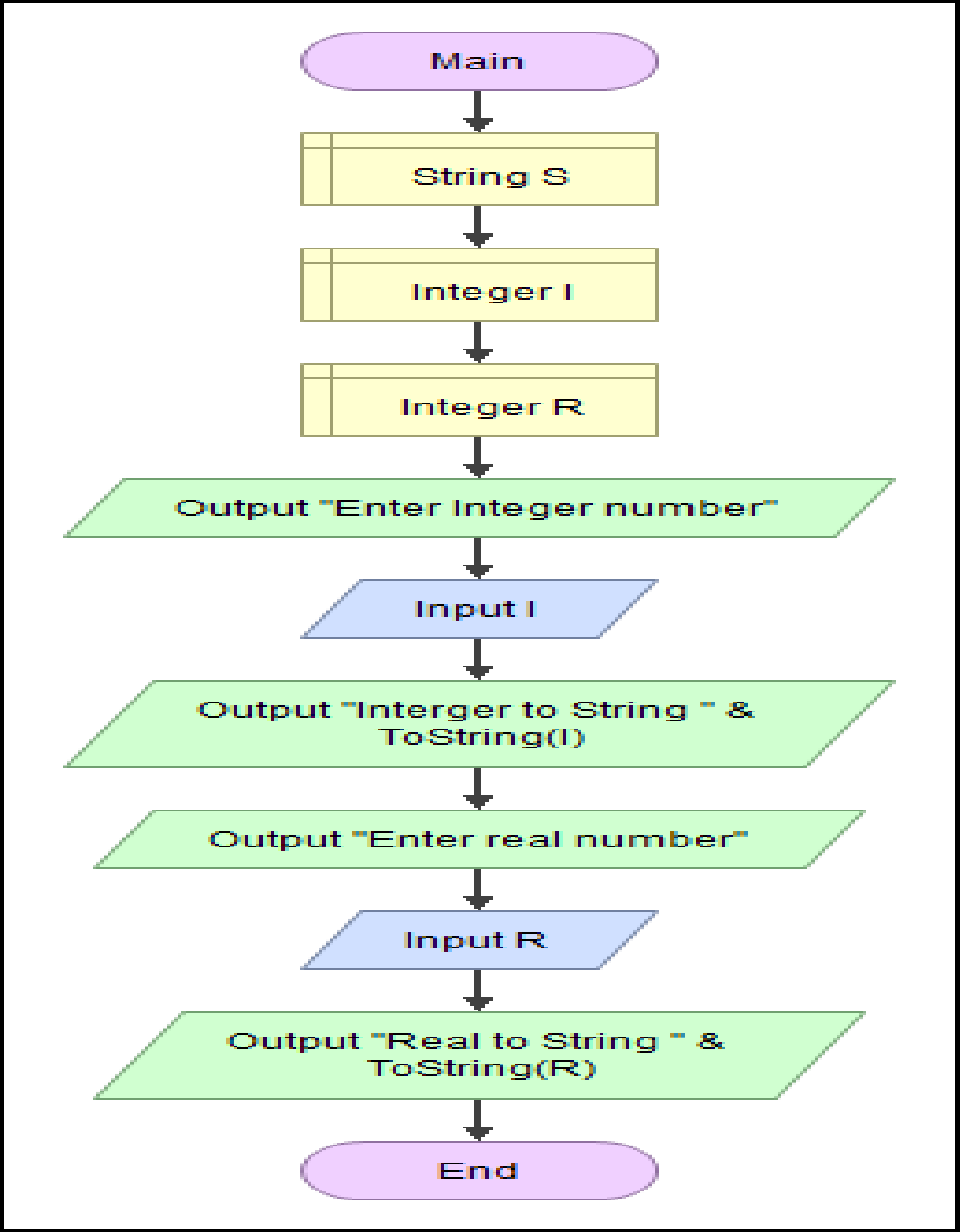
Data Conversion - stringToReal(data)



When run

```
Enter a number
33
2 X 33 = 66
```

Data Conversion - ToString(data)


Main
String S
Integer I
Integer R
Output "Enter Integer number"
Input I
Output "Interger to String " & ToString(I)
Output "Enter real number"
Input R
Output "Real to String " & ToString(R)
End

Functions – Accepts and Display String

- Can also accept data
    - Just like modules
- Will create a function called print() to:
    - Accept a String
    - Display the String
    - Return the String "Did it"

Functions : Scenario

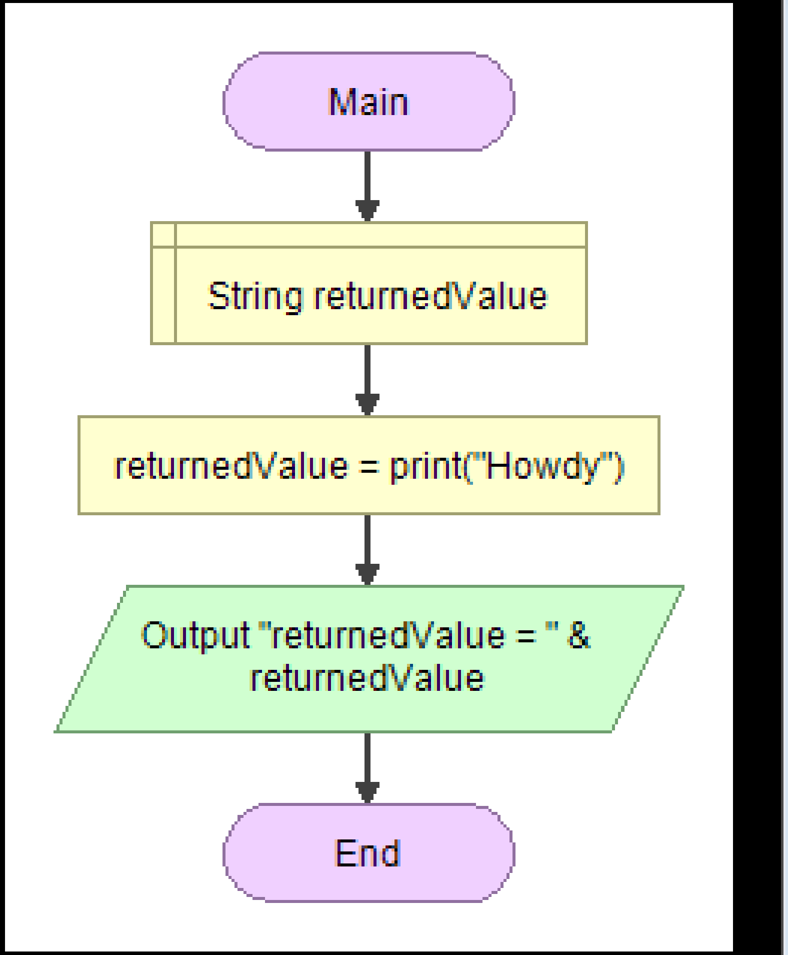
- main() will:
    - Call print() and pass the String "Howdy"
    - Store the String passed back by print in a variable called returnedValue
    - Display the text "returnedValue = " and the value of the variable returnedValue

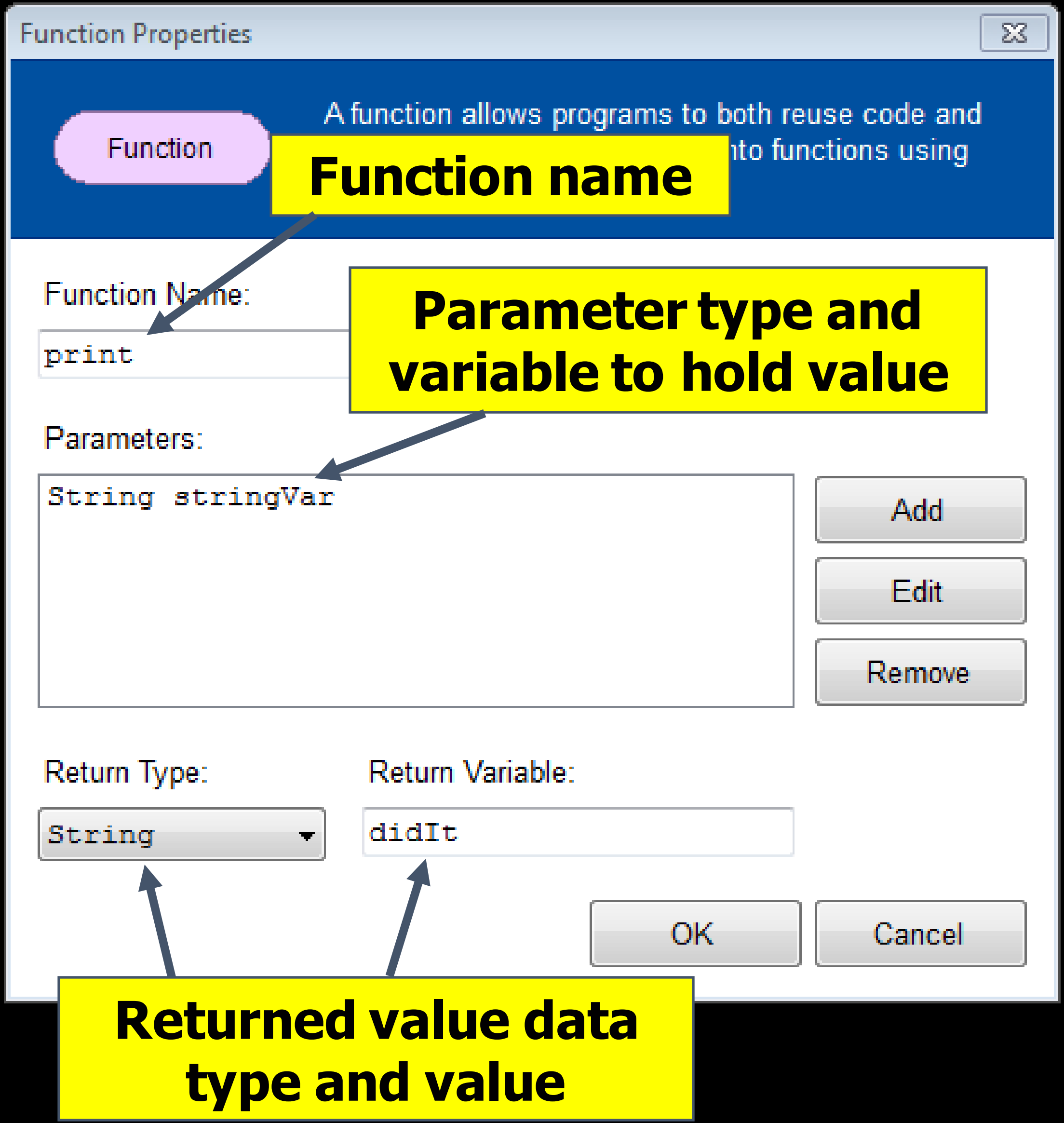
Algorithm

```
Function String print(String stringVar)
    Display stringVar
    Return "Did it"
End Function


Module main()
    Declare String returnedValue
    returnedValue  = print("Howdy")
    Display "returnedValue = ", returnedValue
End Module
```

Flowgorithm Functions


Main
String returnedValue
returnedValue = print("Howdy")
Output "returnedValue = " & returnedValue
End



A function allows programs to both reuse code and ...nto functions using

Function name

Function Name: print

Parameter type and variable to hold value

Parameters:

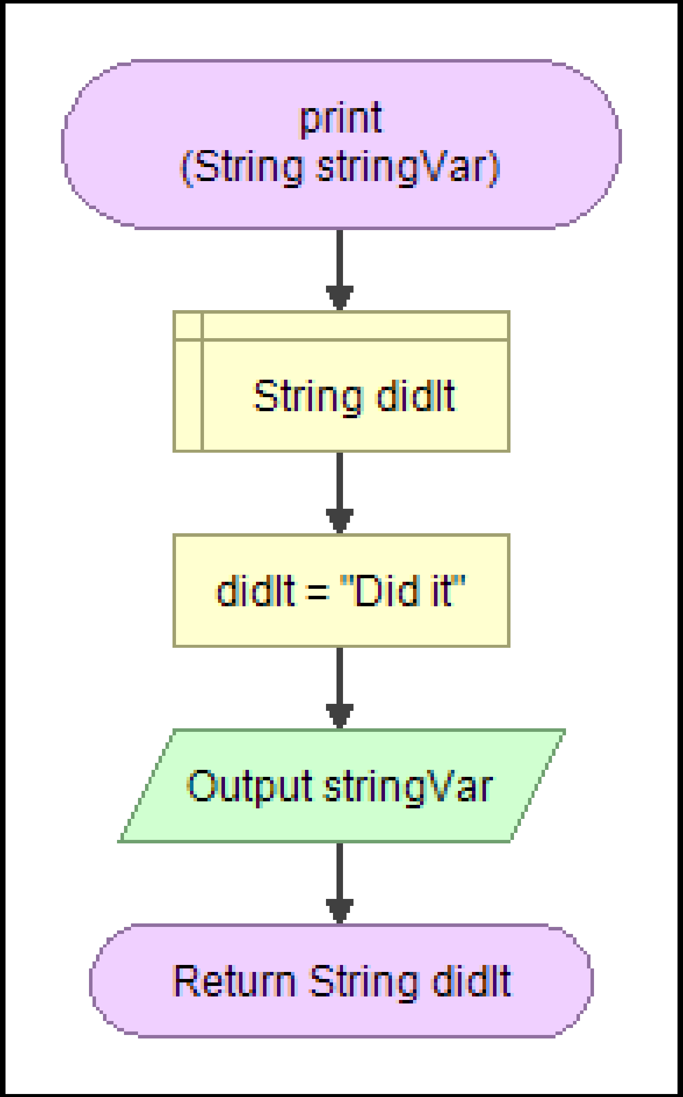
```
String stringVar
```

Return Type: String

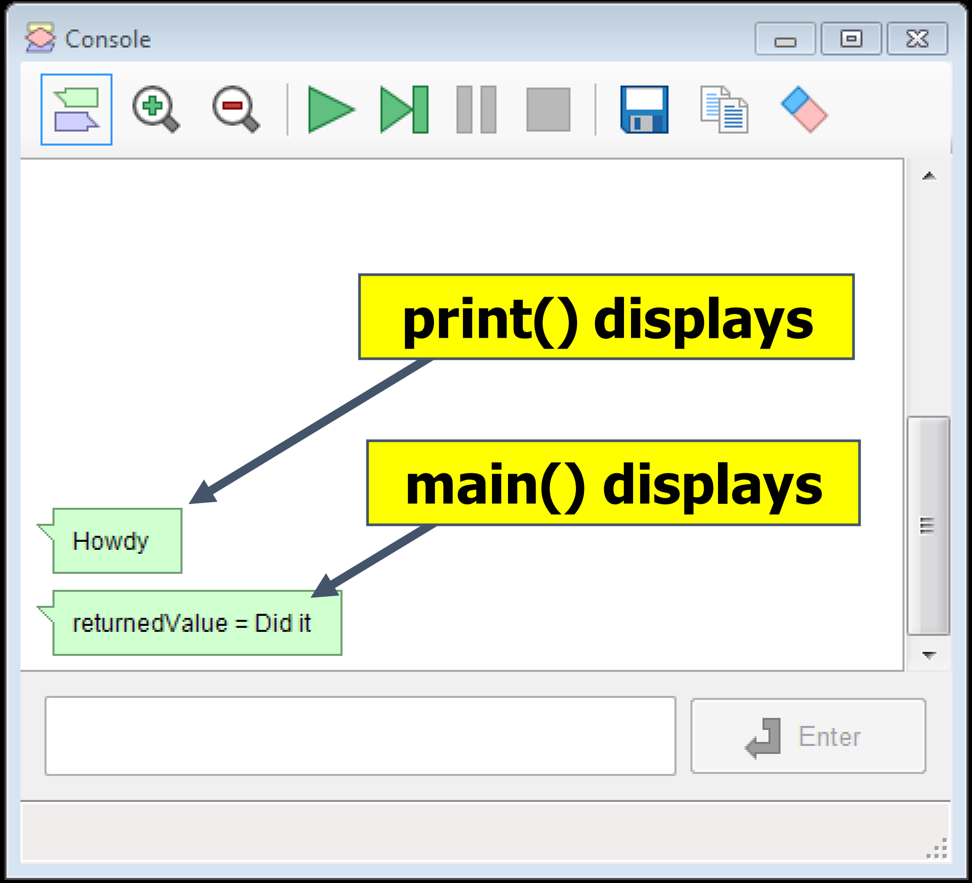
Return Variable: didIt

Returned value data type and value

Flowgorithm Functions



When run



```
Howdy
returnedValue = Did it
```

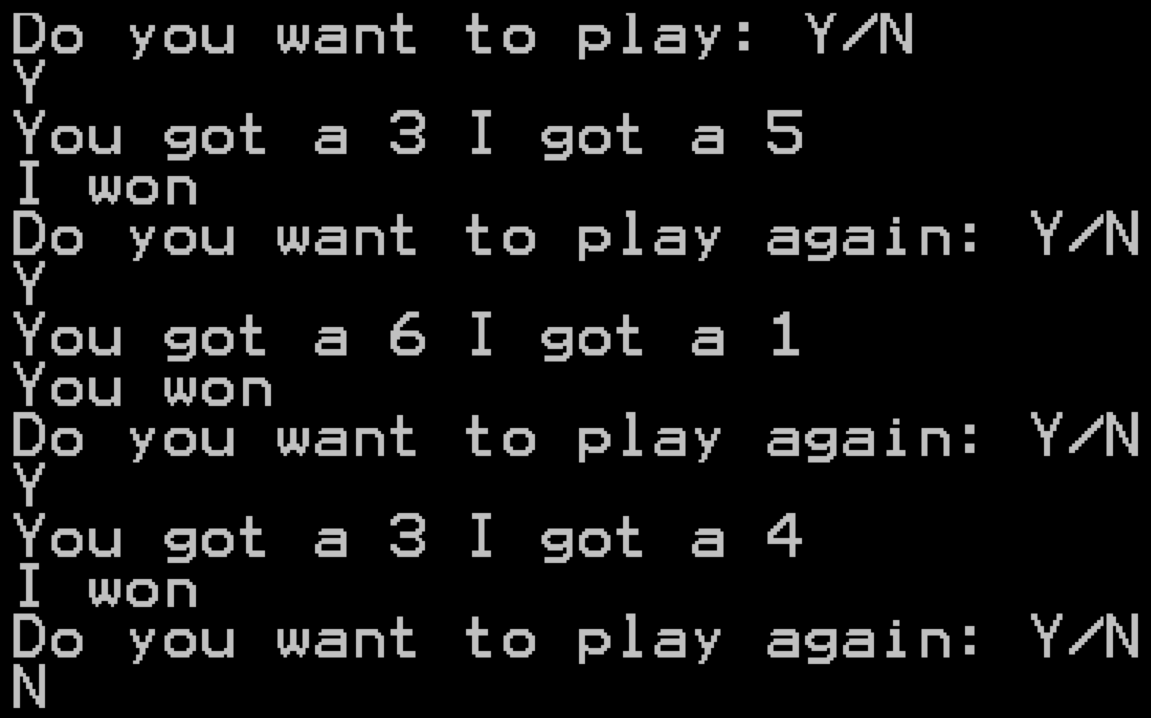
Dice Game

- How about creating a dice game
  - Ask user if they want to play
  - If yes, generate 2 random numbers between 1 and 6 to represent the user's and computer's dice roll
  - Print out numbers and message saying who won (who got the higher number) or if it was a tie
  - Ask the user if they want to play again

Dice Game

- What's the algorithm?

Dice game algorithm



```
Do you want to play: Y/N
Y
You got a 3 I got a 5
I won
Do you want to play again: Y/N
Y
You got a 6 I got a 1
You won
Do you want to play again: Y/N
Y
You got a 3 I got a 4
I won
Do you want to play again: Y/N
N
```

Dice Game-Using Function

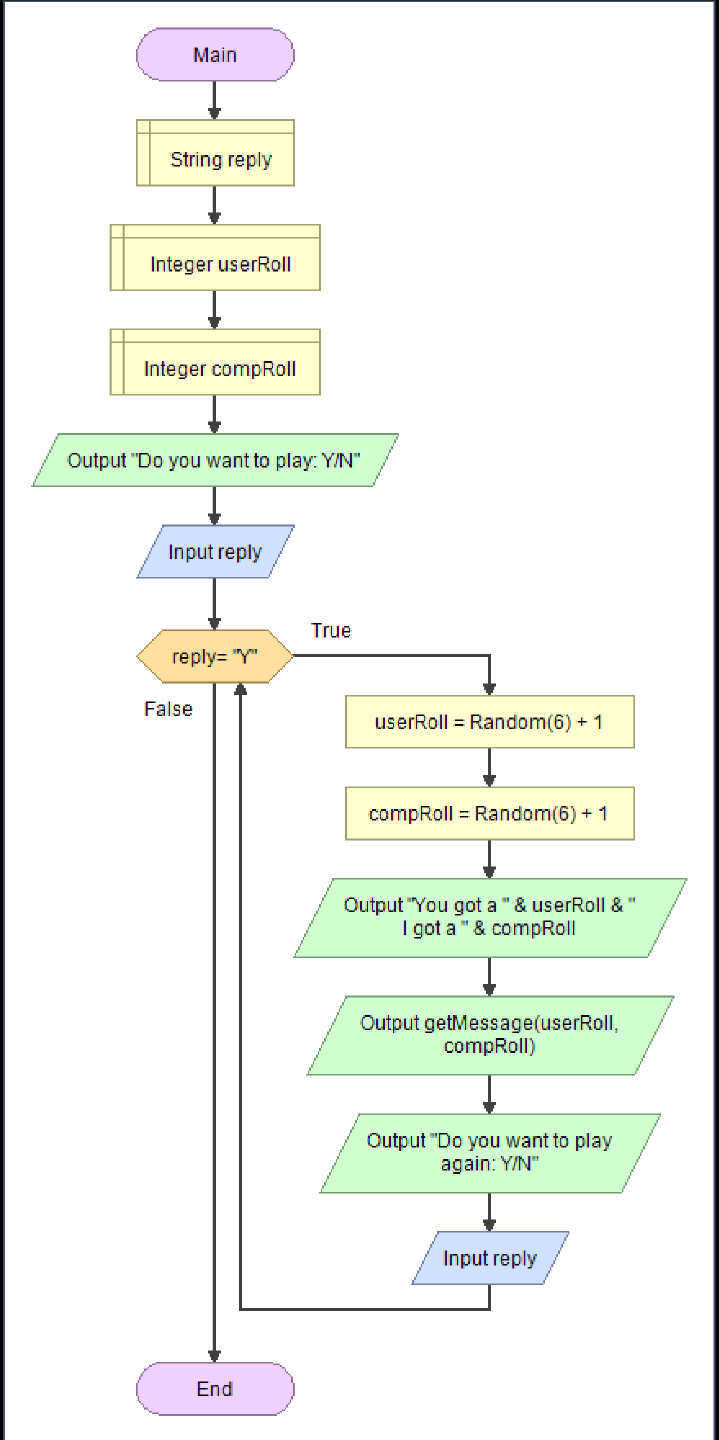
- Then an additional requirement is added to create a function called getMessage

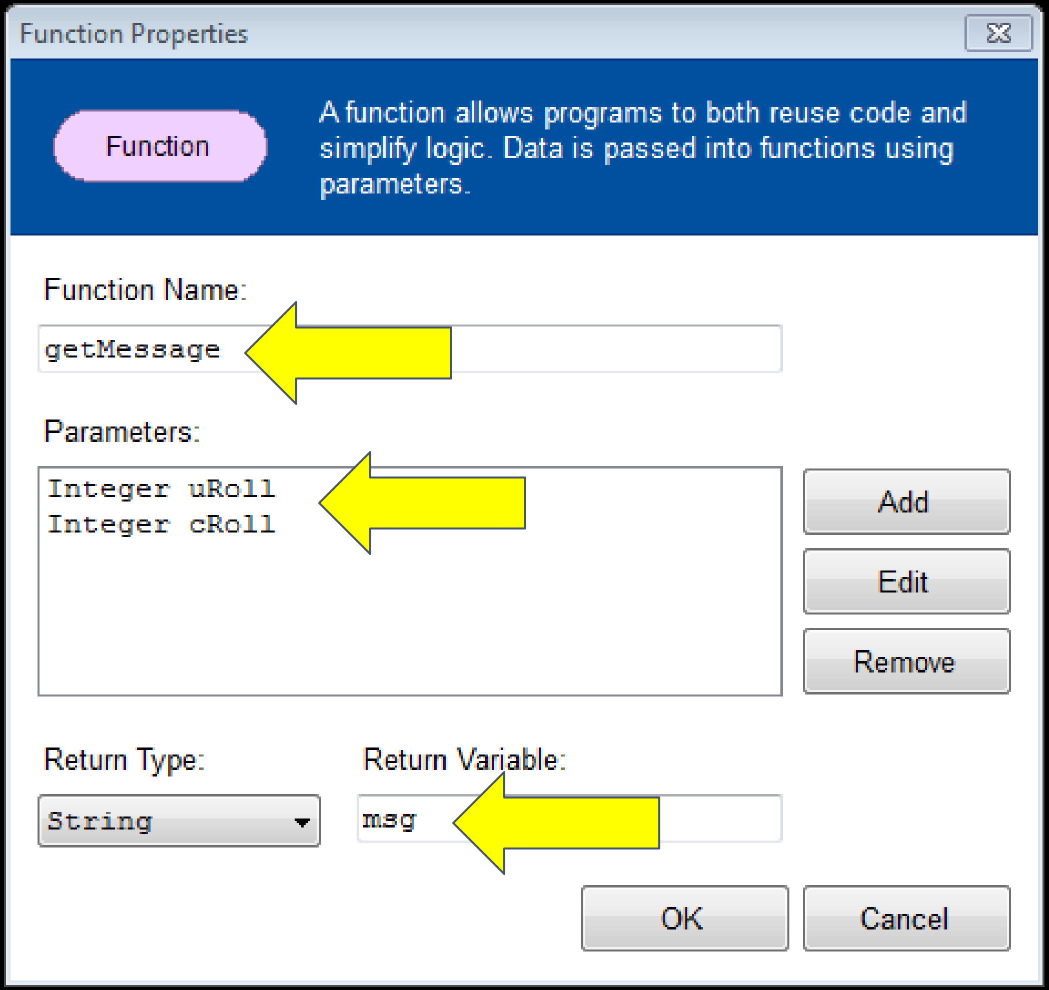
- getMessage will
  - Accept the two dice rolls
  - Generate the correct message
  - Return the message

Dice Game - Random(n)

- Generate the Flowgorithm flowchart
  - Random(6) returns a number between 0 and 5
    - So need to add 1 to returned number to get values of 1 through 6

Dice Game Example


Main
String reply
Integer userRoll
Integer compRoll
Output "Do you want to play: Y/N"
Input reply
reply= "Y"
True
False
userRoll = Random(6) + 1
compRoll = Random(6) + 1
Output "You got a " & userRoll & " I got a " & compRoll
Output getMessage(userRoll, compRoll)
Output "Do you want to play again: Y/N"
Input reply
End



A function allows programs to both reuse code and simplify logic. Data is passed into functions using parameters.

Function Name: getMessage

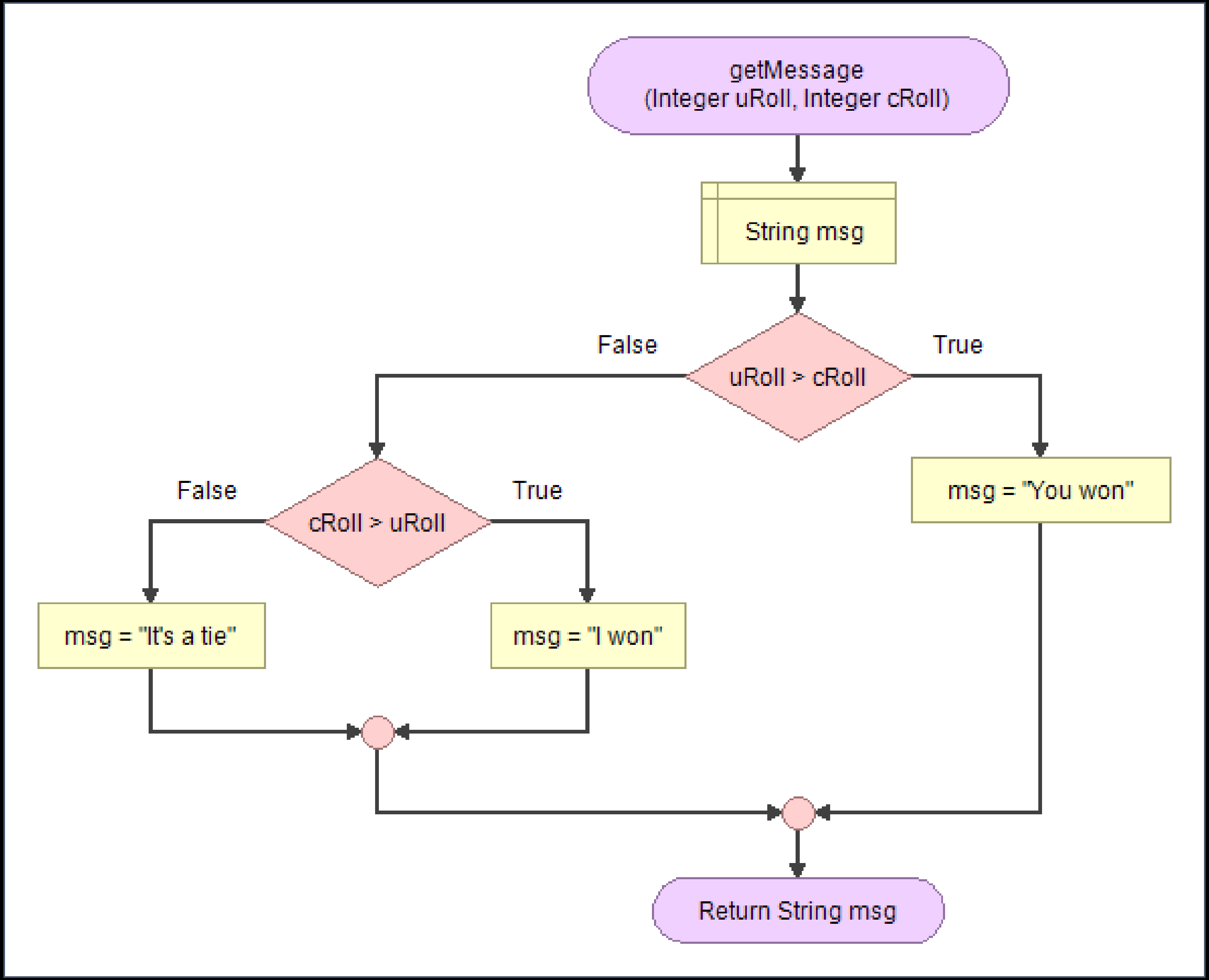
Parameters:

```
Integer uRoll
Integer cRoll
```

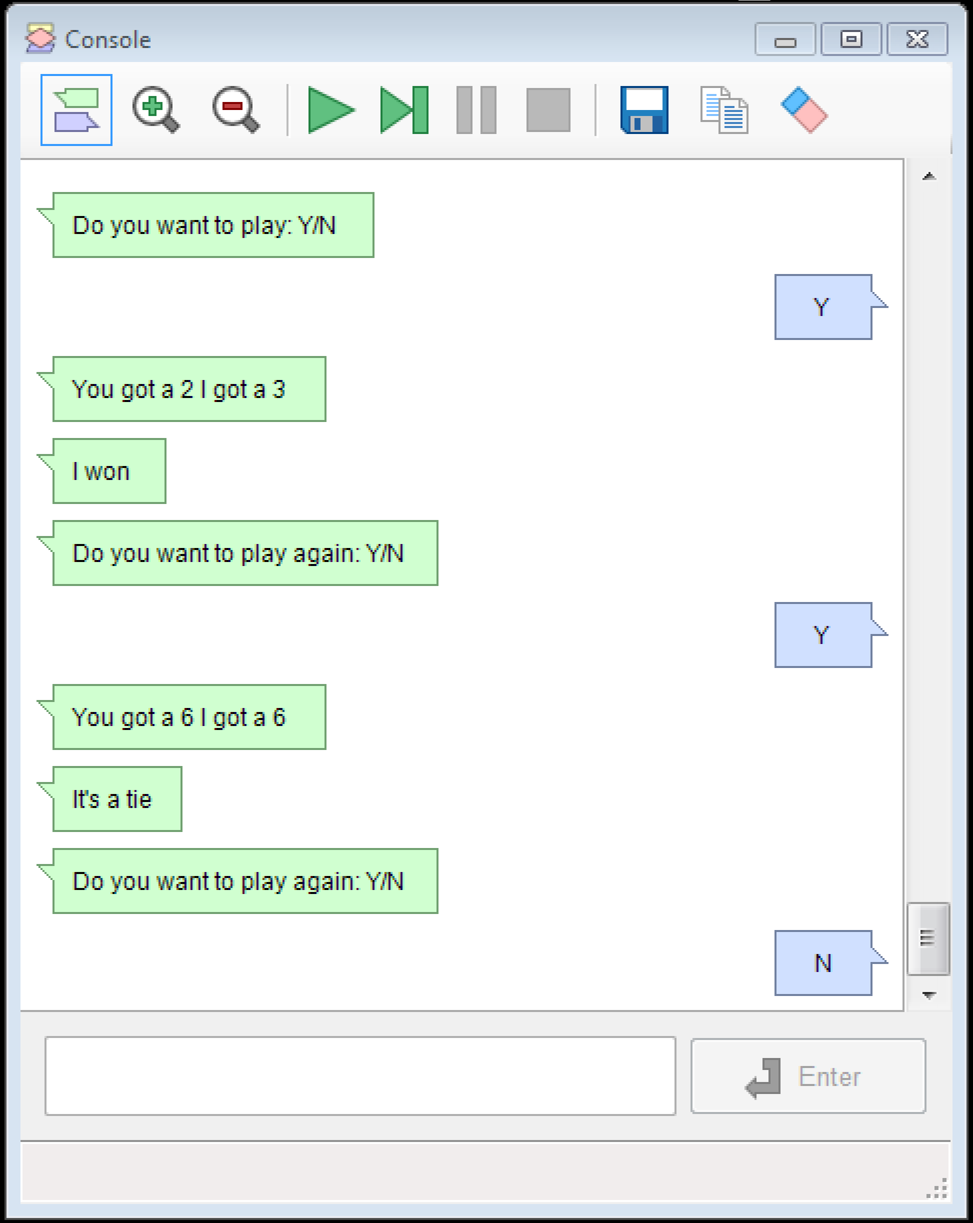
Return Type: String

Return Variable: msg

Dice Game Example

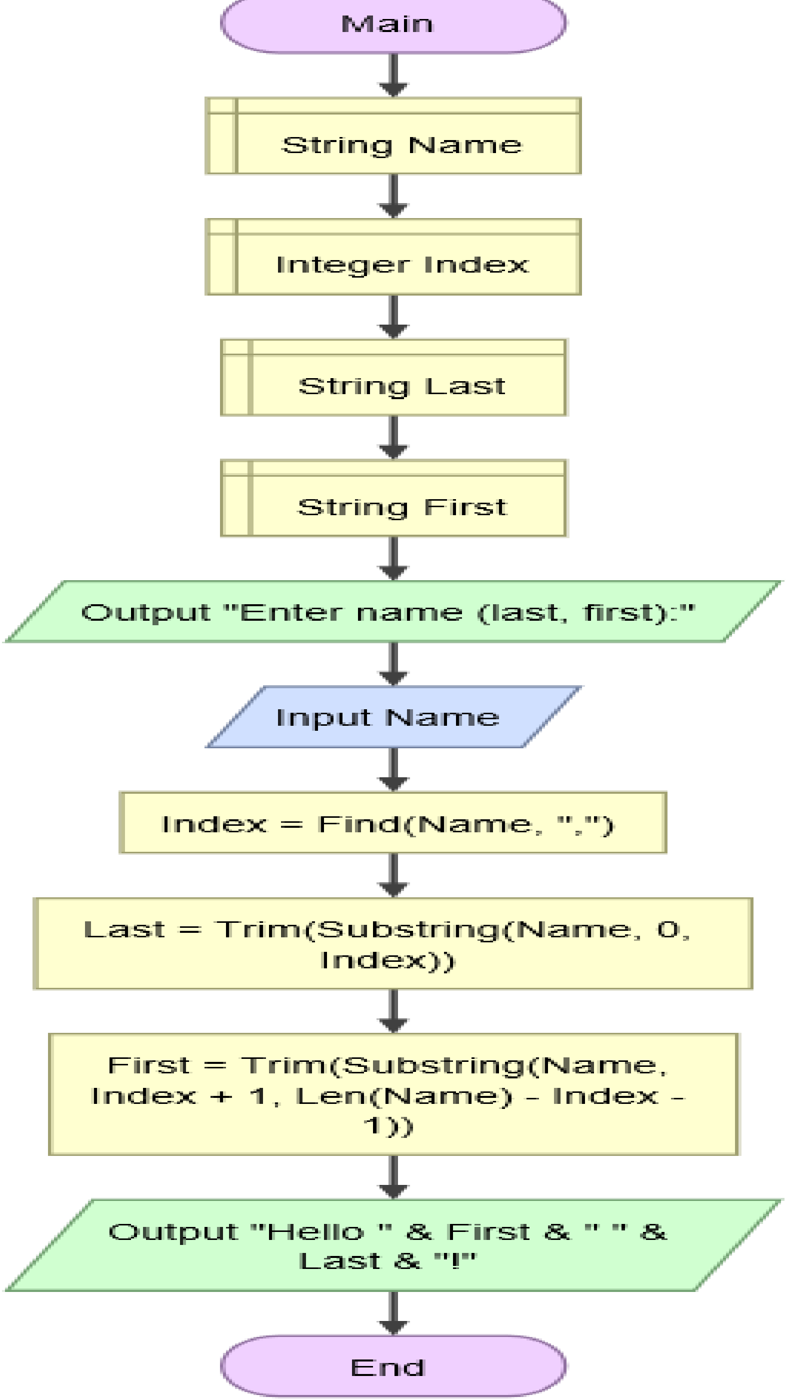


Dice Game Example When Run



```
Do you want to play: Y/N
                                        Y
You got a 2 I got a 3
I won
Do you want to play again: Y/N
                                        Y
You got a 6 I got a 6
It's a tie
Do you want to play again: Y/N
                                        N
```

Other Functions



Main

String Name

Integer Index

String Last

String First

Output "Enter name (last, first):"

Input Name

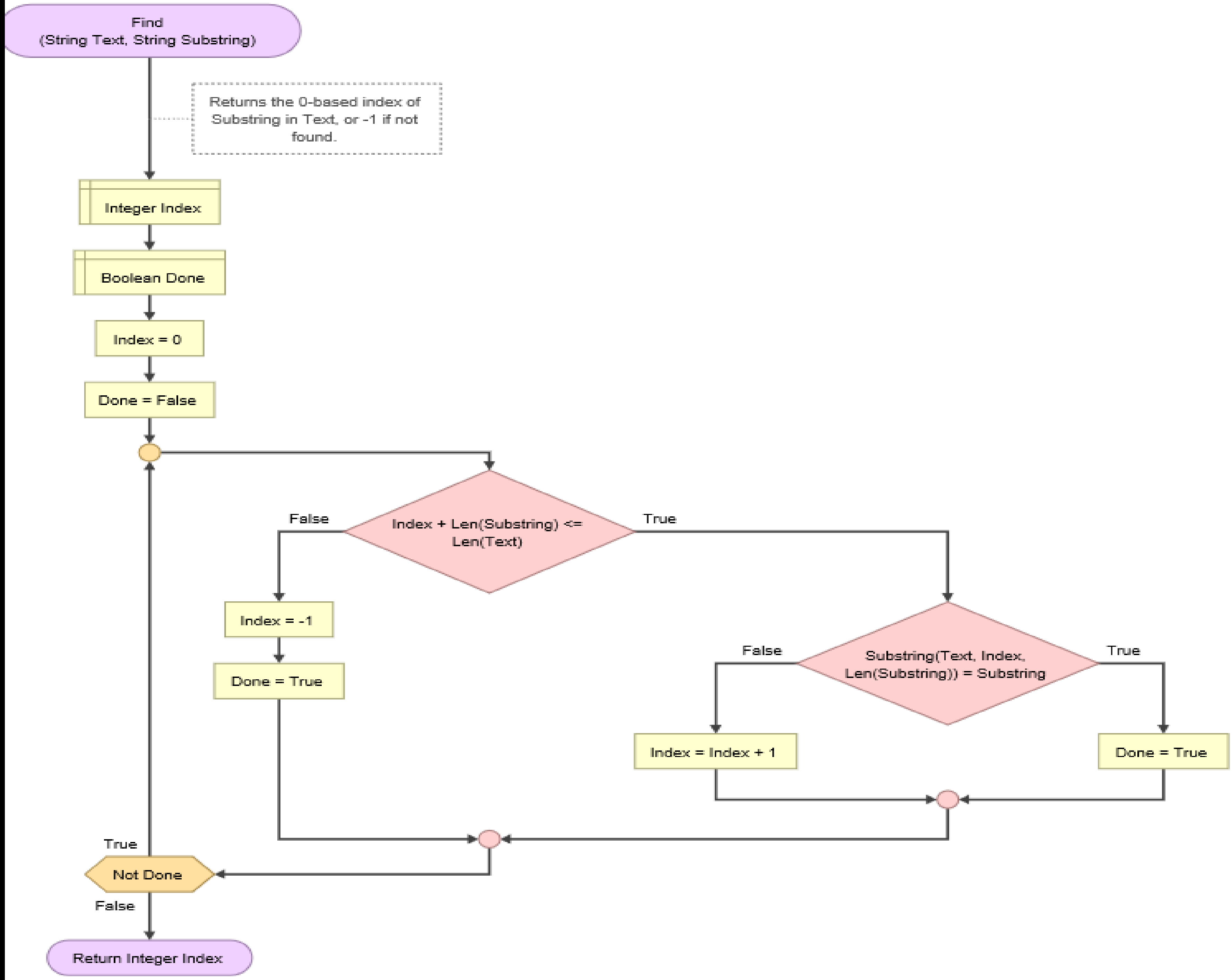
Index = Find(Name, ",")

Last = Trim(Substring(Name, 0, Index))

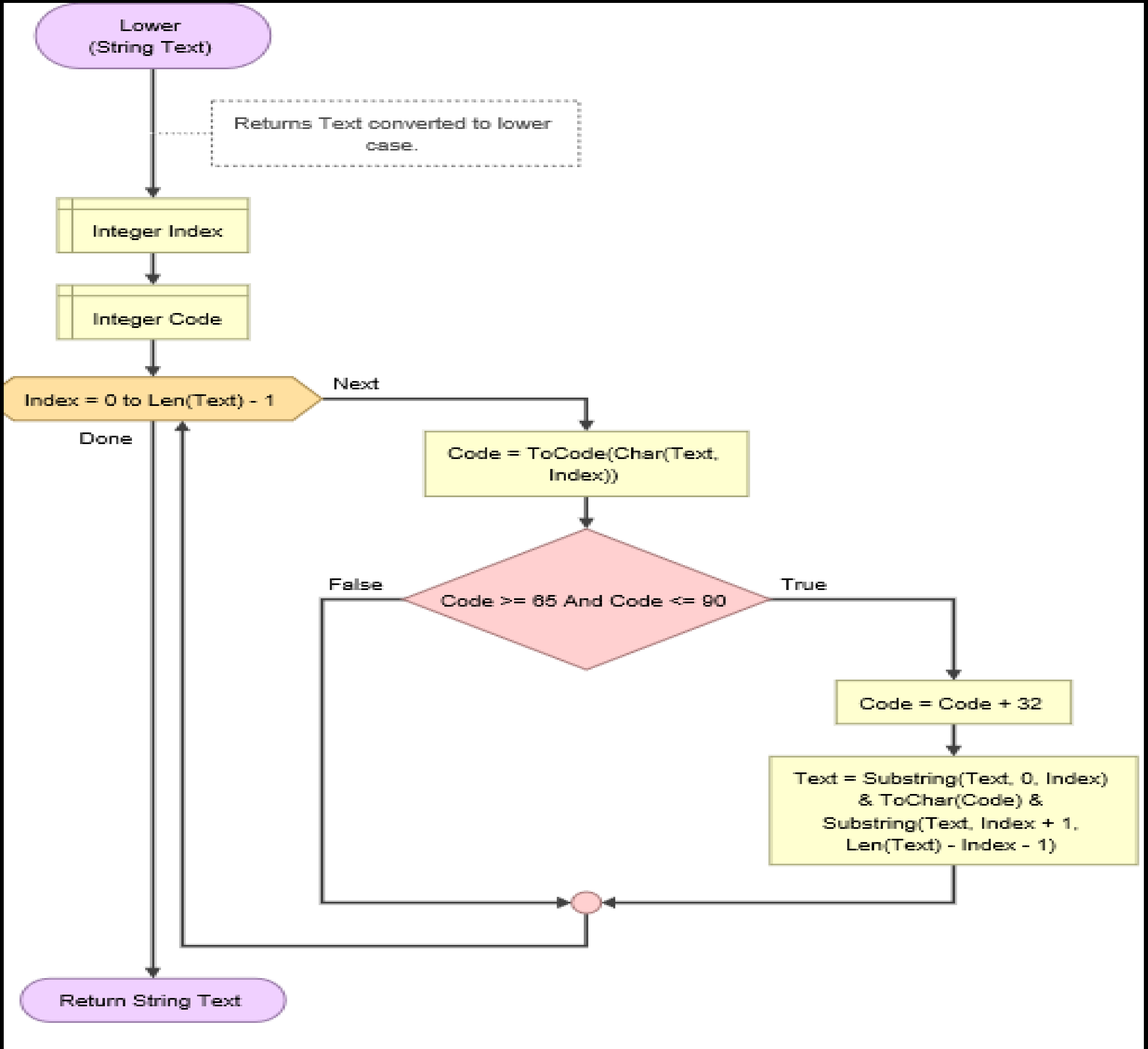
First = Trim(Substring(Name, Index + 1, Len(Name) - Index - 1))

Output "Hello " & First & " " & Last & "!"

End



Returns the 0-based index of Substring in Text, or -1 if not found.



Lower
(String Text)

Returns Text converted to lower case.

Integer Index

Integer Code

Index = 0 to Len(Text) - 1

Next

Done

Code = ToCode(Char(Text, Index))

Code >= 65 And Code <= 90

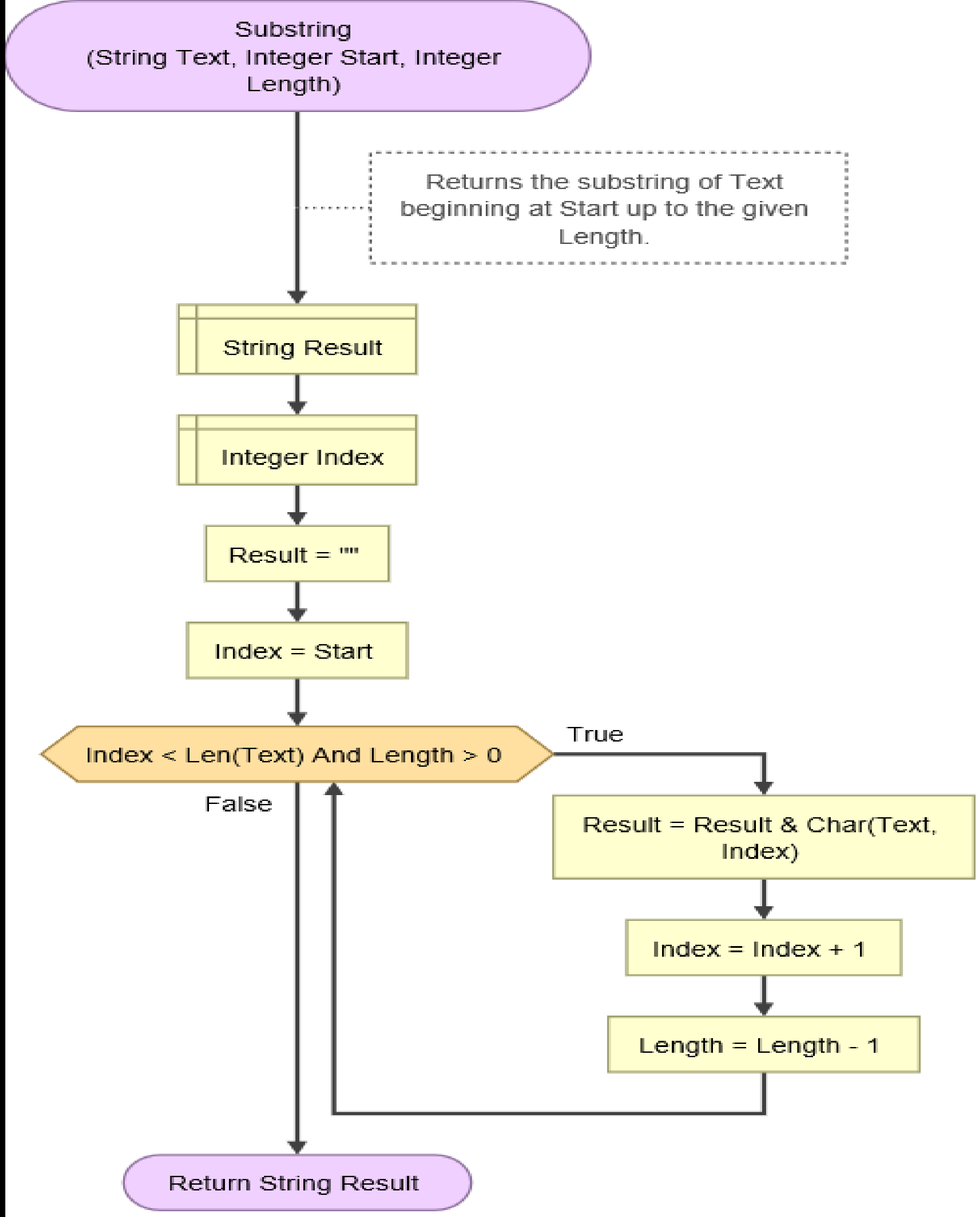
False

True

Code = Code + 32

Text = Substring(Text, 0, Index) & ToChar(Code) & Substring(Text, Index + 1, Len(Text) - Index - 1)

Return String Text



Substring
(String Text, Integer Start, Integer Length)

Returns the substring of Text beginning at Start up to the given Length.

String Result

Integer Index

Result = ""

Index = Start

Index < Len(Text) And Length > 0

True

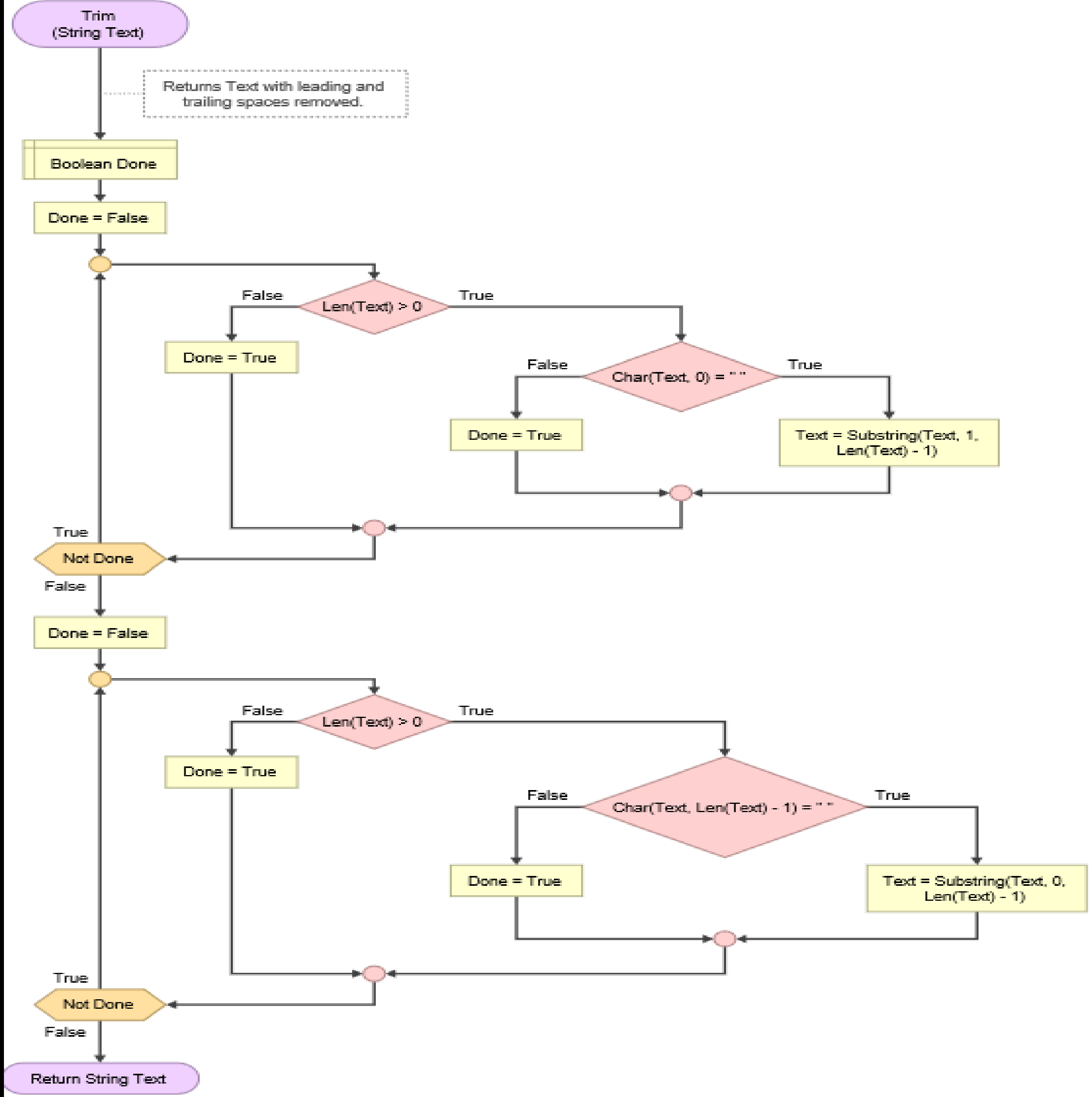
Result = Result & Char(Text, Index)

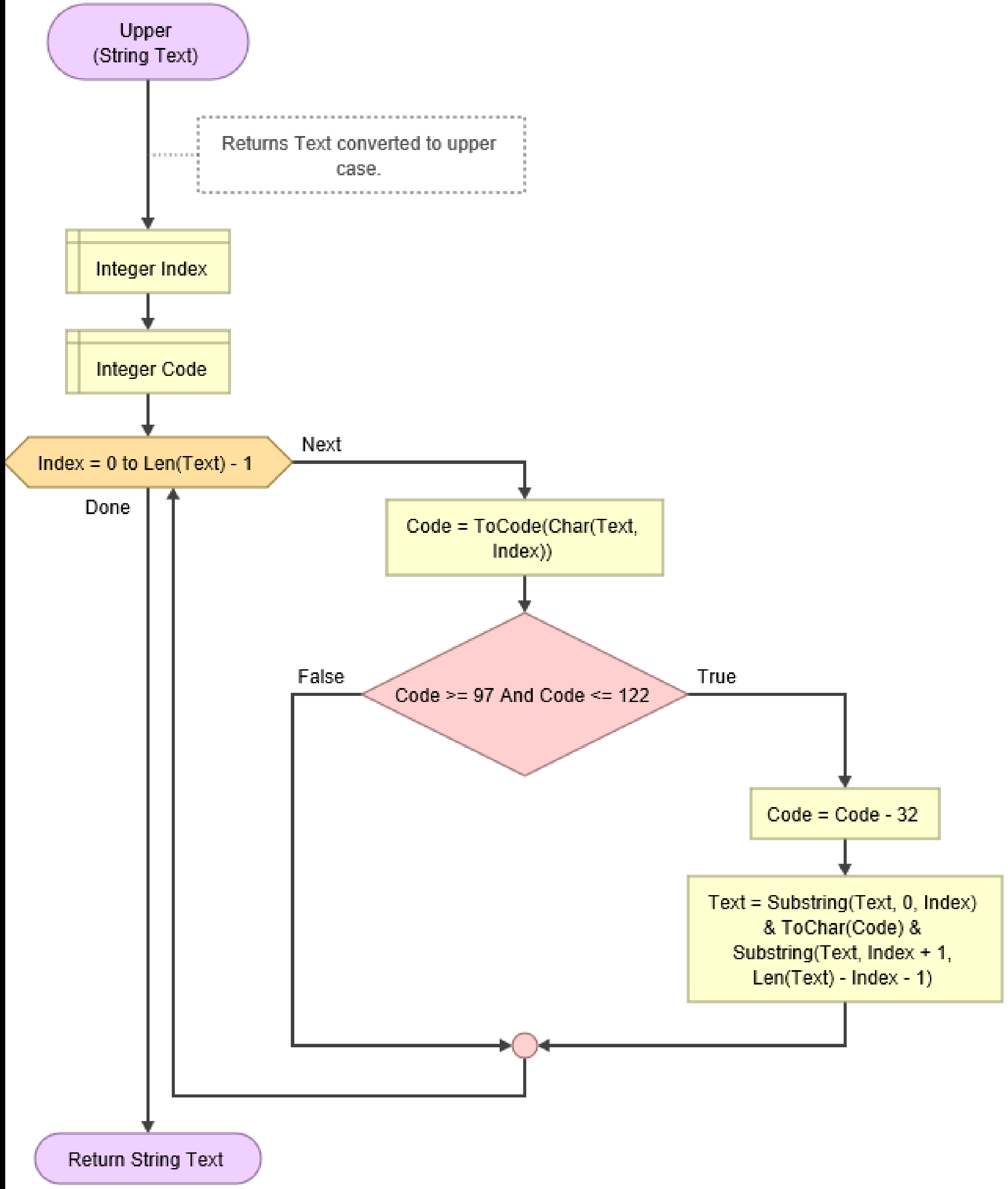
Index = Index + 1

Length = Length - 1

False

Return String Result


Trim
(String Text)
Returns Text with leading and trailing spaces removed.
Boolean Done
Done = False
False
Len(Text) > 0
True
Done = True
False
Char(Text, 0) = " "
True
Done = True
Text = Substring(Text, 1, Len(Text) - 1)
True
Not Done
False
Done = False
False
Len(Text) > 0
True
Done = True
False
Char(Text, Len(Text) - 1) = " "
True
Done = True
Text = Substring(Text, 0, Len(Text) - 1)
True
Not Done
False
Return String Text


Upper
(String Text)
Returns Text converted to upper case.
Integer Index
Integer Code
Index = 0 to Len(Text) - 1
Next
Done
Code = ToCode(Char(Text, Index))
Code >= 97 And Code <= 122
False
True
Code = Code - 32
Text = Substring(Text, 0, Index) & ToChar(Code) & Substring(Text, Index + 1, Len(Text) - Index - 1)
Return String Text

Thank You