

VISUAL BASIC

2010

VISUAL BASIC

(-)

9 6.04.2010

-

2 22.04.2010

2010

681.3.06(071)

Visual Basic (- : , 2010. – 60 .) / . . . - :

».
« » , « ' » ,
« ».

: . . , . .

. . . , . .

		6
1.		7
1.1		7
1.2		7
1.3		8
1.3.1		8
1.3.2		12
1.3.3		15
1.3.4	,	16
1.3.5		18
1.3.6		20
1.3.7		22
1.3.8	,	22
2.	VBA	27
2.1	VBA: , ,	27
2.2	· ,	31
2.3	-	34
2.4		35
2.5		36
3.		40
	1.	40
	2.	
		41
	3.	
		44
	4.	
		46

5.		47
6.		50
7.	,	51
1.		53
2.		54
3.		55
4.		56
5.		57
6.		58
7.	,	59

, , ,
,
- , ,
, , .
' ,
' ' ,
, , - ,
, , .
' ,
, , -
, , .
' ,
, ,
' ,

1.

1.1

1. (, ,) ;
2. ;
3. ;
4. ;
5. ;
6. ;
7. ;
8. ;
9. .

1 2

.

1.2

1. ,
2. .
3. ,
4. ,
5. ,
6. ,
7. ,
8. ,
9. ,
10. ,
11. ,
12. ,
13. ,
14. ,
15. ,
16. ,
17. ,
18. ,
19. ,
20. ,
21. ,
22. ,
23. ,
24. ,
25. ,
26. ,
27. ,
28. ,
29. ,
30. ,
31. ,
32. ,
33. ,
34. ,
35. ,
36. ,
37. ,
38. ,
39. ,
40. ,
41. ,
42. ,
43. ,
44. ,
45. ,
46. ,
47. ,
48. ,
49. ,
50. ,
51. ,
52. ,
53. ,
54. ,
55. ,
56. ,
57. ,
58. ,
59. ,
60. ,
61. ,
62. ,
63. ,
64. ,
65. ,
66. ,
67. ,
68. ,
69. ,
70. ,
71. ,
72. ,
73. ,
74. ,
75. ,
76. ,
77. ,
78. ,
79. ,
80. ,
81. ,
82. ,
83. ,
84. ,
85. ,
86. ,
87. ,
88. ,
89. ,
90. ,
91. ,
92. ,
93. ,
94. ,
95. ,
96. ,
97. ,
98. ,
99. ,
100. ,

, ;

,

.

- .

(. 1), ,

.

,

.

.

4

,

.

,

.

,

,

.

,

.

(,), , ,

,

.

1.3

1.3.1

-

,

,

,

.

1.

, b, ,

:

$$h_a = \frac{2}{a} \sqrt{p(p-a)(p-b)(p-c)}$$

$$h_b = \frac{2}{b} \sqrt{p(p-a)(p-b)(p-c)}$$

$$h_c = \frac{2}{c} \sqrt{p(p-a)(p-b)(p-c)}$$

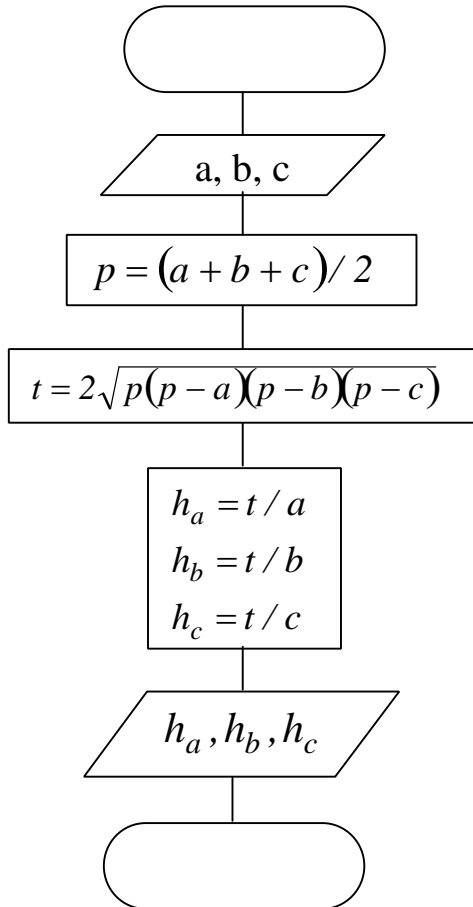
$$p = (a+b+c)/2$$

:

$$t = 2\sqrt{p(p-a)(p-b)(p-c)},$$

$$h_a = t/a, h_b = t/b, h_c = t/c$$

.1.



.1.

2.

$$z = \begin{cases} \sin(x), & x \leq a \\ \cos(x), & a < x < b \\ \operatorname{tg}(x), & x \geq b \end{cases}$$

..2.

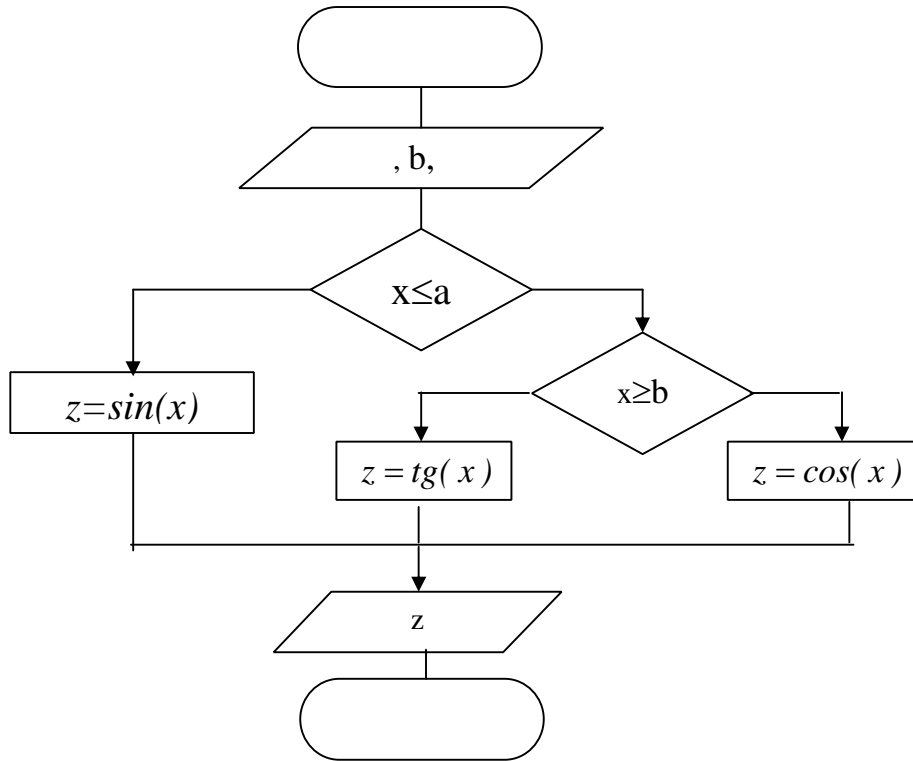
3.

$$z = \frac{x^3}{y}, \quad y = \sin(nx) + 0,5$$

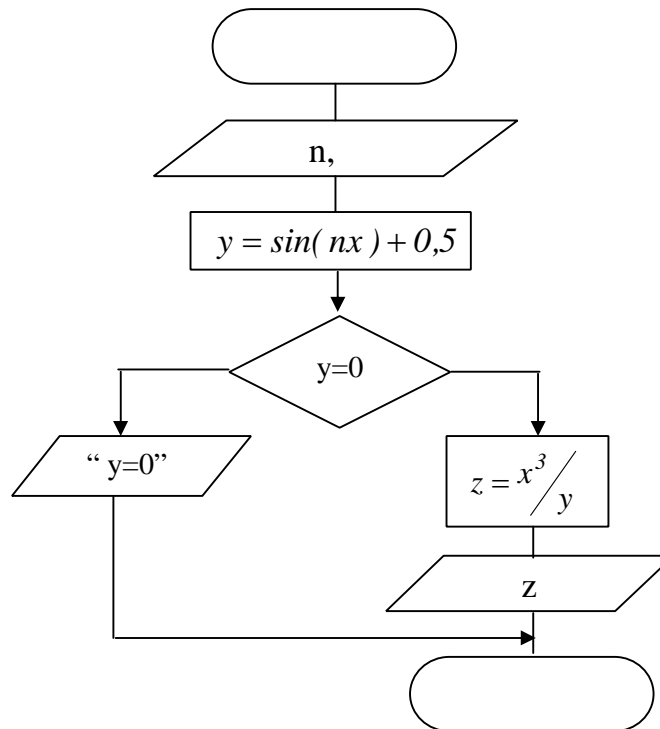
=0,

, =0.

.3.



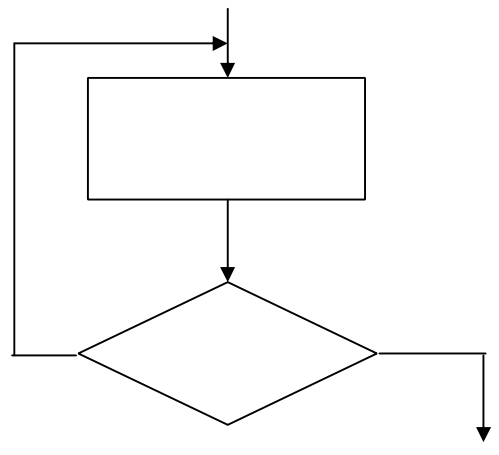
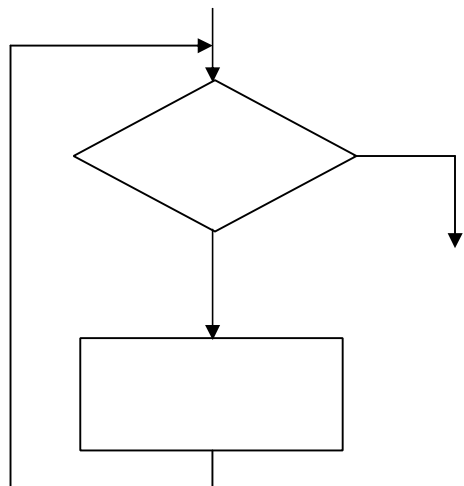
.2.

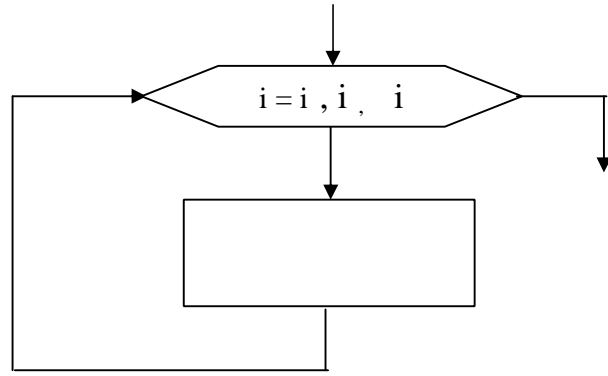


.3.

1.3.2

· , , ,
, - · , - :
- ,
; ;
- ;
- ,
, , ,
, · :
1) « »
2) « ... »
3) · :
:





4.

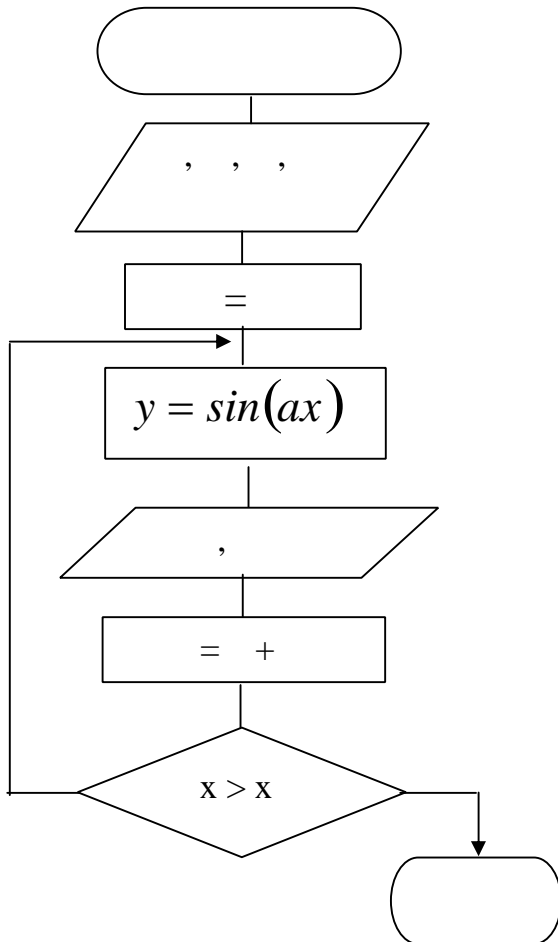
:

$$y = \sin(ax)$$

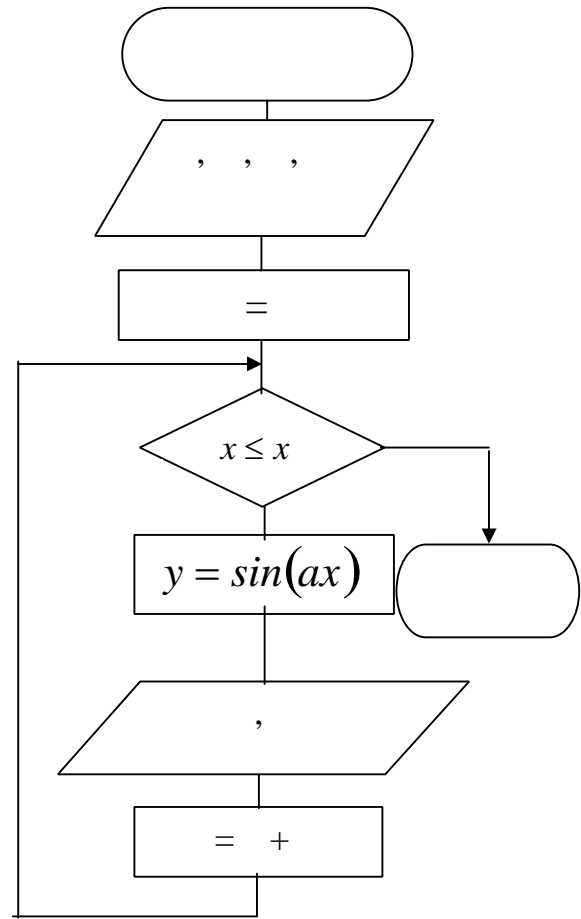
$$1 \leq x \leq 100 \quad \Delta x = 1 \quad a = 1.67$$

$$: =1 \quad =100 \quad \Delta =1 \quad =1.67$$

.4 5.

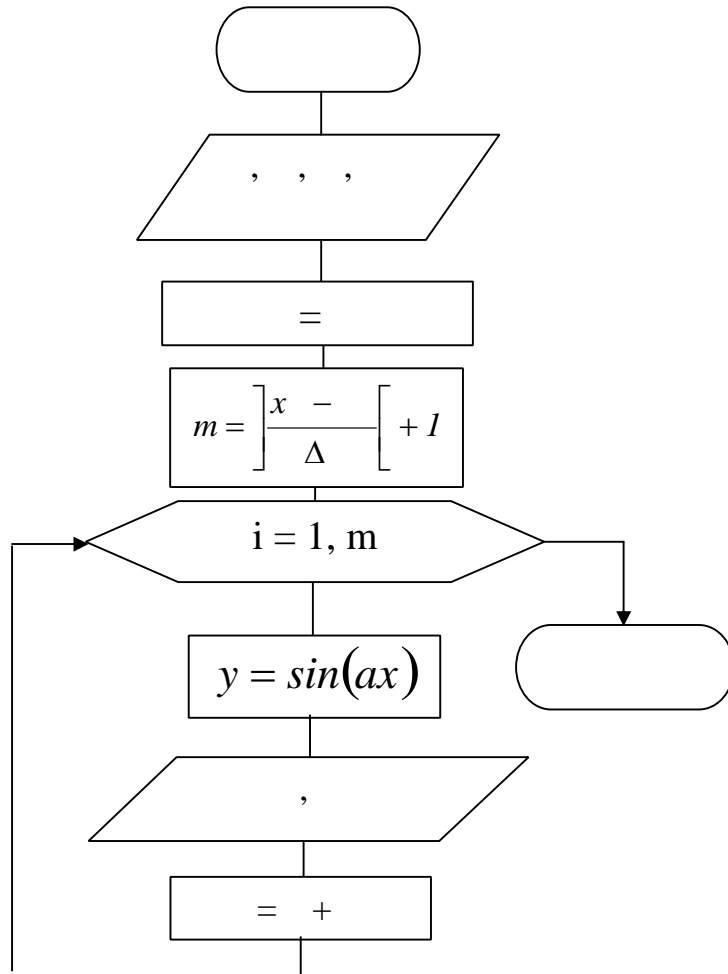


.4



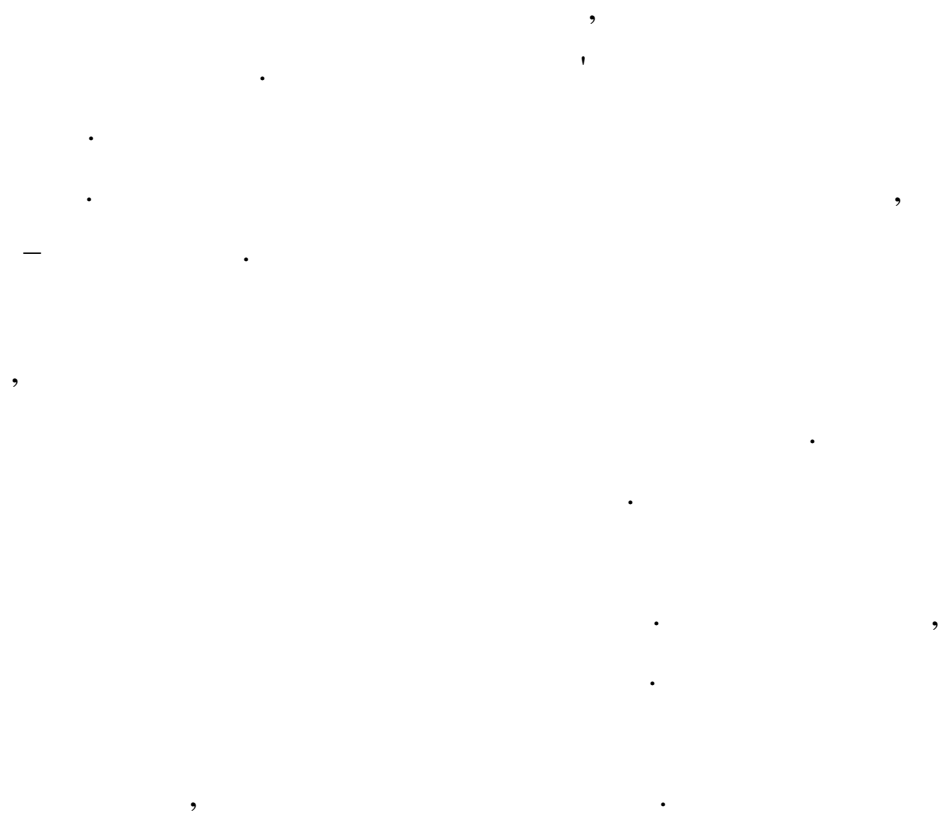
.
 ' 3 :
 ,
 .
 .5
 ,
 i, 1 m, m - ,
 :

$$m = \left\lceil \frac{x - }{\Delta} \right\rceil + 1$$



.5

1.3.3



5.

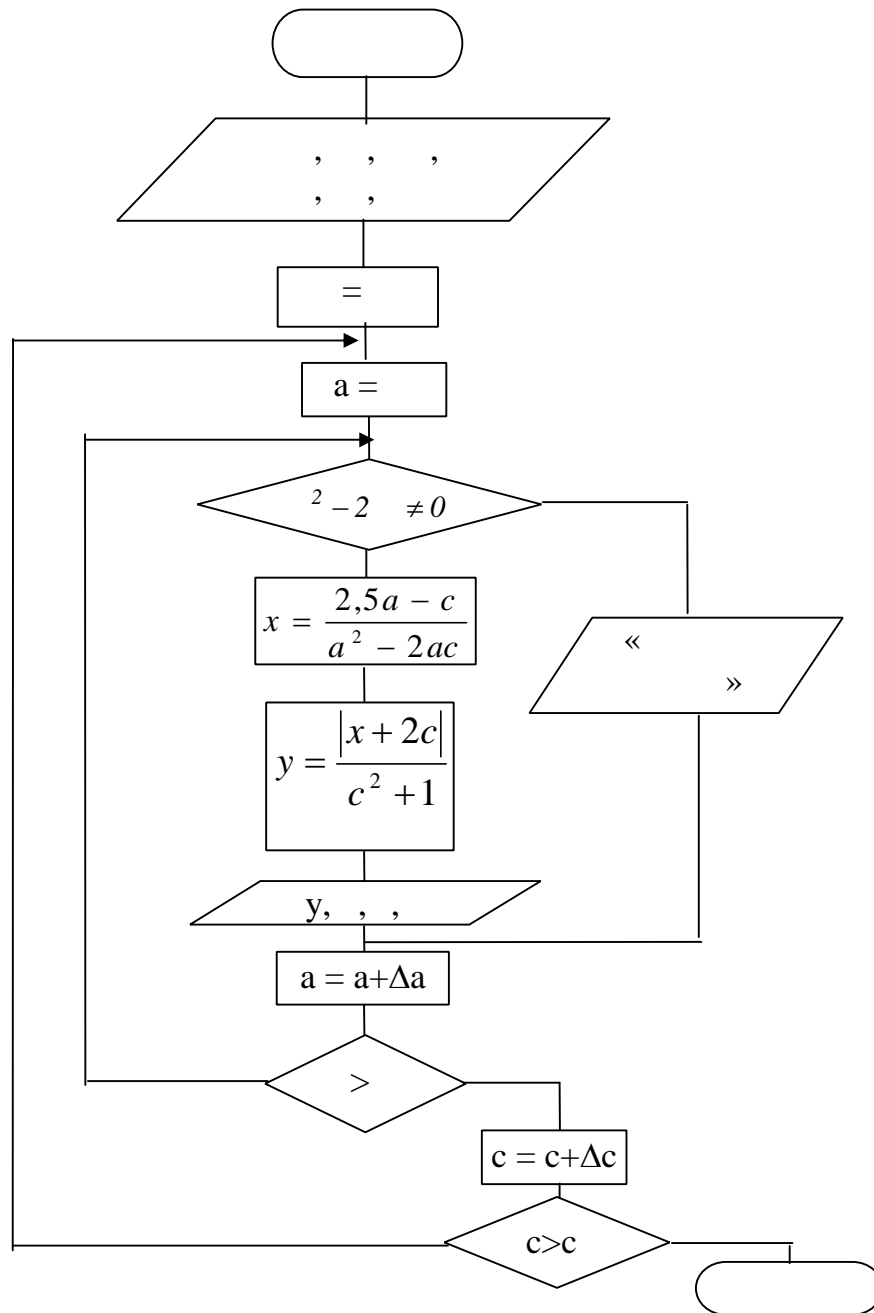
$$x = \frac{2,5a - c}{a^2 - 2ac} \quad y = \frac{|x + 2c|}{c^2 + 1}$$

$$-3 \leq a \leq 3; \quad \Delta a = 1,5;$$

$$-1 \leq c \leq 1; \quad \Delta c = 0,2$$

: , , , , ,

.6.



.6

1.3.4

6.

$$y = \frac{a^2 + x^2}{\ln 3 - |x|}$$

$$-0.5 \leq x \leq 2.5 \quad \Delta x = 0.1 \quad a = 3.8$$

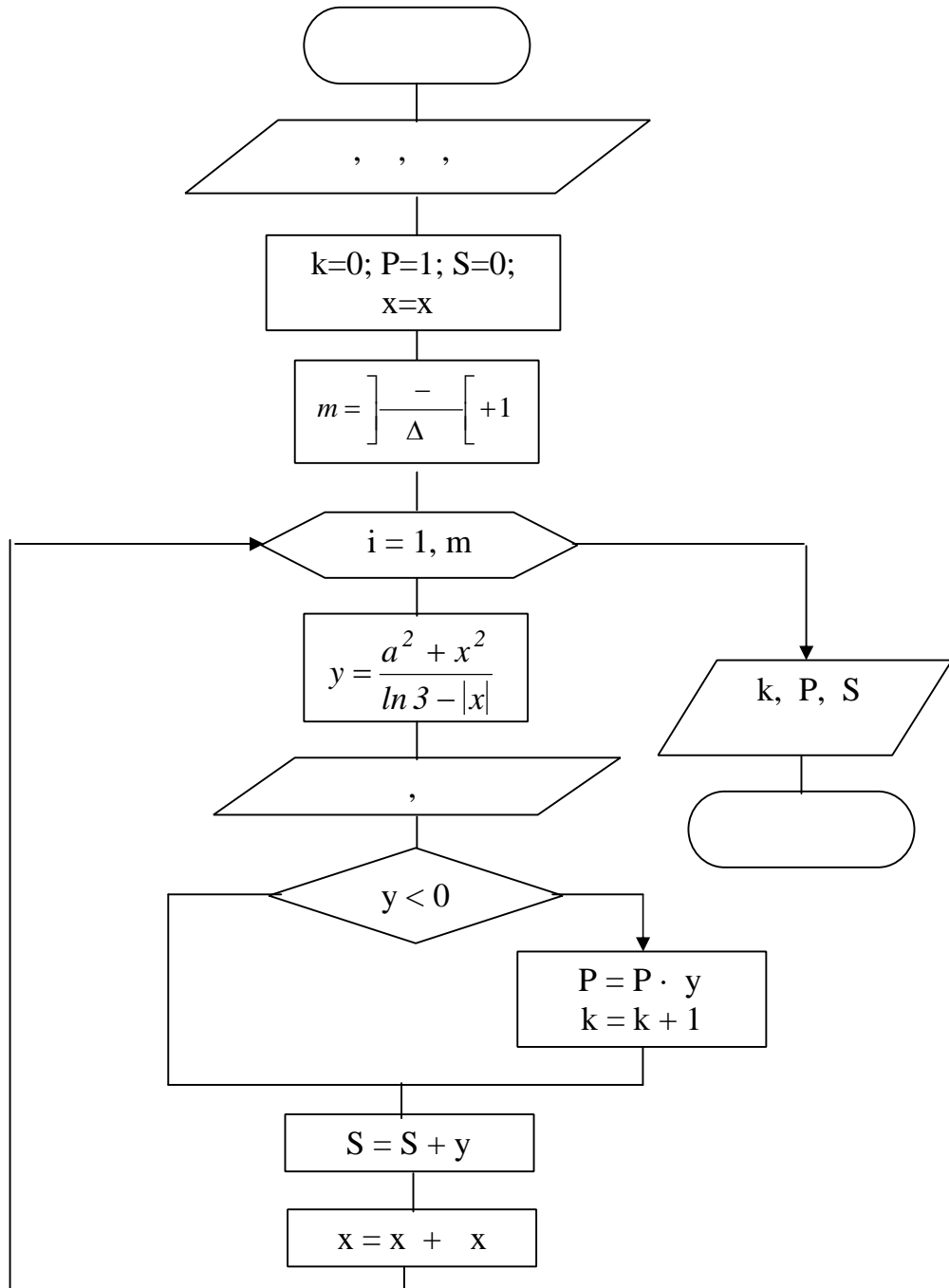
:

(k) $y < 0$

$$P = \prod_{y < 0} y$$

$$S = \sum y$$

.7.



.7

,

k,

S, P.

k, S, P

1.3.5

: = (x₁, x₂, ..., x_n),

n.

n

7.

$$y_i = \begin{cases} a \ln x_i, & x_i \geq 1 \\ \sqrt{x_i^2 + 2,5}, & x_i < 1 \end{cases} \quad i = 1, M$$

.8.

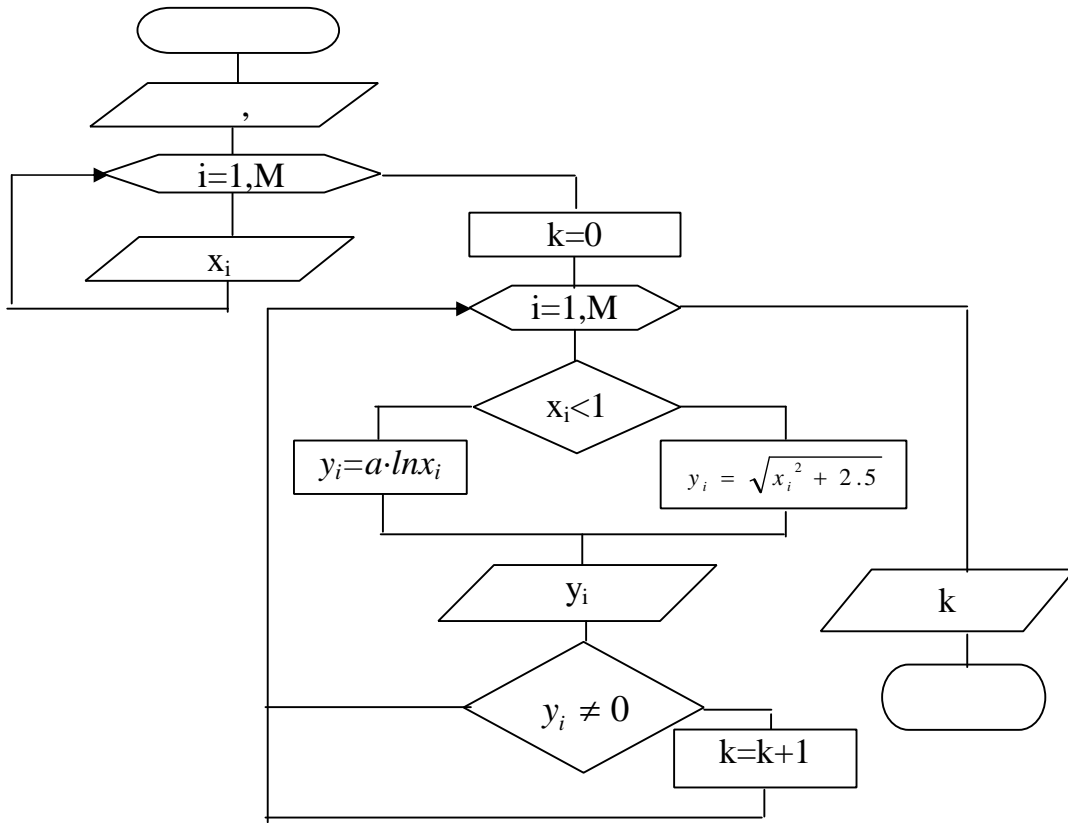
8.

x = (x₁, x₂, ..., x₁₅),

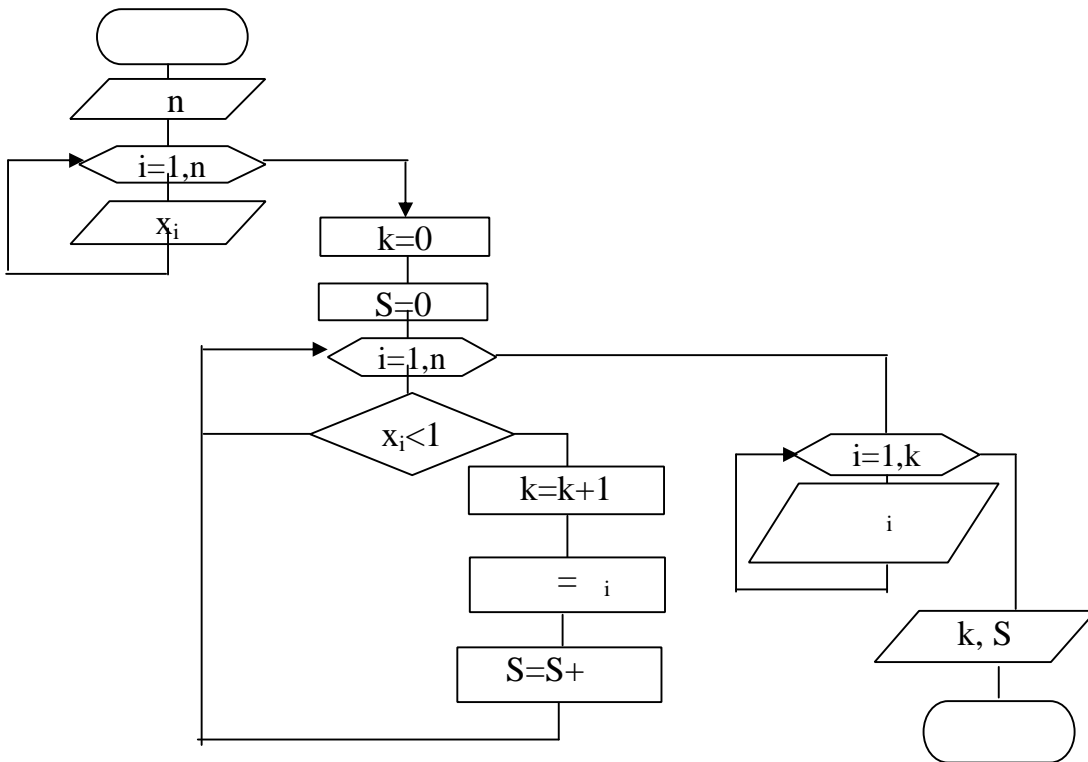
1

y = (y₁, y₂, ..., y_k).

.9.



.8



.9

1.3.6

9.

(n,m)

: A -

n -

m -

;

A;

A.

$$: p = \frac{k}{n \cdot m} \cdot 100\%,$$

k -

.10.

10.

(n,m)

$B(m),$

: A -

n -

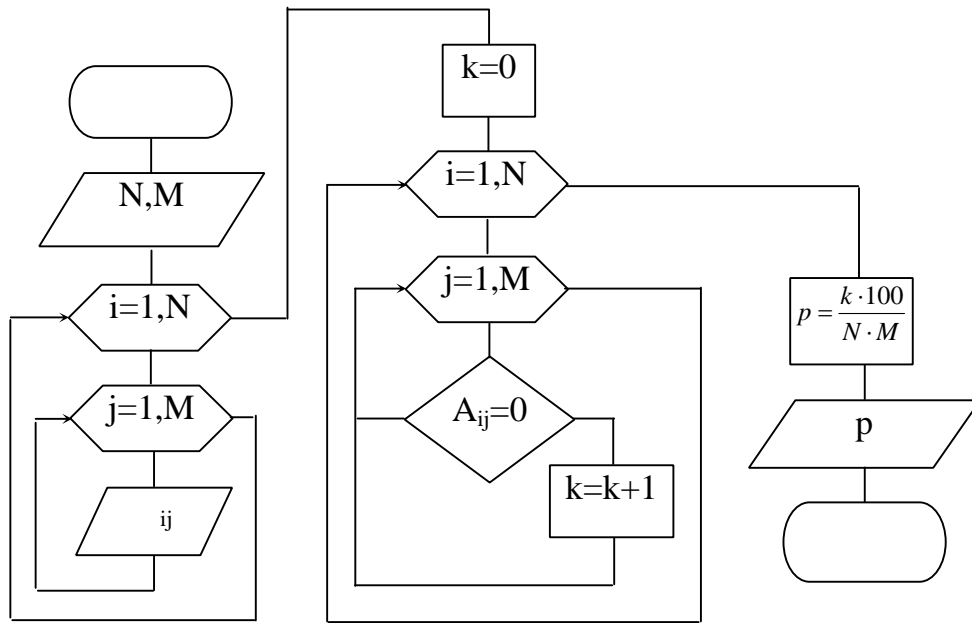
m -

;

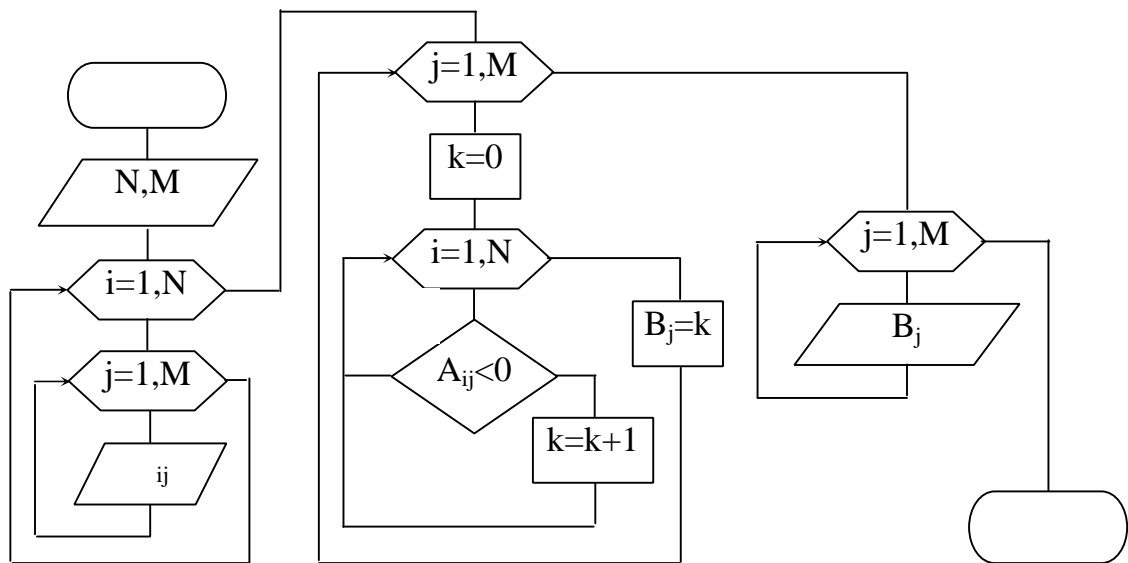
A;

A.

.11.



.10



.11

1.3.7

()
()
()

11.

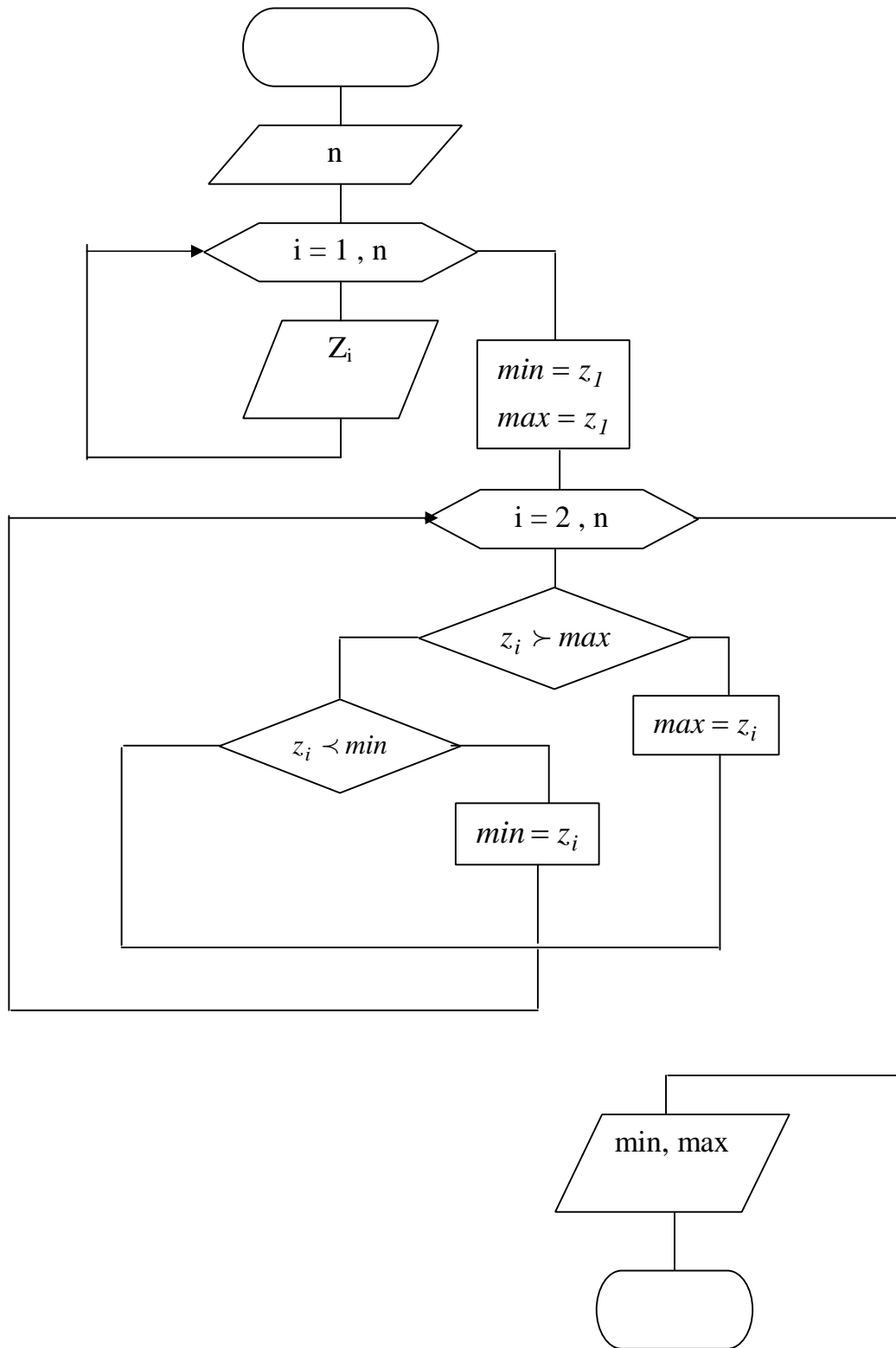
Z(n)

(max)

(min)

.12.

1.3.8



12.

$= (1, 2, \dots, 50)$

$$R = \frac{1}{25} \sum_{i=2,4,\dots}^{50} X_i - \frac{1}{25} \sum_{i=1,3,\dots}^{49} X_i$$

_____ :

R

25

25 :

$$S = \frac{1}{25} \sum_{j=k,k+2,\dots}^n X_j$$

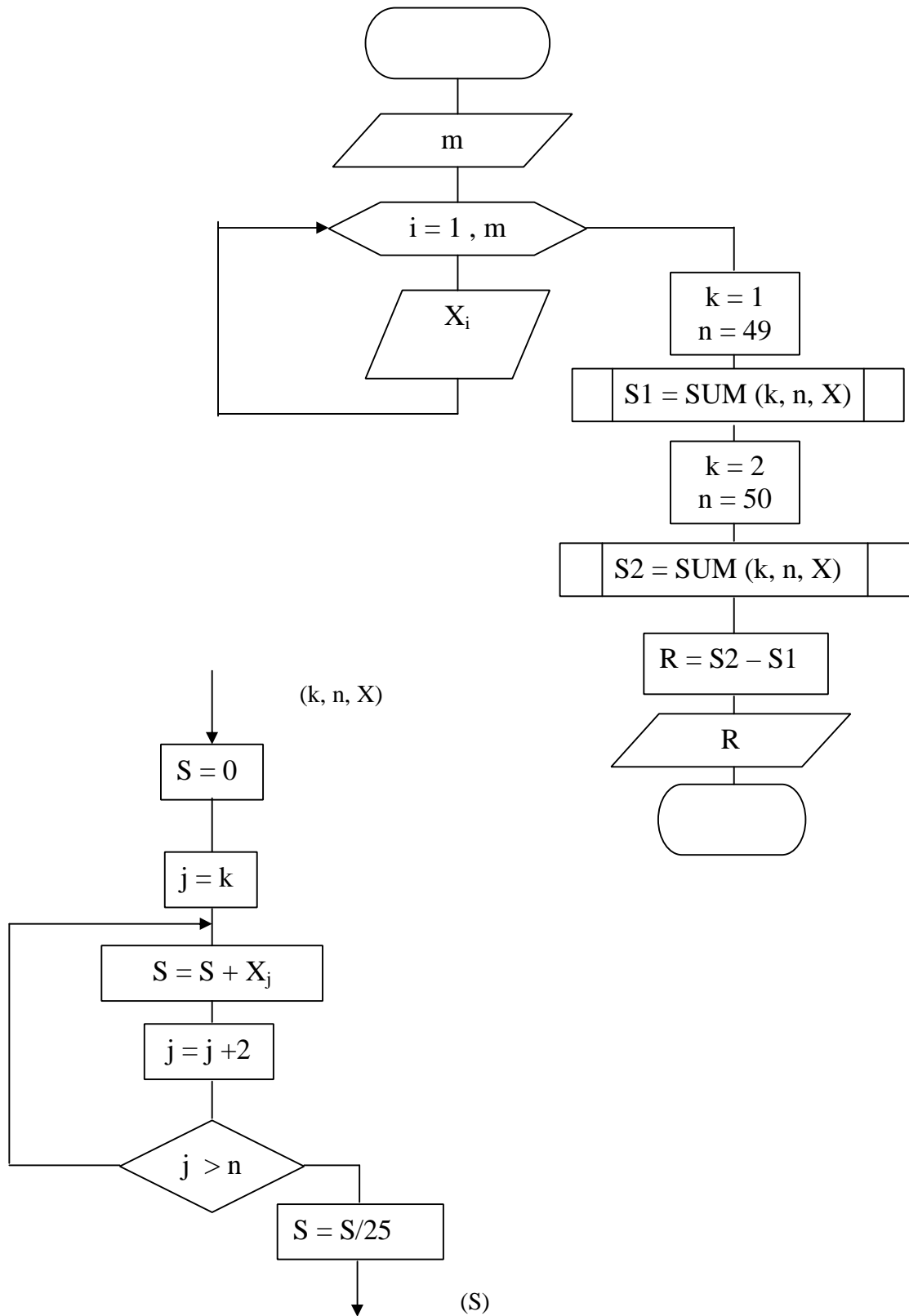
$k = 1 \quad n = 49.$

$k = 2 \quad n = 50.$

« » ,

« » (. .13).

S1, S2.



.13

SUM

13.

$$a_k = 2.8(k - 3.6)^2 + \sqrt{k + 2}$$

$$b_j = 5.4(j + 2.6)^2 + \sqrt{j + 2}$$

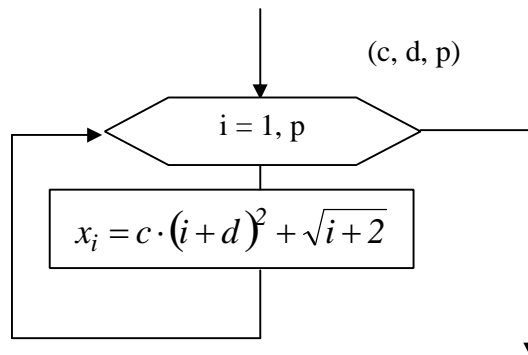
$$k = 1, m \quad j = 1, n$$

_____.

$$: \quad x_i = c \cdot (i + d)^2 + \sqrt{i + 2}$$

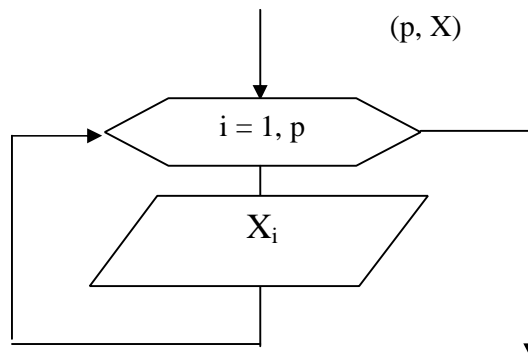
.14.

– FORM

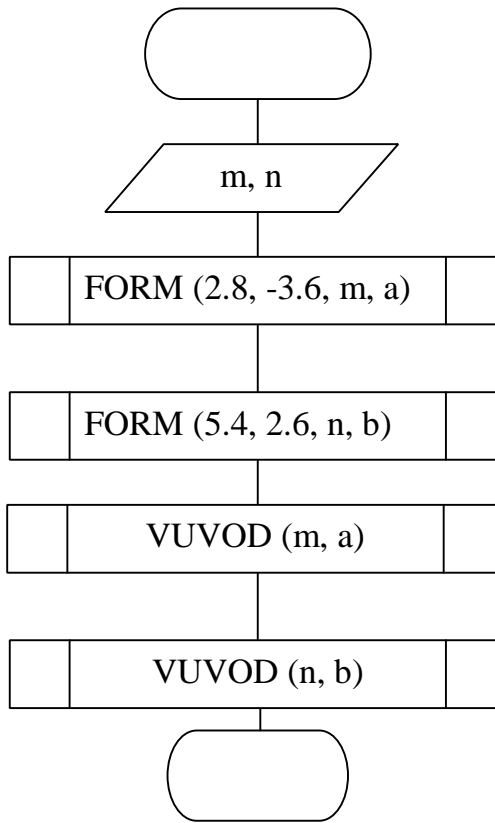


(X)

– VUVOD



(X)



.14

2.

VBA

2.1

VBA:

VBA

-
-

;

, , , , ,
,
,
,
:
,
;
. ! & \$ # @

- ' : , ;
 - 255 ;
 - ;
 - VBA

(True, False).

(2.1)

Dim ' As
Const ' =

Dim as integer, b as single

Const PI = 3.14159

2.1. VBA

	' ()	
Boolean ()	2	True False
Integer ()	2	- 32 768 32 768
Long ()	4	- 2 147 483 648 2 147 483 648
Single ()	4	1,401298 E – 45 3,402823 E+38
Double ()	8	4,94065645841247 E–324 1,797693134862322E+308
String ()	10+	0 2·10 ⁹

VBA

Dim () **As**

Dim B (1 to 3, 1 to 3) As Single // B -

3 3,

;

Dim A (1 to 12) As Integer // -

12

VBA

(. 2.2).

:

1) _____

:

^

*

/

\

+

-

mod (,

19 mod 5 4)

2) _____

:

or ()

and ()

not ()

xor

3) _____

:

= <> < > <= >=

,

VBA

$$f = \frac{a+b}{2x+b} (a+x) \cdot \sin x^3$$

:

$$f=(a+b)/(2*x+b)*(a+x)*\sin(x^3)$$

2.2

VBA

Cdate ()	Date
Cint ()	Integer
CLng ()	Long
CSng ()	Single
CStr ()	String
Abs ()	
Atn ()	
Cos ()	
Int ()	
Log ()	
Exp ()	
Sin ()	
Sqr ()	
Tan ()	

2.2

Visual Basic For Applications –

Excel.

Excel: / / Visual Basic.

VBA

. 15.

VBA,

VBA

: /

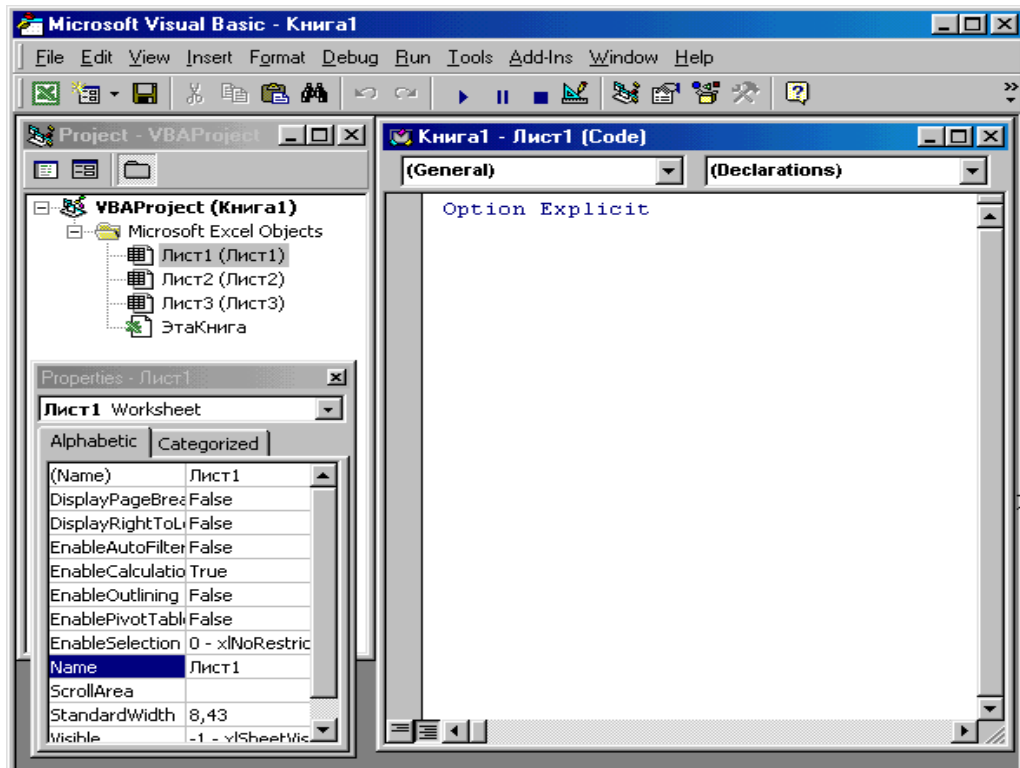
Insert / Module.

VBA :

- - Sub,

;

- - Function,




.15

VBA

```

:
[ ] Sub ' ([ ]
End Sub

```



```


( ' )
: Public -
( ), Private -
, ( ).
( ' )
,
.
( ),
,
.
,
.

```

```

:
[ ] Function ' ([ ] As
=
End Function

```



```

: ' = .

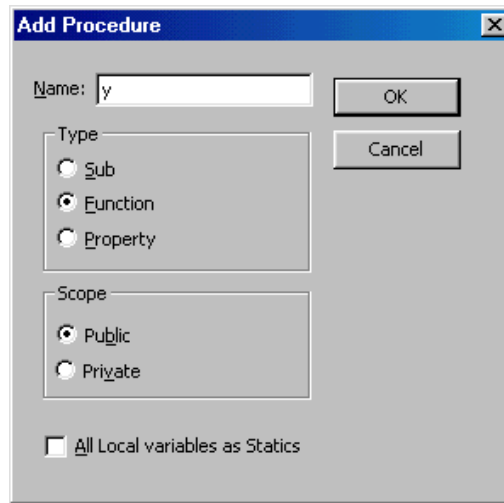
```


Procedure
Name,

Insert / Procedure.

(Function Sub)

Add



```

:
Option Explicit
Option Base 1
Sub test()
  Dim a As Integer
  Dim b As Integer
  Dim c As Integer
  a = 5
  b = 10
  c = a + b
End Sub

```

“ : ”.

“ _ ” ().

: Run →

Run Sub / User Form

→

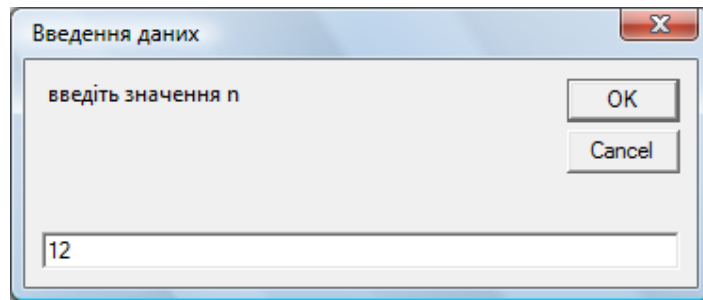
/ User Form.

InputBox

```

:
' = InputBox ( [ , ] )
_____ - ' .
, , .
_____ - ' .
,
n = InputBox (" n", ")

```



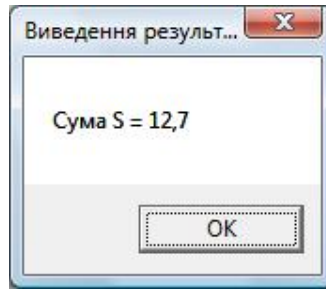
MsgBox

```

:
MsgBox [ , ] [ , ]
_____ - ' .
, , .
& Chr(13)

```

```
MsgBox " S = " & CStr(S), vbOKOnly, "
```



2.4

VBA

If ... Then ... Else

VBA

If Then 1 Else 2

1

2.

If Then

1

Else

2

End If

```

Else
:
If      Then
      1      If      Then
End If

```

```

:
GoTo Label

```

```

Label –

```

```

:
...
If x < 2 Then
    = + 2 * x : GoTo 1
Else
    = sqr ( x )
End If
b = sin(a)+ abs(x): MsgBox “b= “ & CStr ( b )
1: MsgBox “y= “ & CStr ( )
...

```

2.5

For ... Next. :

For i=i To ik [Step Δi]

Next i

i – ;

i , ik – ;

Δi – (,
1).

For ... Next ,

,

For ... Next:

Sub test ()

Dim As Integer, Sum As Integer

Sum = 0

For = 1 To 10

Sum = Sum +

Next

MsgBox “ Sum = “ & CStr (Sum)

End Sub

VBA

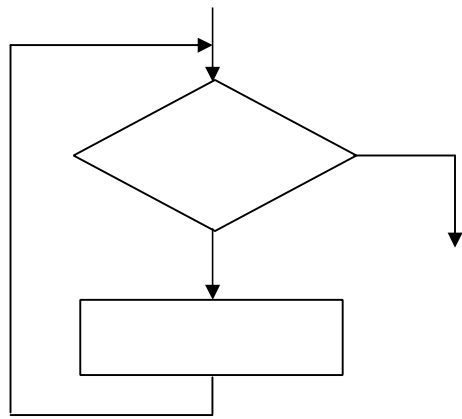
:

Do While ... Loop

Do ...Loop While

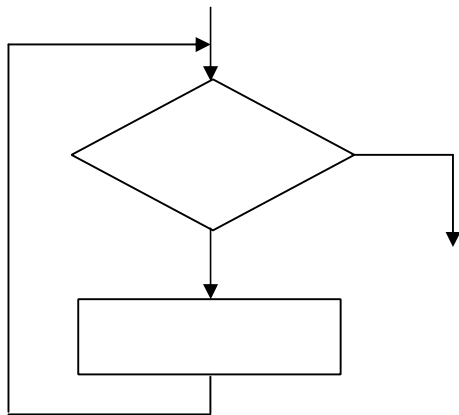
Do Until ... Loop

Do ... Loop Until



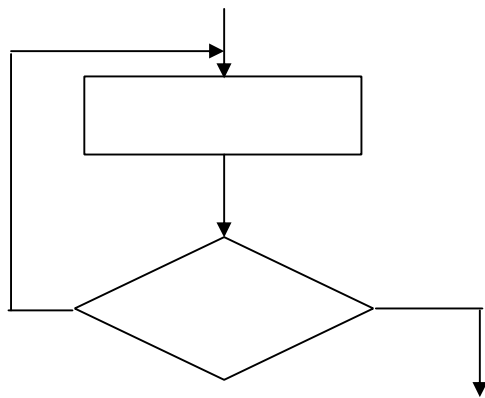
Do While

Loop



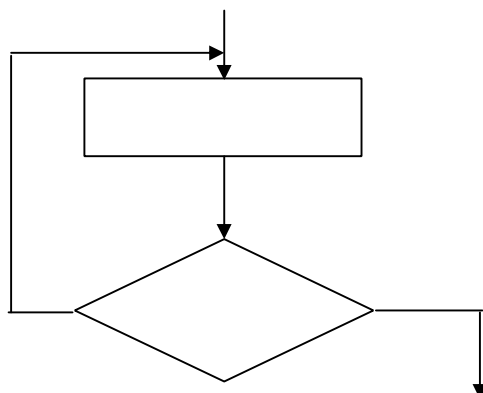
Do Until

Loop



Do

Loop Until



Do

Loop While

Do While ... Loop

Do Until ... Loop –

Do ... Loop While Do ... Loop Until

Do While...Loop Do... Loop Until:

```
Sub test ()
Dim i As Integer, Sum As Integer
Sum = 0 : i = 1
Do While i <= 10
Sum = Sum +
    i
    i = i + 1
Loop
MsgBox "Sum = " & CStr ( Sum )
End Sub
```

```
Sub test ()
Dim i As Integer, Sum As Integer
Sum = 0 : i = 1
Do
Sum = Sum +
    i
    i = i + 1
Loop Until i > 10
MsgBox "Sum = " & CStr ( Sum )
End Sub
```

3.

1.

_____ : -
.

/		/	
1	$v = \begin{cases} b^2 - \sqrt{x+b}, & x < 2 \\ \frac{bx-1}{\ln(x-b)}, & x \geq 2 \end{cases}$	2	$z = \begin{cases} \sqrt[3]{ax+1}, & x > 1.5 \\ \frac{ax+1}{\sin x}, & x \leq 1.5 \end{cases}$
3	$z = \begin{cases} t - \frac{1}{\ln(t-a)}, & t \leq 2 \\ \cos^2 \frac{x}{a}, & t > 2 \end{cases}$	4	$v = \begin{cases} y + \sqrt[3]{ax}, & x < 0 \\ \sin y^2 + a, & = 0 \\ \frac{y+x}{\ln(x-y)}, & x > 0 \end{cases}$
5	$z = \begin{cases} \ln|x^3| - b^3, & x < 1 \\ \frac{|\sin x| + b}{x-b}, & x \geq 1 \end{cases}$	6	$s = \begin{cases} \sqrt[5]{ax-1}, & x < 5 \\ \frac{2.5}{\ln(x-a)}, & x \geq 5 \end{cases}$
7	$z = \begin{cases} 1.5a - \ln(x-a), & x \leq 2 \\ \frac{23}{\sqrt{85-xa}}, & x > 2 \end{cases}$	8	$y = \begin{cases} e^{\frac{1}{x-1}}, & x < 2 \\ \sqrt[3]{x^2 - 4}, & x \geq 2 \end{cases}$
9	$y = \begin{cases} \frac{t \cdot e^{-x}}{\ln(x+1)}, & x < 1 \\ \sin x + t^2, & x \geq 1 \end{cases}$	10	$y = \begin{cases} \ln|ax+1|, & x < -0.5 \\ \sqrt{ax+1}, & -0.5 \leq x \leq 2 \\ ax+1, & x > 2 \end{cases}$

2.

/		
1	$z = \begin{cases} \sqrt[3]{ax+1}+b, & x < 5 \\ \sin(bx+2), & x = 5 \\ b \cdot \cos(cx+3), & x > 5 \end{cases}$ $y = \sqrt{z} + \frac{b \cdot \cos z}{\ln(zx)}$ $a, b, c; \quad -2 \leq x \leq 4 \quad \Delta x = 1$	$y = \begin{cases} e^{\sin x}, & a^2 x < b^3 \\ (b^2 - a) / \sin x, & a^2 x = b^3 \\ \cos^2 4x, & a^2 x > b^3 \end{cases}$ $F = 5,37y + \ln(x^3 + x^2 + x)$ $F, \quad 0.$ $= \prod_{F>0} F, \quad S = \sum_{F<0} F$ $, b; \quad x \leq 3 \quad x = -0,1$
2	$z = \begin{cases} ax^2 + 1, & x < 3 \\ bx + \cos^2 bx, & x = 3 \\ \frac{1}{\sqrt{ax - bx}}, & x > 3 \end{cases}$ $y = \sin(za) + \cos(za)$ $, b; \quad -1 \leq x \leq 8 \quad \Delta x = 0.5$	$z = \begin{cases} y^2 + \frac{a+y}{ay}, & y \leq 1 \\ 3ay + \cos^2 ay, & y > 1 \end{cases}$ $F = z^2 \sqrt{0,1+y} + \frac{3z}{\sqrt{0,1+y}} + b$ $F, \quad ,$ $Q.$ $z > 0, S = \sum_{z \leq 0} z$ $, b, Q; \quad \geq 0, \quad y = 0,5$
3	$v = \begin{cases} y + \sqrt{0,5 + \sin x}, & y \leq a \\ 3 \cdot e^{xy+1}, & y > a \end{cases}$ $y = \sin\left(\frac{\pi}{2}x\right)$ $x = \sqrt{t^2 - 0.5}$ $a; \quad 0 \leq t \leq 10 \quad \Delta t = 2$	$z = \begin{cases} \frac{x^2}{x+a} + \sqrt{x}, & x \leq 1 \\ \sqrt{ax} + 3x \sin^3 x, & x > 1 \end{cases}$ $y = 2bz \cdot \sin|\pi a| + \sqrt{x+t}$ $, \quad x+t \geq 0.$ $= !, \quad -$ $, b, t; \quad x \leq 5 \quad x = -0,5$

4	$a = \begin{cases} 1 + \sin x, & x < 3 \\ 0.5 \cos^2 \frac{x}{x+b}, & x = 3 \\ 1/(1+x^2), & x > 3 \end{cases}$ $y = e^{-x} + b \cdot \ln(ax)$ $b; \quad -2 \leq x \leq 2 \quad \Delta x = 1$	$z = \begin{cases} a^2 + 0,2 |\sin ax|, & x \geq 1 \\ \sqrt{2x^2 - 3x + e^{-ax}}, & x < 1 \end{cases}$ $y = a \cdot \cos x^2 + \ln|\sin 3z|$ $F = \sum_{x=0,2}^{\infty} y, \quad z \geq 0.$ $, Q; \quad x \geq 1$
5	$y = \begin{cases} 1 - \sin^3 ax, & x > 0 \\ -\sin(ax^2) & x = 0 \\ \frac{a+x}{\sqrt{\cos ax}}, & x < 0 \end{cases}$ $z = a^2 + \ln(ay)$ $a; \quad -3 \leq x \leq 5 \quad \Delta x = 2$	$z = \begin{cases} \sqrt{\frac{x}{a+0,3x}} + a^3, & x \leq 2 \\ \cos(a+0,3x) + 5x, & x > 2 \end{cases}$ $F = \sqrt{\frac{0,2x}{x^2+1}} + \sin^3 z^2$ F $; \quad x \leq 3 \quad x = -0,2$
6	$y = \begin{cases} ab \cdot (x + \sin^2 x), & x < -5 \\ (a+b)/(1+x), & -5 \leq x \leq 5 \\ \ln(ab-x) - x^3, & x > 5 \end{cases}$ $z = \cos y + a^3/bx$ $a, b; \quad -10 \leq x \leq 25 \quad \Delta x = 5$	$t = \begin{cases} (a-b)\sqrt{\ln(b+x)}, & x < 0 \\ \sqrt[3]{ax} + \sin^3 ax, & x \geq 0 \end{cases}$ $z = 1,5t - \ln\left(\frac{x}{ax+b}\right)$ Z $= \prod t, \quad S = \sum_{z>t} z$ $, b; \quad x \geq 1 \quad x = -0,1$
7	$z = \begin{cases} \ln|x| + \frac{2}{\sin bx}, & x < 1 \\ (1+x^2) \cos b, & x = 1 \\ b \cdot e^x, & x > 1 \end{cases}$ $y = z^3 + \sqrt{b \cdot \cos z}$ $b; \quad -3 \leq x \leq 3 \quad \Delta x = 1$	$y = \begin{cases} (a+b)^3 + e^x, & x \geq 2 \\ ax^3 + \ln(b+x), & x < 2 \end{cases}$ $z = \frac{a+b}{2x-b} \sin(x+y)$ Z $S = \sum_{y>0} y, \quad F = \prod z$ $, b; \quad x \geq 0 \quad x = 0,5$

8	$y = \begin{cases} \sqrt{a+bx}, & x < 4 \\ a + \ln bx, & 4 \leq x \leq 6 \\ (a-b) \cdot \sin x, & x > 6 \end{cases}$ $b = (x^2 + a) \ln x$ $a; \quad -2 \leq x \leq 10 \quad \Delta x = 1$	$b = \begin{cases} \sqrt{|a-x|} \ln(a+x), & x < 2 \\ a + \sqrt{x^3}, & x \geq 2 \end{cases}$ $y = \sin^2 b + \cos(x - \pi) + 1$ <p>10.</p> $P = \prod y, \quad = \sum_{b>0} b + \sum_{y<0} y$ $; \quad x \geq 0 \quad x = 0,1$
9	$y = \begin{cases} \sqrt{b^3 + x}, & x < a^2 \\ |x^5| - ax, & x = a^2 \\ \frac{ax^4 + 4x^3}{bx}, & x > a^2 \end{cases}$ $b = \sin x + \cos(xa)$ $a; \quad -2 \leq x \leq 10 \quad \Delta x = 0.2$	$y = \begin{cases} 0,5a \frac{x}{1-x} + \sin^2 xa, & x \leq 1 \\ 4a + e^{-x} + 2 \cos^3 x^2, & x > 1 \end{cases}$ $z = 2,3y + \sqrt{\frac{x}{2x^2 + 1}}$ <p>z</p> <p>.</p> <p>z.</p> $; \quad \leq 10 \quad = -0,5$
10	$z = \begin{cases} \ln|x| - b^2, & x < 0.2 \\ \sin x + \sqrt{bx}, & x = 0.2 \\ b + \ln x, & x > 0.2 \end{cases}$ $b = (a + \sin x)^2 / \cos x$ $a; \quad -8 \leq x \leq 8 \quad \Delta x = 0.4$	$y = \begin{cases} \sin a^2 + \cos(a - \pi) + x^3, & x > 0 \\ 3 \cdot \ln(1 + e^x) + \sqrt{|x|}, & x \leq 0 \end{cases}$ $F = \frac{\pi}{2} \sin 2y + \ln(2x - x^2)$ <p>F</p> <p>,</p> $P = \prod F, \quad S = \sum_{y<0} y,$ <p>F>0.</p> $; \quad \leq 1 \quad = -0,1$

3.

/	
1	$y = \begin{cases} 2 \sin^2 x + x^3, & x > 0 \\ \frac{|x|}{x^2 - 1}, & x \leq 0 \end{cases}$ $a = \ln|y| + 0,5 y^2$ $-2 \leq x \leq 5 \quad \Delta x = 0,1$
2	$z = \begin{cases} 2x^3 + 3 \cos x, & x \geq 5 \\ 7 + \ln(x + 6), & 1 \leq x < 5 \\ -\frac{2}{x^3}, & x < 1 \end{cases}$ $y = (x^2 + 2) \cdot \sin z$ $-2 \leq x \leq 10 \quad \Delta x = 1$ $z \in [-1; 1] \quad z \notin [-1; 1].$
3	$z = \begin{cases} \sqrt{xy}, & x^2 + y^2 < 1 \\ x + \frac{x+y}{x-y}, & x^2 + y^2 = 1 \\ 2x + \sin(x+y), & x^2 + y^2 > 1 \end{cases}$ $y = (a+x)^3 + \cos a^3$ $a; -2 \leq x \leq 2 \quad \Delta x = 0,5$ $z, \quad z > 0$
4	$y = \begin{cases} ax + \ln x, & x < 0,5 \\ \sin^2 x + -x, & x = 0,5 \\ \sqrt{x} + \frac{a}{bx}, & x > 0,5 \end{cases}$ $a = \sin(xb) + \sqrt{2-x}$ $b; -1 \leq x \leq 1 \quad \Delta x = 0,2$ $\geq 0 \quad < 0.$

5	$f = \begin{cases} -4, & x < -1 \\ x^2 + \frac{3}{x} + 4, & -1 \leq x \leq 1 \\ \cos(x+4)^2, & x > 1 \end{cases}$ $Z = \sin^3 x + |f|$ $-2 \leq x \leq 2 \quad \Delta x = 0,2$	$f > 0,$	$Z.$
6	$q = \begin{cases} 1 + \cos 2a, & -x > 0,1 \\ \pi \sin \frac{a}{2}, & -x \leq 0,1 \end{cases}$ $a = 2x + \sqrt{x^3 + 4}$ $-0,5 \leq x \leq 2 \quad \Delta x = 0,5$	$q > 0,$	$(q -).$
7	$z = \begin{cases} \cos^2 \frac{\pi}{4} x + \ln |x|, & y > x^2 \\ \frac{y}{(x+1)}, & y \leq x^2 \end{cases}$ $y = \sin^2 x + 0,5 \cos x^2$ $-2 \leq x \leq 2 \quad \Delta x = 0,5$	$(+ z)$	$, > z.$
8	$y = \begin{cases} x^2 + \sin^3 x, & a \leq x \leq b \\ \sqrt[3]{x} - \frac{ab}{|x|}, & c \leq x \leq d \\ 0, & \end{cases}$ $f = x^y + 1$ $a, b, c, d; \quad -1 \leq x \leq 1 \quad \Delta x = 0,1$	$f,$	$> 0.$
9	$f = \begin{cases} \cos^2 x - z, & z > 0 \\ \sqrt{z + 3x} + x^3, & -1 \leq z \leq 0 \\ |x + 0,38z|, & z < -1 \end{cases}$ $z = x^3 + 5 \ln |x|$ $-1 \leq x \leq 5 \quad \Delta x = 0,5$	$z,$	$f < 0 \quad f > z.$
10	$z = \begin{cases} x + 3 \sin \frac{\pi}{2} x, & y < 0 \\ \ln(x-2) + x^3, & y \geq 0 \end{cases}$ $y = a^2 - a + \sqrt{x}$ $a; \quad -1 \leq x \leq 4 \quad \Delta x = 0,5$	$,$	$z > 0.$

4.

_____ : -

/		,
1	$x = \frac{-|a+5|}{c^2} + bc^2 \quad y = b^2c + \left| \frac{a}{x} \right| + 1$ <p>, $2 \leq a \leq 6 \quad \Delta a = 1 \quad -4,5 \leq b \leq 4,5 \quad \Delta b = 3$</p>	, b, x,
2	$x = b^3a - \frac{|ac|}{ac-10} \quad y = \frac{|x^2 + 2x|}{b^3 - c + 5}$ <p>a, $3 \leq b \leq 9 \quad \Delta b = 2 \quad 1 \leq c \leq 5 \quad \Delta c = 1$</p>	b,c,x,y
3	$x = ay^2 - (by^2 + c) \quad y = \frac{ab^2 - cb}{|ac|}$ <p>c, $3 \leq a \leq 6 \quad \Delta a = 1 \quad -4,5 \leq b \leq 4,5 \quad \Delta b = 3$</p>	, b, x,
4	$x = \frac{(a+2)^2}{|bc|} - \frac{abc}{a+2} \quad y = \frac{|(b-c)^3|}{x^2} + bc$ <p>, $-2,5 \leq a \leq 1,5 \quad \Delta a = 1 \quad 2 \leq b \leq 5 \quad \Delta b = 1$</p>	, b, x,
5	$x = \frac{a^2 - b^3}{|abc|} - (b+1)^2 \quad y = \frac{x^2}{b+1} - 2ab$ <p>b, $1 \leq a \leq 5 \quad \Delta a = 1 \quad 3 \leq c \leq 9 \quad \Delta c = 2$</p>	, , x,
6	$x = \frac{|a - c^2|}{2a} + ac \quad y = \frac{(3a+4)x - 10}{ab - c^2}$ <p>a, $-7,5 \leq b \leq 8,5 \quad \Delta b = 4 \quad 3 \leq c \leq 9 \quad \Delta c = 2$</p>	b, , x,

7	$x = \frac{4a + |bc - 3|}{ab - bc} \quad y = \frac{|ax - c^2|}{bc - 3}$ $b, \quad -3,5 \leq a \leq 4,5 \quad \Delta a = 2 \quad 2 \leq c \leq 5 \quad \Delta c = 1$	, , x,
8	$x = a(b + c) \cdot |abc - 19| \quad y = \frac{a^3 + |x - 2b^2c|}{ac^2 + ab - 1}$ $a, \quad -2 \leq b \leq 2 \quad \Delta b = 1 \quad 1,5 \leq c \leq 6 \quad \Delta c = 1,5$	b, , x,
9	$x = \frac{bc + c^2a}{|2a - b^3|} \quad y = \frac{abc}{|a^2 + bc|} + 3ac$ $c, \quad 2 \leq a \leq 8 \quad \Delta a = 1 \quad -3 \leq b \leq 3 \quad \Delta b = 1,5$	, b, x,
10	$x = \frac{ab + c}{a^3} - |b + 2| \quad y = \frac{a(b + 2)}{|x|} + \frac{(b + 2)^2}{a - c}$ $a, \quad -4,5 \leq b \leq 4,5 \quad \Delta b = 3 \quad 2 \leq c \leq 6 \quad \Delta c = 1$	b, , x,

5.

_____ : -
.

/	
1	<p>) , r</p> $r_i = \begin{cases} \frac{a-3}{\sqrt{x_i^2+2}} & , x_i < 1 \\ 2,3ax_i & , x_i \geq 1 \end{cases} \quad i = 1, N$ <p>) = (1, 2, ..., 12)</p> <p>Y = (1, 2, ...,). Y.</p>

2	<p>)</p> $s_k = \begin{cases} B \cdot \ln(x_k^2 + 1) & , x_k < 1 \\ -2,7 \sin^2 x_k & , x_k \geq 1 \end{cases} \quad k = 1, M$ <p>)</p> $A = (a_1, a_2, \dots, a_{15})$ $B = (b_1, b_2, \dots, b_k).$ <p>B.</p>
3	<p>)</p> $c_i = \begin{cases} \operatorname{tg} \frac{x_i}{\pi} & , x_i < 1 \\ 2,8 z x_i^2 & , x_i \geq 1 \end{cases} \quad i = 1, M$ <p>)</p> $x_i \in [1; 2],$ <p>Y.</p>
4	<p>)</p> $a_k = \begin{cases} \frac{3,5d}{|x_k| + 2} & , x_k < 2 \\ d^2 - x_k^2 & , x_k \geq 2 \end{cases} \quad k = 1, Z$ <p>)</p> $= (\quad , \quad , \dots, \quad)$ <p>Y.</p>
5	<p>)</p> $t_k = \begin{cases} -\sqrt{x_k + 3} & , x_k \geq 4 \\ 2\pi \cos x_k & , x_k < 4 \end{cases} \quad k = 1, M$ <p>)</p> $= (\quad , \quad , \dots, \quad)$ <p>Y.</p>
6	<p>)</p> $v_k = \begin{cases} (a - x_k) \sin x_k & , x_k < 2,5 \\ 2\sqrt{x_k - 1} & , x_k \geq 2,5 \end{cases} \quad k = 1, M$

	<p>) , $= (1, 2, \dots, 10)$</p> <p>$= (1, 2, \dots,)$. Y</p>
7	<p>) ,</p> $a_k = \begin{cases} 0,5x_k + b, & x_k < 0 \\ 3x_k\sqrt{x_k} - b, & x_k \geq 0 \end{cases} \quad k=1, P$ <p>) $= (1, 2, \dots, 17)$,</p> <p>$x_i \in [2;3]$, $= (1, 2, \dots,)$.</p>
8	<p>) , u</p> $u_i = \begin{cases} a \ln(1 + x_i^2), & x_i < 1 \\ 2,5 \sin x_i, & x_i \geq 1 \end{cases} \quad i=1, M$ <p>) $= (1, 2, \dots, 12)$.</p> <p>1.</p>
9	<p>) d,</p> <p>$0 < d_k < 1$</p> $d_k = \begin{cases} 3,8e^{-x_k} + a, & x_k < 0 \\ a\sqrt{x_k + 2}, & x_k \geq 0 \end{cases} \quad k=1, B$ <p>) $= (1, 2, \dots, 14)$</p> <p>$= (1, 2, \dots,)$.</p>
10	<p>) $z_i < a$</p> $z_i = \begin{cases} \frac{b^2 + 3}{x_i^2 + 1}, & |x_i| \geq 1 \\ 4,2 \sin^2 x_i, & |x_i| < 1 \end{cases} \quad i=1, R$ <p>) $= (1, 2, \dots, 15)$</p> <p>$= (1, 2, \dots, 7)$.</p> <p>(-1).</p>

6.

_____ : -
.

/	
1	) D(N,M) , ,) (N), C(N,M).
2	) K(N,M) . .) (M), (N,M).
3	) X(N,M) , , , 0 - .) (N), (N,M).
4	) Z(N,M) ,) (M), (N,M).
5	) T(N,M) , , - .) (N), (N,M).

6	) A(N,M) (N), (N,M).
7	) X(N,M) (M), (N,M).
8	) Z(N,M) k- (N,M)
9	) L(N,M) (N,M)
10	) K(N,M) (N,M)

7.

_____:

/	
1	$y(x) = \frac{3,2 - \log_x(x^2 + 1)}{\log_{x+1}(x+2)}, g(x) = \sqrt{1 + \log_x^2(x+3)}$ $2 \leq \leq 12 \quad \Delta = 1,5$

2	$y(x) = \frac{3,5 \log_{x+2} x + 1}{\log_{x^2} (x+2)}$ $g(x) = \frac{a \log_{2x} (x+1)}{a^2 + \log_{x+3}^2 x}$ $\log_k n = \frac{\ln n}{\ln k}$ <p style="text-align: right;">[1,2;3,6], $\Delta = 0,4$</p>
3	$a_j = \frac{2,8 \sin(j^2 + 2)}{\cos^2(j^2 + 2) + 3,6} \quad b_k = \frac{k \sin(k^2 + 3)}{4 \cos^2(k^2 - 0,6) - 8,2}$ $j = 1, m; \quad k = 1, n$ <p style="text-align: center;">z.</p>
4	$n_k = \frac{2,6 \sqrt{\sin k + 3,4}}{1 + \sqrt{\sin k^2 + 1,8}} \quad m_i = \frac{3,8 \sqrt{\sin i^2 + 2,4}}{4 + 5 \sqrt{\sin i + 1,6}}$ $k = 1, a; \quad i = 1, b$
5	$g(x) = \frac{8,2 + 3,6 \ln^2(x+0,7)}{2,8 - 2,4 \ln^2(x+1,4)}$ $f(x) = \frac{a + 2 \ln^2(x+2,5)}{3,6 - 3 \ln^2(x+0,8)}$ $-5 \leq x \leq 10, \quad \Delta x = 1,5$
6	$y = hf(x_1) + \frac{h^2}{2} f(x_2^2) + \frac{h^3}{3} f^2(x_1 + x_2), \quad f(x) = \frac{ax\sqrt{x} + \ln|x+b|}{2,58c}, \quad h = \frac{x_2 - x_1}{10}$ $1 \leq \leq 8, \quad \Delta = 0,5.$ <p style="text-align: right;">$b, c, x_1, x_2.$</p>
7	$g(x) = \frac{5,9 - \log_{x^2} (x+1)}{2,8 \log_{x+1} x}$ $z(x) = \frac{3,4 + \log_x (x+2)}{4 \log_{x+1} x}$ $2 \leq x \leq 10 \quad \Delta x = 1,5.$ $\log_k n = \frac{\ln n}{\ln k}$
8	$z_k = 2,3k^2 + 8,1 \sin(k+2) - 3,4,$ $x_i = 1,5i^2 - 6,9 \sin(i-1) + 8,2$ $i = 1, \quad ; \quad k = 1, h$

9	$Q(x) = e^{-2x} + \sqrt[3]{\sin x + 2,8}$ $0,2 \leq x \leq 1,6 \quad \Delta x = 0,3.$	$P(x) = e^{x+1} + \sqrt[3]{\sin x - 0,4}$
10	$t(x) = 2,6 \cos^3 x + \frac{1}{7} \sqrt[3]{1 - \sin^2 x}$ $0,2 \leq x \leq 1,4 \quad \Delta x = 0,3.$	$S(x) = 1,5 \cos^3 x + \frac{2}{3} \sqrt[3]{1 + \sin^2 x}$

1

:



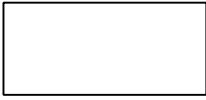
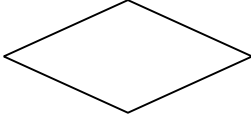

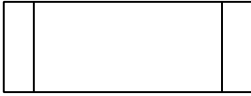

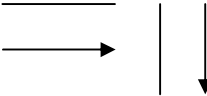


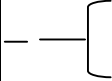
	1	2	3	4	5	6	7	8	9	10

,

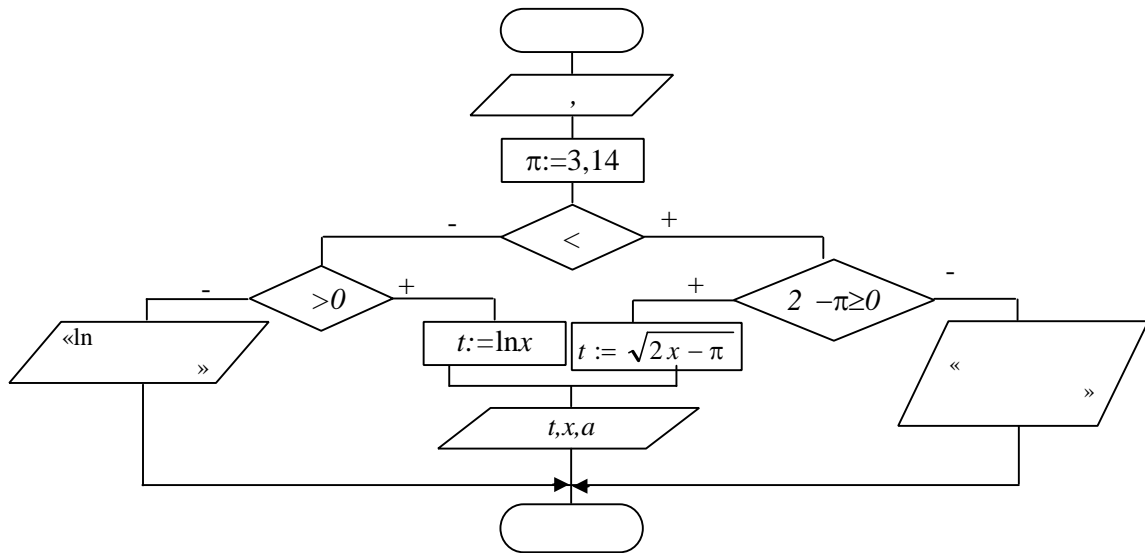
1, 2, 3.

:

- 1 – 9 ()
- 2 – 3 ()
- 3 – 1 ()

/			,
1	,		,
2			,
3			
4			
5			
6			
7	,		,
8			,
9	,		,
10	,		,
12			

$$t = \begin{cases} \sqrt{2x - \pi}, & x < a \\ \ln x, & x \geq a \end{cases}$$

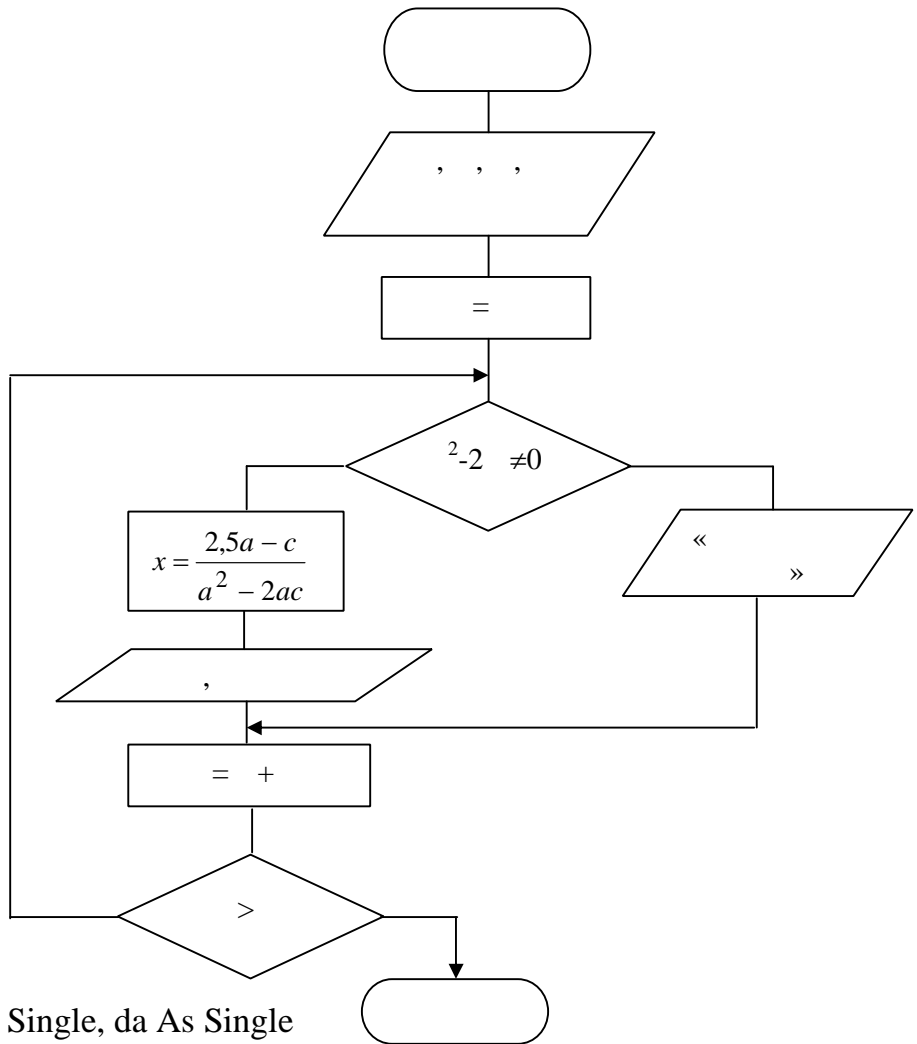


```

Sub Main()
Dim x As Single, a As Single, pi As Single, t As Single
x = InputBox("x = ", " ")
a = InputBox("a = ", " ")
pi = 3.14
If x < a Then
    If 2 * x - pi >= 0 Then
        t = Sqr(2 * x - pi)
    Else
        MsgBox "Error: 2 * x - pi < 0", vbExclamation, "": GoTo 1
    End If
Else
    If x > 0 Then
        t = Log(x)
    Else
        MsgBox "Error: x <= 0", vbExclamation, "": GoTo 1
    End If
End If
MsgBox "t = " & x & ", a = " & a & " t=" & t
1: End Sub
  
```

$$x = \frac{2,5a - c}{a^2 - 2ac}$$

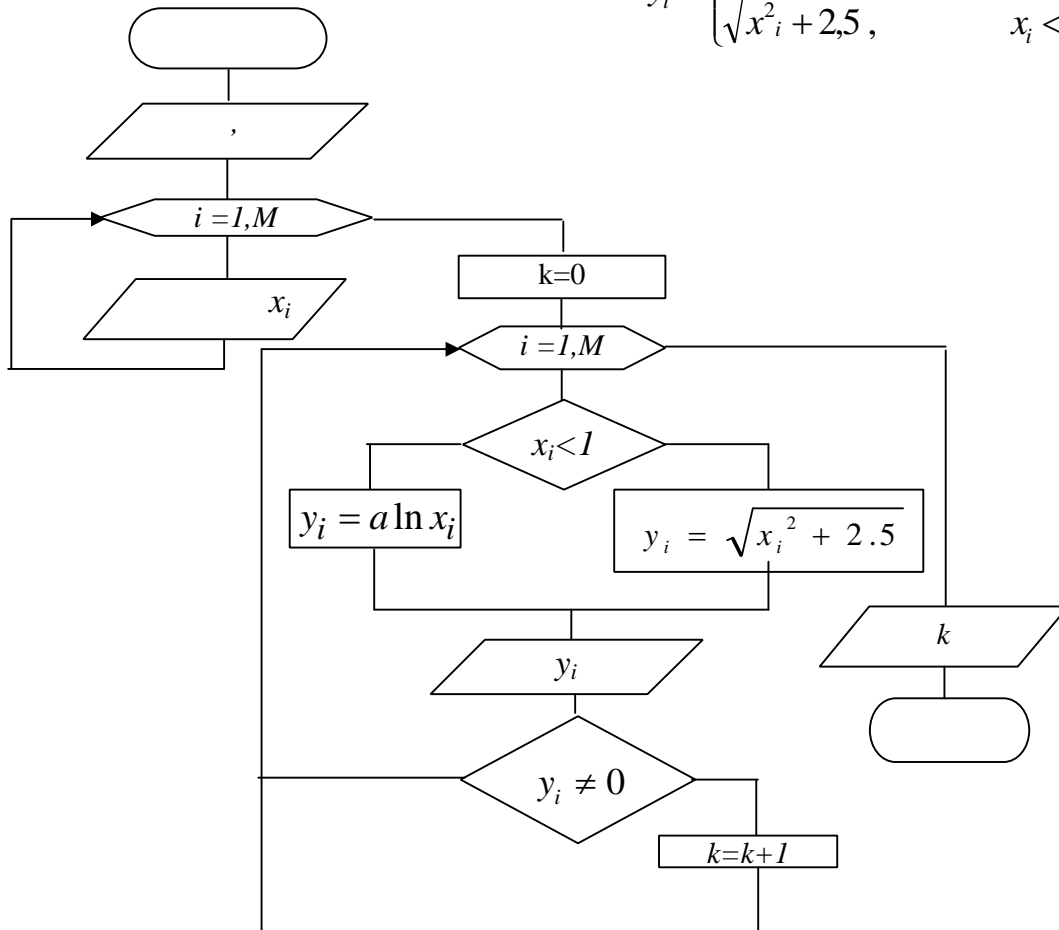
$$-3 \leq a \leq 3; \Delta a = 1,5$$



```

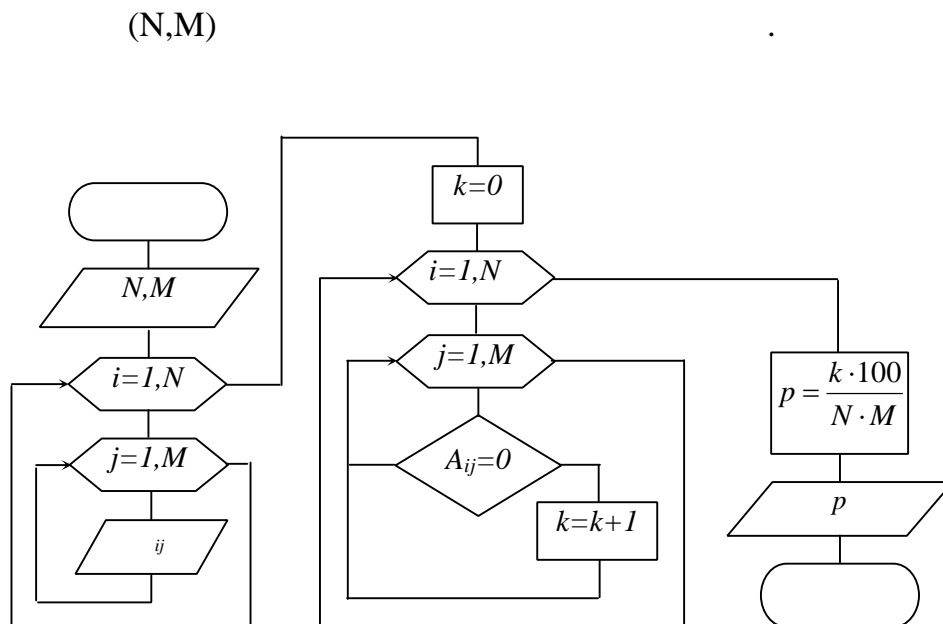
Sub Main ( )
Dim an As Single, ak As Single, da As Single
Dim  As Single,  As Single, x As Single, st As String
an = InputBox ("          an="): ak = InputBox ("          ak=")
da = InputBox ("          da="):  = InputBox ("          c=")
  = an: st = "          " & Chr (13)
Do
If ^2 - 2 * * <> 0 Then
x = (2.5 * - ) / ( ^2 - 2 * * )
Else
st = st & "          = " &  & Chr (13): GoTo 1
End If
st = st & " = " &  & " = " &  & Chr (13)
1:  = + da
Loop Until  > ak
MsgBox st
End Sub
  
```


$$y_i = \begin{cases} a \ln x_i, & x_i \geq 1 \\ \sqrt{x_i^2 + 2.5}, & x_i < 1 \end{cases} \quad i=1, M$$



```

Sub Main ( )
Dim x(1 To 6) As Single, (1 To 6) As Single, m As Integer, k As Integer
Dim  As Single, i As Integer, st As String
m = InputBox("      m="):  = InputBox("      a=")
For i = 1 To m
x(i)= InputBox("      x(" & i & ")="," ")
Next i : k = 0
For i = 1 To m
If x(i)< 1 Then  (i) = Sqr(x(i)^ 2 + 2.5) Else  (i) = * Log(x(i))
st = st & " (" & i & ")=" &  (i):  If  (i) <> 0 Then k = k+1
Next i
MsgBox st & "k=" & k
End Sub
  
```



Sub Main()

Dim n As Integer, m As Integer, i As Integer, j As Integer, k As Integer

Dim p As Single, (1 To 25, 1 To 25) As Single

n = InputBox (" n(n<=25)=", " ")

m = InputBox (" m(m<=25)=", " ")

For i = 1 To n

For j = 1 To m

(i,j)=InputBox (" (" & i & ", " & j & ")=", " ")

Next j

Next i

k=0

For i = 1 To n

For j = 1 To m

If (i,j)=0 Then k=k+1

Next j

Next i

p = k * 100 / (n * m)

MsgBox "p=" & p

EndSub

$$z(x) = -0,75x^3 + 1,2\sqrt{|a \sin^2 x - 0,6|} \quad 1 \leq x \leq 10 \quad \Delta x = 0,5$$

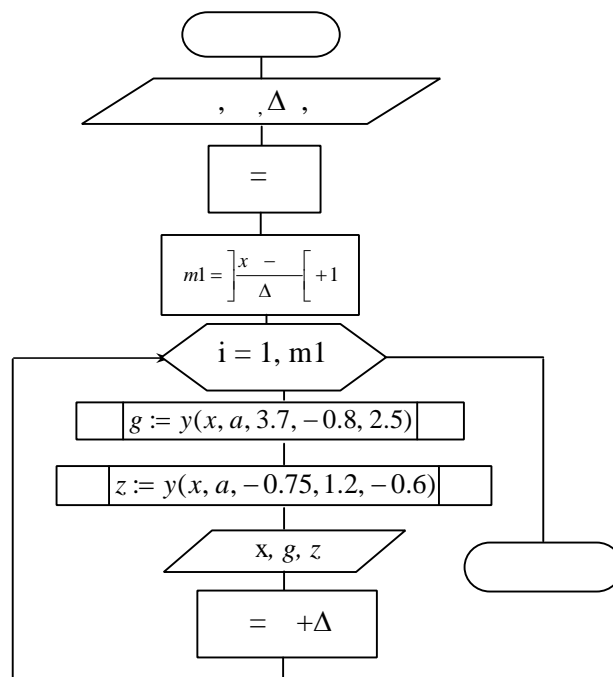
$$g(x) = 3,7x^3 - 0,8\sqrt{|a \sin^2 x + 2,5|}$$

- g(x) n=x; m=a; b=3,7; c=-0,8; d=2,5
- z(x) n=x; m=a; b=-0,75; c=1,2; d=-0,6

$$y = bn^3 + c\sqrt{|m \sin^2 n + d|}$$

(n, m, b, c, d)

(y)



```
Function (n As Single, m As Single, b As Single, c As Single, d As Single) As Single
    = b * n ^ 3 + c * Sqr(Abs(m * (Sin(n)) ^ 2 + d))
End Function
```

```
Sub main()
    Dim xn As Single, xk As Single, dx As Single, x As Single, i As Integer
    Dim a As Single, g As Single, z As Single, st As String, m1 As Integer
    xn = InputBox("xn"): xk = InputBox("xk"): dx = InputBox("dx"): a = InputBox("a")
    x = xn : st = "" : m1 = Int((xk - xn) / dx) + 1
    For i = 1 To m1
        g = (x, a, 3.7, -0.8, 2.5): z = (x, a, -0.75, 1.2, -0.6)
        st = st & "x=" & x & "g=" & g & "z=" & z & Chr(13): x = x + dx
    Next i : MsgBox st : End Sub
```

VISUAL BASIC

(-)

: