

Mavzu: Algoritm tushunchasi

Ishdan maqsad: Algoritm turlari va ular bilan ishlashni o'rganish. Algoritm lardan foydalangan holda blok sxemalar tayyorlash bo'yicha ko'nikmalar hosil qilish.

Uslubiy ko'rsatmalar:

Standart funksiyalarning Paskal tilida yozilishi:

	Matematik ifoda	Paskal tilida yozilishi	Sonning butun qismini olish	TRUNC(x)
			Sonni yaxlitlash	ROUND(x)
1.	a+b	a+b	x dan oldin keluvchi element	PRED(x)
2.	a-b	a-b		
3.	ab	a*b	x dan keyingi element	SUCC(x)
4.	$\frac{a}{b}$	a/b	Simvollar to'plamida x ning tartib nomerini aniqlash	ORD(x)
5.	a	abs(a)	Sonning juftligini aniqlash.	ODD(x)
6.	sin(x)	sin(x)	Simvolni simvollar to'plamidagi I - tartib nomeri bo'yicha aniqlash	CHR(I)
7.	cos(x)	cos(x)		
8.	tg(x)	tan(x)		
9.	ctg(x)	ctan(x)		
10.	x^2	sqr(x)		
11.	x^3	sqr(x)*x, exp(3*ln(x))		
12.	x^y	exp(y*ln(x))		
13.	e^x	exp(x)		
14.	a^x	exp(x*ln(a))		
15.	ln(x)	ln(x)		
16.	$\sqrt{x}$	sqrt(x)		
17.	$\sqrt[4]{x}$	exp((1/4)*ln(x))		
18.	$\sqrt[n]{x}$	exp((n)*ln(x))		

Nostandart matematik funksiyalar.

$$1. \sec x = \frac{1}{\cos x}; \quad 2. \operatorname{cosec} x = \frac{1}{\sin x}; \quad 3. \operatorname{Tgx} = \frac{\sin x}{\cos x}; \quad 4. \operatorname{Arcctgx} = \operatorname{Arctg} \frac{1}{x};$$

$$5. \operatorname{Arcsin} x = \operatorname{Arctg} \frac{x}{\sqrt{1-x^2}}; \quad 6. \operatorname{Arc} \cos x = \operatorname{Arctg} \frac{\sqrt{1-x^2}}{x}; \quad 7. \operatorname{Arcsec} x = \operatorname{Arctg} \sqrt{x^2-1};$$

$$8. \operatorname{Arc} \operatorname{cosec} x = \operatorname{Arctg} \frac{1}{\sqrt{x^2-1}}; \quad 9. \operatorname{Log}_a b = \frac{\operatorname{Lnb}}{\operatorname{Lna}}; \quad 10. \operatorname{Padian} = \frac{\operatorname{Gradius} \cdot \pi}{180}$$

Misollar:

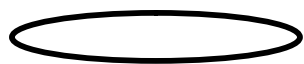
Ifoda	Paskal tilida yozilishi
$\sin^2 x$	SQR(SIN(X))
$\cos^2 x^3$	SQR(COS(EXP(3*LN(X)))) yoki SQR(COS(X*X*X))
$\sqrt[3]{a^5-3}$ yoki $(a^5-3)^{\frac{1}{3}}$	EXP(1/3*LN(EXP(5*LN(X))-3))
$ \sin 3x $	ABS(SIN(3*X))
$e^{\sqrt{3}x}$	EXP(SQRT(3*X))
$\ln x^7$	LN(EXP(7*LN(X)))
$ x^2 $	ABS(SQR(X))

$e^{\sin \sqrt{x} + \cos x^2 + \operatorname{tg}(x + \sqrt{3}) + \operatorname{tg}(x + \sqrt{3})}$	<code>EXP(SIN(SQRT(X))+COS(SQR(X)))+ SIN(X+SQRT(3))/COS(X+SQRT(3))</code>
$\frac{1001x^2}{y} + \sqrt{c^2(2b+6x)}$	<code>((1001*SQR(x))/y)+SQRT(SQR(s)*((2*6)+(6*x)))</code>
$\cos^2 x + \sin \ln x - a - b $	<code>SQR(COS(X))+SIN(LN(X))-ABS(A+B)</code>

Topshiriq: Berilgan ifodalarni Paskal tilida yozing:

1. $y = 2x^3 + \sqrt[3]{x+1}$
2. $y = \ln^3 \sqrt{x^2 + 4x + 2}$
3. $y = x^2 \cos^5 x^6$
4. $y = \operatorname{arctg} \sqrt{x^6 + 5}$
5. $y = \sin^3 x^4 + \sqrt{x+1}$
6. $y = \operatorname{tg} x^7 + \sqrt{x^3 + 3x}$
7. $y = \ln^4 x^3 - \sqrt[5]{\operatorname{tg} x}$
8. $y = 3 \cos^2 x + \sqrt[7]{x^6} - \cos 4x$
9. $y = 2 \sin^2 x - e^{x + \cos x}$
10. $y = \sqrt{(e^{x^5 - \sin x})^3}$
11. $y = \sqrt[3]{\cos^2 x + \operatorname{tg}(x/2)}$
12. $y = \sin \pi x - \operatorname{tg}^3 9x^2$
13. $y = 5x^2 a^5 (\ln 2x - \sin^3 5x)$
14. $y = \sin^3 x - \cos^4 x + 4 \operatorname{tg}^5 2x$
15. $y = e^{ab^3 - \sin x} + \cos(\pi x + a)$

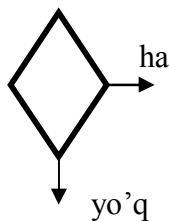
Algoritmlarni chizishda qo'llaniladigan belgilar:



- algoritmning boshlanishi yoki oxiri



- hisoblash bloki



- shart tekshirish bloki



- funksiya yoki qism-dasturga murojaat

- boshlangich ma'lumotlarni kiritish bloki



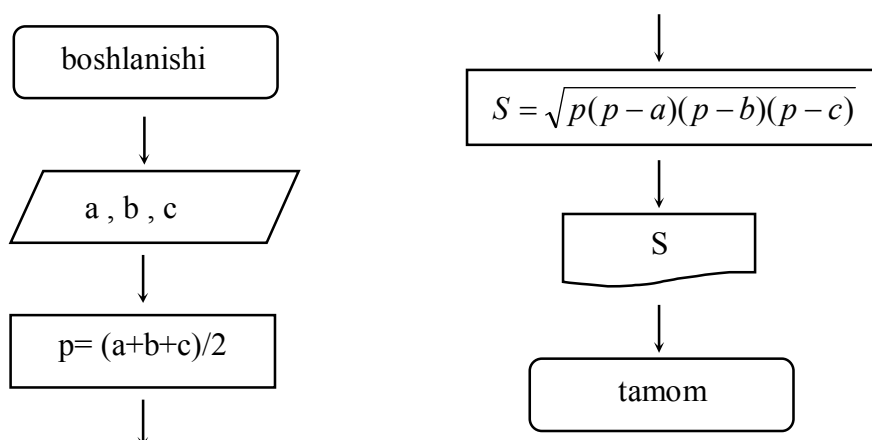
- natijalarni chiqarish bloki

Chiziqli algoritmlar

Har qanday murakkab algoritmlar amalda uch xil strukturaning kombinatsiyasidan iborat bo'ladi. Bular chiziqli, tarmoqlanuvchi va takrorlanuvchi algoritmlardir. Bularning eng soddasi chiziqli algoritmlar bo'lib hisoblanadi. Chiziqli algoritmlar amallar ketma-ketligini tashqil qilib, hisoblash jarayonida bu amallar kelish tartibi bo'yicha faqat bir martagina bajariladi. Amalda chiziqli algoritmlar juda kam uchraydi. Bunday algoritmlardan, asosan, katta formulalarni yuqori aniqlikda hisoblashda foydalanish mumkin. Chiziqli algoritimga misol ko'raylik.

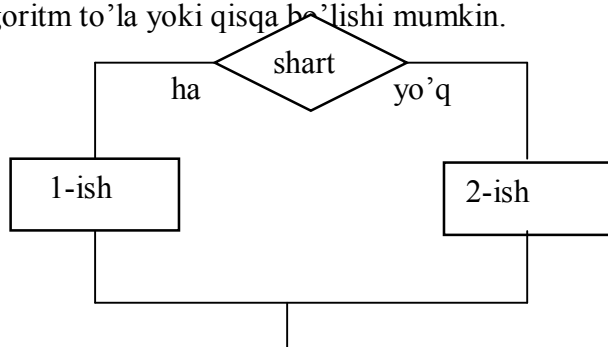
Misol 1. Uchburchak yo'zini hisoblash algoritmini chizing. Boshlangich ma'lumotlar sifatida uning a, b, c tomonlarining uzunliklari berilgan.

Yechish:



Tarmoqlanuvchi algoritmlar

Tarmoqlanuvchi algoritmlar o'z tarkibida bir yoki bir nechta shartni tekshiruvchi blokning bo'lishi bilan harakterlanadi. Bu shartning bajarilishi yoki bajarilmasligining natijasiga qarab u yoki bu amalning bajarishi ta'minlanadi. Shuning uchun shartning bajarilishiga qarab hisoblash jarayoni albatta tarmoqlanadi. Shu bilan birga tarmoqlanuvchi algoritm to'la yoki qisqa bo'lishi mumkin.



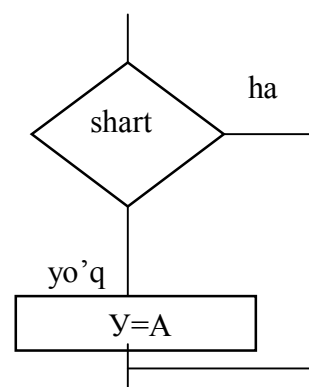
Tarmoqlanishning to'la formasi.

Tarmoqlanishning qisqa formasi

Tarmoqlanuvchi algoritmlarning xarakterli tomoni shundaki, ba'zi amallar blok-sxemada keltirilgan shartning bajarilishi yoki bajarilmasligiga qarab aniq lanadi. Tarmoqlanuvchi algoritimga misollar ko'rib chiqaylik.

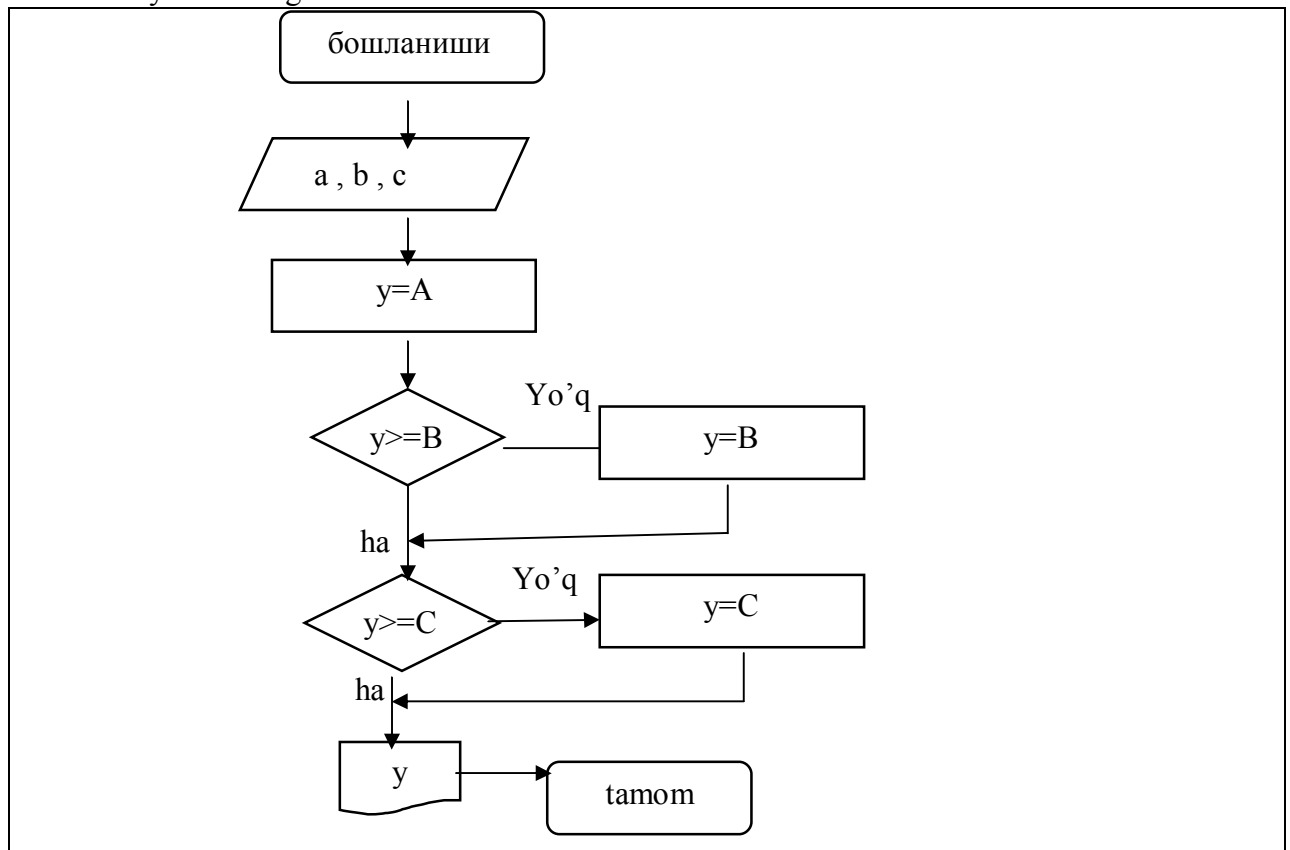
1-misol. A, B, C sonlari berilgan bo'lsin. Bu sonlar ichida eng kattasining kvadrati topilsin.

Yechish : Bu misolni yechish uchun dastavval ikkita son A va B taqqoslanadi. So'ng olingan natijaga qarab , ya'ni ularning kattasi uchinchi son bo'lgan C bilan solishtiriladi. Agar S soni



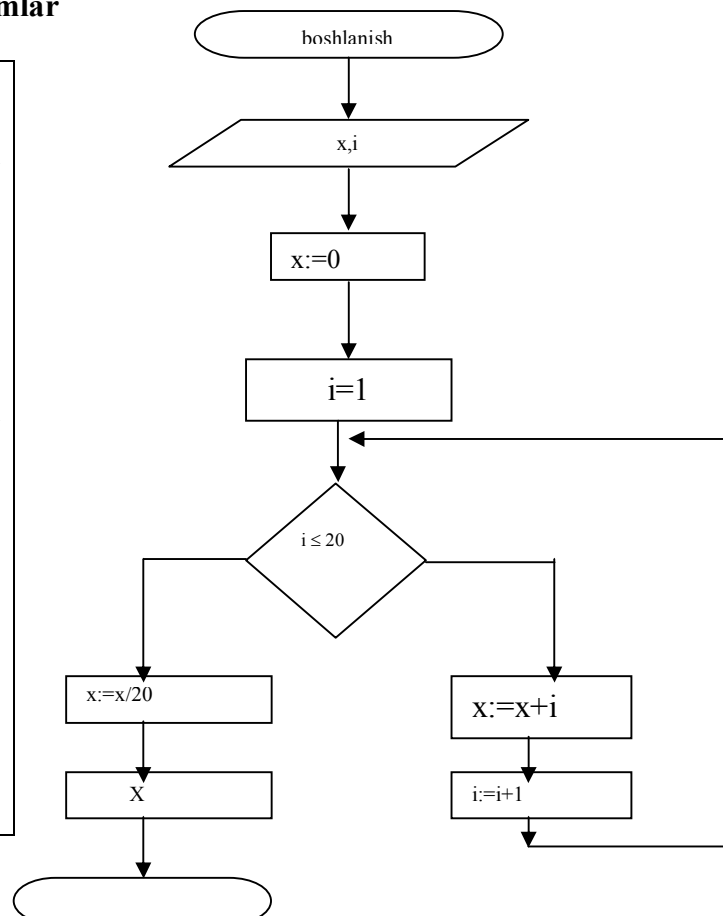
takkoslangan sondan katta bo'lsa, unda S soni kvadratga ko'tariladi, aks holda solishtirilgan sonning o'zi kvadratga oshiriladi.

Masalani yechish algoritmi:



Takrorlanuvchi algoritmlar

Amaliyotda murakkab jarayonlarni dasturlashda ma'lum buyruqlar ketma-ketligini ma'lum shartlar asosida qayta-qayta bajarish zaruriyati tug'iladi. Ma'lum bir o'zgaruvchining turli qiymatlarida ma'lum buyruqlar tizimining biron bir qonuniyatga asosan takrorlanib bajarilishi takrorlanuvchi hisoblash jarayoni (sikl) deb ataladi. Masalan: 1 dan 20 gacha butun sonlarning o'rta arifmetigini topish algoritmi:



Topshiriq:

Topshiriq: Quyida berilgan funksiyalarning blok-sxemalarni tuzing:

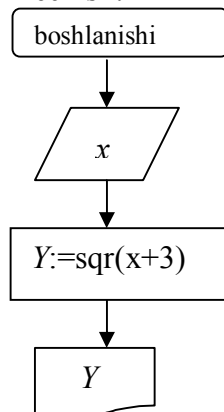
1-variant 1. $y = x^2 \cos^5 x^6$ 2. $y = \begin{cases} \operatorname{tg} x + a^x, \text{ agar } x < a \\ 0,5\sqrt{1+a^2}, \text{ agar } x = a \\ \ln \sin x , \text{ agar } x > a \end{cases}$ 3. $y = \sum_{i=1}^{50} \frac{1}{i^3}$ 2-variant 1. $y = \ln^3 \sqrt{x^2 + 4x + 2}$ 2. $y = \begin{cases} 3x^2 + 4\sqrt{a-x}, \text{ agar } a > x \\ \sin \sqrt{3a+x}, \text{ agar } a = x \\ e^{\sqrt{x+a}}, \text{ agar } a < x \end{cases}$ 3. $y = \prod_{i=1}^{52} \frac{i^2}{i^2 + 2i + 3}$ 3-variant 1. $y = \ln^4 x^3 - \sqrt[5]{\operatorname{tg} x}$ 2. $y = \begin{cases} x^2 - x, \text{ agar } x < a \\ a^{x-1}, \text{ agar } x = a \\ x^2 - 2a, \text{ agar } x > a \end{cases}$ 3. $y = \sum_{k=1}^n \frac{(-1)^k}{(2k+1)k}$ 4-variant 1. $y = 3\cos^2 x + \sqrt[7]{x^6} - \cos 4x$ 2. $y = \begin{cases} a \sin wt, \text{ agar } a - wt < 1 \\ a \cos wt, \text{ agar } a - wt = 1 \\ a \operatorname{tg} wt, \text{ agar } a - wt > 1 \end{cases}$ 3. $y = \sum_{i=1}^{100} \frac{1}{i^2}$ 5-variant 1. $y = 2\sin^2 x - e^{x+\cos x}$	9-variant 1. $y = \operatorname{tg} x^7 + \sqrt{x^3 + 3x}$ 2. $y = \begin{cases} 4x + 4,3 \sin x, \text{ agar } x < 1 \\ 2 \sin x + x^3 + 1, \text{ agar } x = 2 \\ 1,5x - x^2, \text{ agar } 0 \leq x < 2 \end{cases}$ 3. $y = \sum_{k=1}^n \frac{1}{k^5}$ 10-variant 1. $y = \sin^3 x^4 + \sqrt{x+1}$ 2. $y = \begin{cases} \sqrt[5]{x-\pi} + \sin \pi/2, \text{ agar } x = \pi/2 \\ \operatorname{arctg} \sqrt{x+1}, \text{ agar } x > \pi/2 \\ \sin(\cos x), \text{ agar } x < \pi/2 \end{cases}$ 3. $y = \sum_{k=1}^n \frac{1}{(2k+1)^2}$ 11-variant 1. $y = \sqrt[3]{\cos^2 x} + \operatorname{tg}(x/2)$ 2. $y = \begin{cases} x + 3a^2 + \cos x, \text{ agar } a < x \\ \sin 2a - x^2 , \text{ agar } a = x \\ x^2 + \operatorname{ctg} x^3, \text{ agar } a > x \end{cases}$ 3. $y = \sum_{i=1}^n \frac{x^i}{i}$ 12-variant 1. $y = \sin^3 x - \cos^4 x + 4\operatorname{tg}^5 2x$ 2. $y = \begin{cases} ax^3 + 3\ln x+1,2 , \text{ agar } ax < 1 \\ 2ax + 3a^2x^2, \text{ agar } ax = 1 \\ e^{\sqrt{ax+\sin x}}, \text{ agar } ax > 1 \end{cases}$ 3. $y = \sum_{i=1}^n \frac{x + \cos(ix)}{2^i}$ 13-variant 1. $y = \sin \pi x - \operatorname{tg}^3 9x^2$
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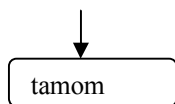
$2. y = \begin{cases} \sin \sqrt{x}, \text{agar } x = \pi / 2 \\ \operatorname{tg} \sqrt{x+1}, \text{agar } x > \pi / 2 \\ \sin(\cos x), \text{agar } x < \pi / 2 \end{cases}$ $3. y = \sum_{k=0}^n \frac{(-1)^k (k+1)}{k}$ 6-variant $1. y = 2x^3 + \sqrt[3]{x+1}$ $2. y = \begin{cases} \sqrt[3]{x^2 + a^2}, \text{agar } x^2 + a^2 < 4 \\ x + a, \text{agar } x^2 + a^2 = 4 \\ \ln x, \text{agar } x^2 + a^2 > 4 \end{cases}$ $3. y = \prod_{i=2}^{100} \frac{i+1}{i+2}$ 7-variant $1. y = \sqrt{(e^{x^5 - \sin x})^3}$ $2. y = \begin{cases} 4,7x + 1,3^x, \text{agar } x < 1 \\ 0,5x\sqrt{1+x^2}, \text{agar } x = a \\ \ln \sin x , \text{agar } x > 1 \end{cases}$ $3. y = \sum_{i=0}^n \frac{1}{4^i + 5^{i+2}}$ 8-variant $1. y = \operatorname{arctg} \sqrt{x^6 + 5}$ $2. y = \begin{cases} 3^{x-1}, \text{agar } x > 1 \\ (x-1)^3, \text{agar } x < 1 \\ 0, \text{agar } x = 1 \end{cases}$ $3. y = \sum_{i=1}^{128} \frac{1}{(2i)^2}$	$2. y = \begin{cases} \sqrt[3]{x^2 + a^2}, \text{agar } x^2 + a^2 < 4 \\ x + a, \text{agar } x^2 + a^2 = 4 \\ \ln x, \text{agar } x^2 + a^2 > 4 \end{cases}$ $3. y = \sum_{i=1}^n \frac{(-1)^{i+1}}{i(i+1)(i+2)}$ 14-variant $1. y = 5x^2 a^5 (\ln 2x - \sin^3 5x)$ $2. y = \begin{cases} 4,7x + 1,3^x, \text{agar } x < 1 \\ 0,5x\sqrt{1+x^2}, \text{agar } x = a \\ \ln \sin x , \text{agar } x > 1 \end{cases}$ $3. y = \prod_{k=1}^n \left(1 + \frac{\sin(kx)}{k}\right)$ 15-variant $1. y = e^{ab^3 - \sin x} + \cos(\pi x + a)$ $2. y = \begin{cases} 3x^2 + 4\sqrt{a-x}, \text{agar } a > x \\ \sin \sqrt{3a+x}, \text{agar } a = x \\ e^{\sqrt{x+a}}, \text{agar } a < x \end{cases}$ $3. y = \sum_{k=1}^n \frac{(-1)^{k+1}}{k(k+1)}$
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Namuna. Quyida berilgan funksiyalarning blok-sxemalarni tuzing:

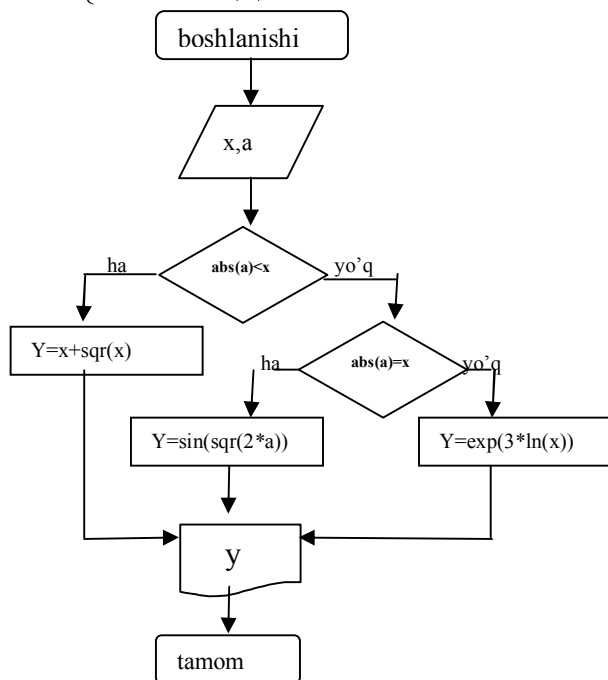
$$1. y = \sqrt{x+3}$$

Yechish:





$$2. y = \begin{cases} x + 3a^2, & \text{agar } |a| < x \\ \sin|2a|, & \text{agar } |a| = x \\ x^3, & \text{agar } |a| > x \end{cases}$$



$$3. y = \sum_{i=1}^{10} \frac{i+1}{i^2-i}$$

