

VBA

Основные конструкции

Типы

Integer

Double

String

Boolean

Date

Variant

Type Point

 x as Double

 y as Double

End Type

Переменные

```
Dim x
```

```
Dim y as Integer
```

```
Dim z as New Collection
```

```
Dim a(1 to 10) as Double
```

```
Dim matrix(1 to 3, 1 to 3) as Double
```

```
Dim chart as Chart
```

```
Set chart = New Chart
```

```
Dim p as Point
```

```
p.x = 1
```

```
p.y = 2
```

Объекты

Пример 1

```
Dim r As Range
Set r = Range("A1")
r.Value = 5
r.AddComment ("Test")
Set r = Range("A1:A10")
r.Cells(1,1) = 6
X = r.Cells(1,1)
```

Пример 2

```
Dim r As Range
Set r = Range("A1")
With r
    .Value = 5
    .AddComment ("Test")
End With
```

Процедуры

```
Sub <Identifier> ( [Parameters] )  
    ...  
End Sub
```

! Процедура не возвращает значений

Пример

```
Sub PrintLog (text as String)  
    Debug.Print Date & ": " & text  
End Sub
```

```
PrintLog "Работа завершена"
```

Immediate

```
29.10.2015: Работа завершена
```

ФУНКЦИИ

```
Function <Identifier> ( [Parameters] ) as <Type>  
...  
    <Identifier> = <Expression>  
End Function
```

Пример

```
Function axpy (a as Double, x as Double, y as Double) as Double  
    axpy = a*x+y  
End Function  
  
PrintLog "5*2+3=" & axpy(5,2,3)
```

Immediate

```
29.10.2015: 5*2+3=13  
|
```

Операторы

Оператор	Описание
=	Присваивание
+ -	Плюс, минус
* /	Умножить, разделить
%	Остаток от целочисленного деления
^	Возведение в степень
<	Меньше
<=	Меньше или равно
>	Больше
>=	Больше или равно
=	Равно
<>	Не равно
Not	Не
And	И
Or	Или

Условный оператор

```
If <Condition> Then
    ...
[
Else | ElseIf <Condition> Then
    ...
]
End If
```

Пример

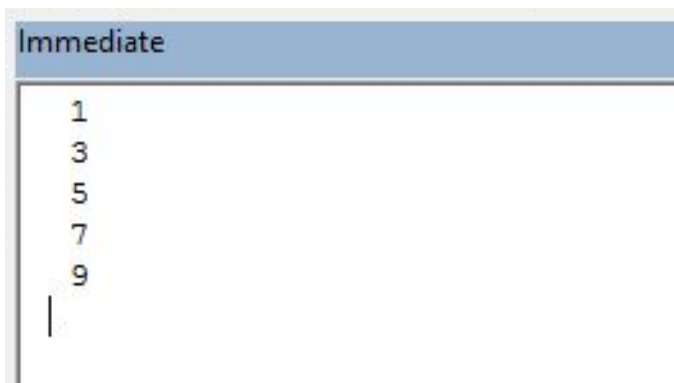
```
If a > b then
    PrintLog a
ElseIf b > c then
    PrintLog b
Else
    PrintLog c
End If
```


Цикл For

```
For <identifier>=<from> To <to> [ Step <by> ]  
...  
Next [<identifier>]
```

Пример

```
For i=1 To 10 Step 2  
    Debug.Print i  
Next
```



Immediate

```
1  
3  
5  
7  
9  
|
```

Цикл For Each

```
For Each <identifier> [ As <Type> ] In <expression>  
    ...  
Next
```

Пример

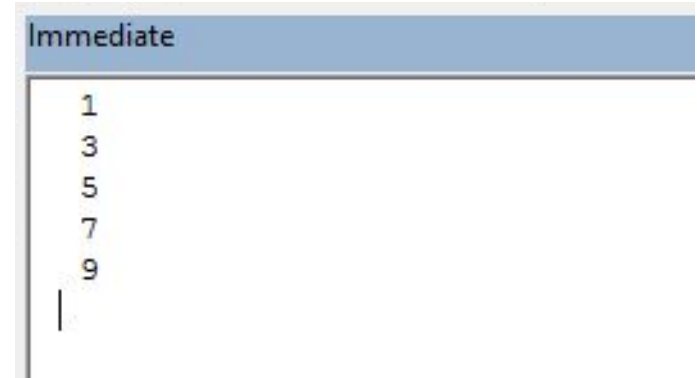
```
Dim a() As Variant  
a = Array(1, 2, 3, 4, 5)  
For Each x In a  
    Debug.Print x  
Next
```

Цикл Do

```
Do [ While <condition> ]  
  ...  
  [ Exit Do ]  
  ...  
Loop
```

Пример

```
i = 1  
Do While i < 10  
  Debug.Print i  
  i = i + 2  
Loop
```



The screenshot shows a window titled "Immediate" with a list of numbers: 1, 3, 5, 7, 9. A vertical cursor is positioned to the left of the number 9.

Пример1 : поиск корней $ax^2+bx+c=0$

```
Function ToString(Val)
    If IsArray(Val) Then
        ToString = ""
        For Each x In Val
            If ToString <> "" Then ToString = ToString & ";"
            ToString = ToString & CStr(x)
        Next
    Else
        ToString = CStr(Val)
    End If
End Function

Function SquareRoots (a As Double, b As Double, c As Double)
    Const Epsilon As Double = 0.0000001

    d = b ^ 2 - 4 * a * c
    If d < 0 Then
        SquareRoots = "Действительных корней нет"
    Else
        x1 = (-b + Sqr(d)) / (2 * a)
        x2 = (-b - Sqr(d)) / (2 * a)
        If Abs(x1 - x2) < Epsilon Then
            SquareRoots = x1
        Else
            SquareRoots = Array(x1, x2)
        End If
    End If
End Function

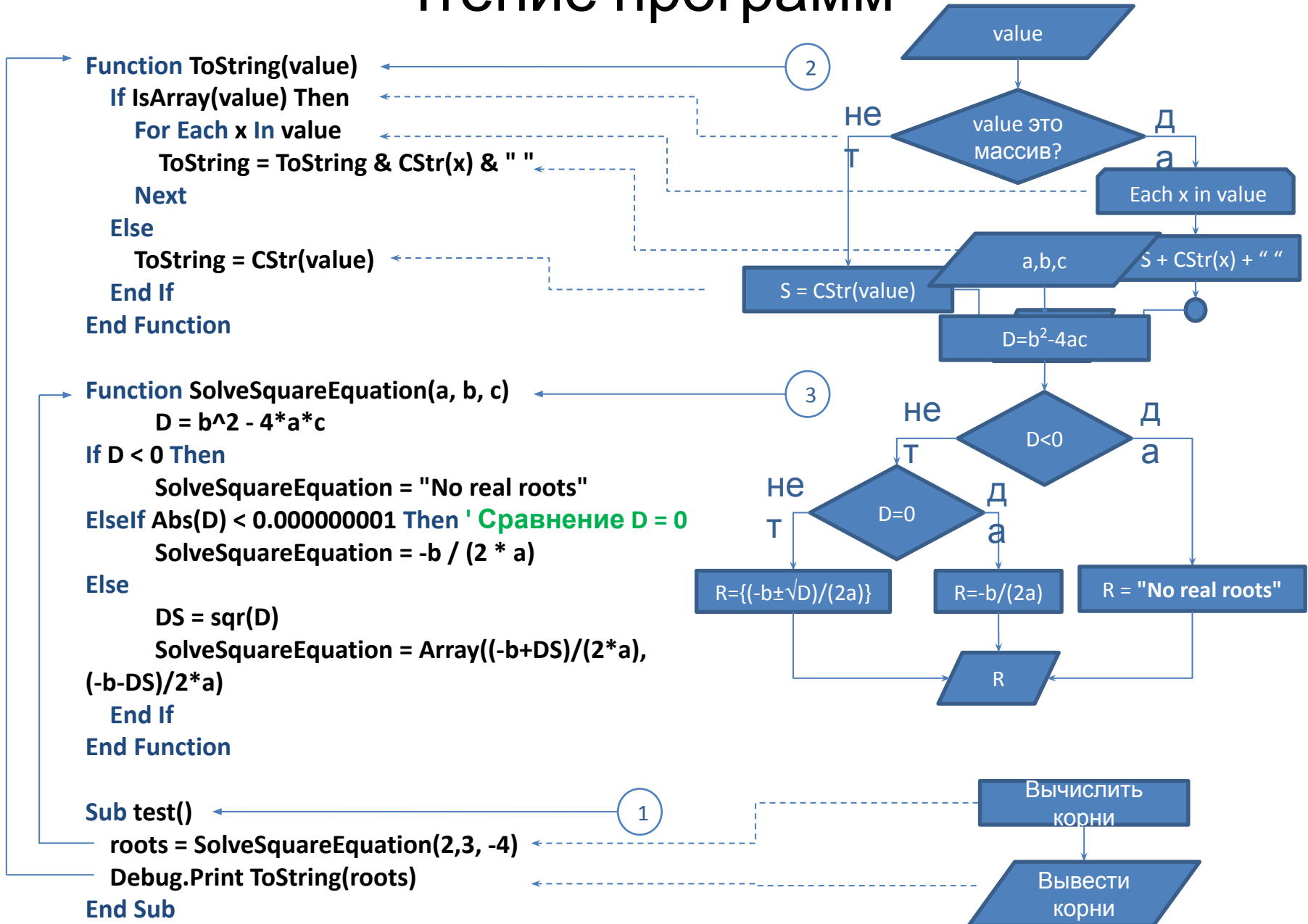
Sub test()
    x = SquareRoots (1, 2, -3)
    Debug.Print ToString(x)
End Sub
```

Immediate

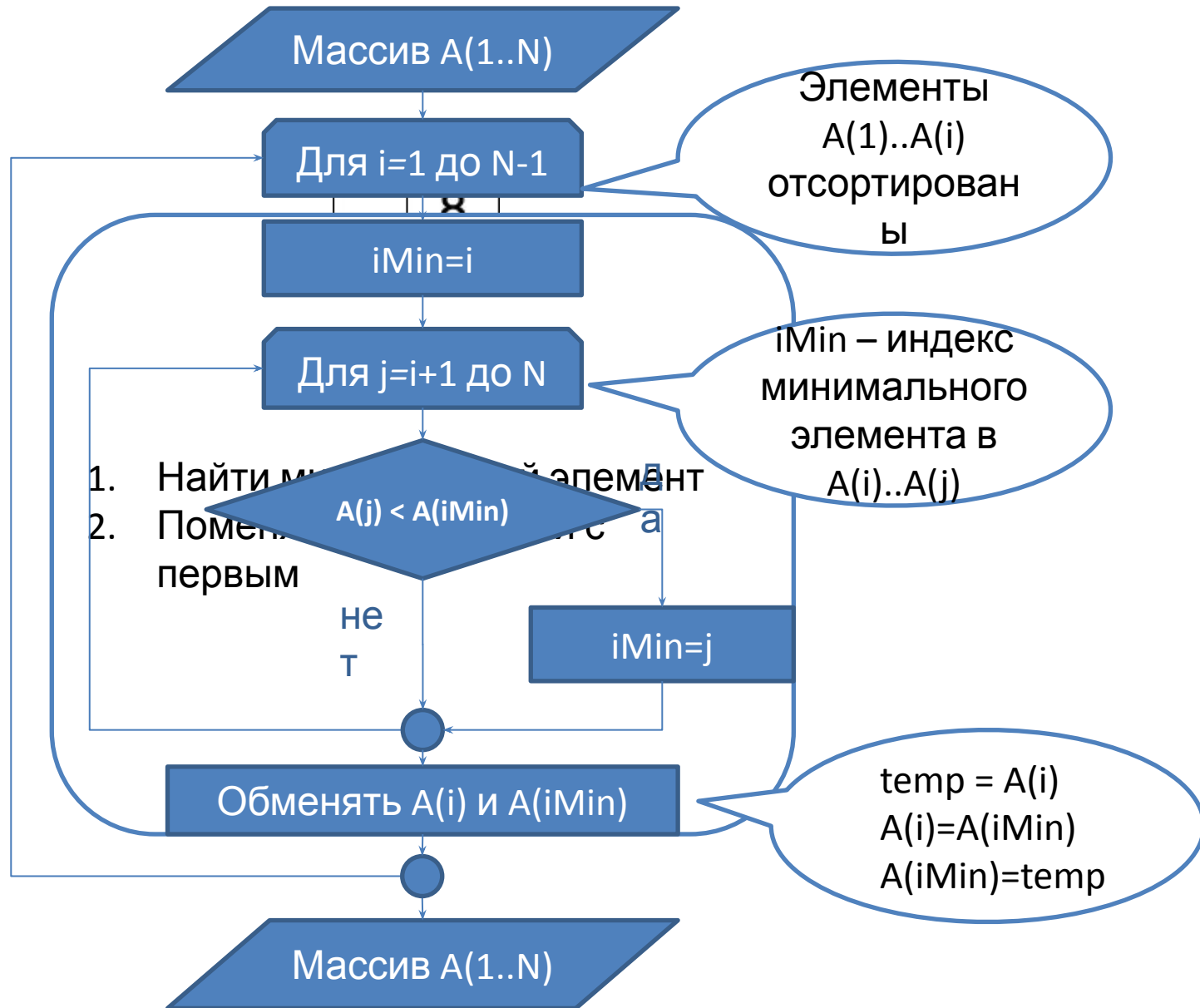
1;-3

|

Чтение программ



Сортировка выбором



Чтение программ: сортировка выбором

Function ToString(value) ← 2

...
End Function

Sub SelectionSort(A) ← 3

For I = LBound(A) To UBound(A) - 1

 iMin = I

 For J = I + 1 To UBound(A)

 If A(J) < A(iMin) Then iMin = J

 Next

 ' Обмен

 temp = A(I)

 A(I) = A(iMin)

 A(iMin) = temp

Next

End Sub

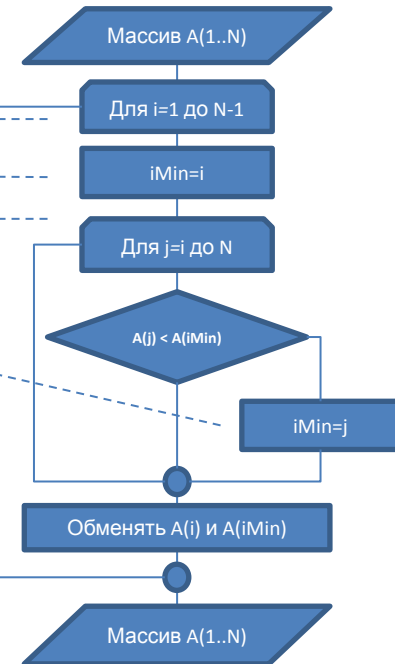
Sub test() ← 1

 A = Array (8, 7, 3, 6, 2, 5, 9, 0, 1)

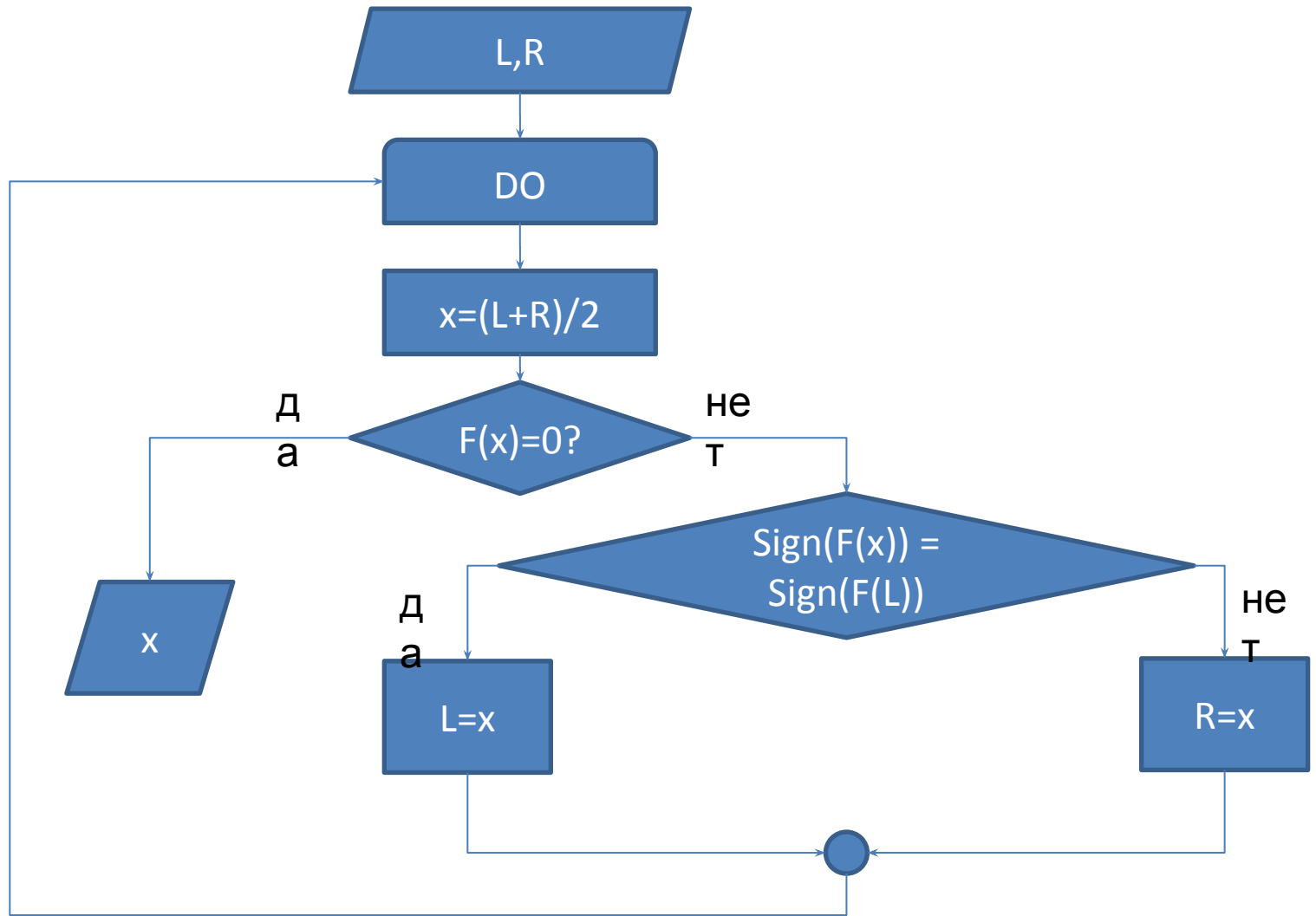
 SelectionSort A

 Debug.Print ToString(A)

End Sub



Поиск корней: $F(x)=0$



Пример2 : поиск корней $ax^2+bx+c=0$

```
Function fn(a, b, c, x)
    fn = a * x ^ 2 + b * x + c
End Function
```

```
Function DivideByTwo(a As Double, b As Double, c As Double, left As Double, right As Double)
    If left > right Then Swap left, right

    Do ' While True
        x = (left + right) / 2
        fnx = fn(a, b, c, x)
        If Abs(fnx) < Epsilon Or Abs(x - left) < Epsilon Or Abs(x - right) < Epsilon Then
            Exit Do
        ElseIf sign(fnx) = sign(fn(a, b, c, left)) Then
            left = x
        Else ' sign(fnx) = sign(fn(a, b, c, right))
            right = x
        End If
    Loop

    DivideByTwo = Array(x, fnx)
End Function
```

```
Sub test()
    Const a As Double = 1#, b As Double = 2#, c As Double = -3#
    x = DivideByTwo(a, b, c, -5, 0)
    Debug.Print ToString(x)
    x = DivideByTwo(a, b, c, 5, 0)
    Debug.Print ToString(x)
End Sub
```

Immediate

```
-3,00000004470348;1,78813936102529E-07
1,000000001490116;5,96046447753906E-08
```

Sign(x)

$$\text{Sign}(x) = \begin{cases} -1, & x < 0 \\ 1, & x > 0 \\ 0, & x = 0 \end{cases}$$

