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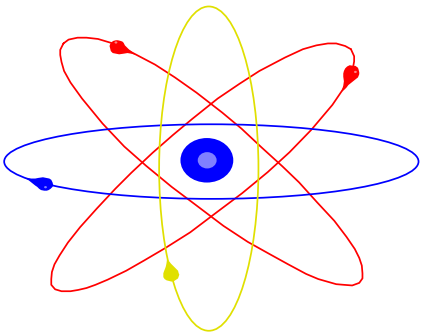
TOSHKENT TO`QIMACHILIK VA ENGIL SANOAT INSTITUTI

“Informatika va AT” kafedrasi



INFORMATIKA VA AXBOROT TEXNOLOGIYALARI FANIDAN ALGORITM VA DASTURLASH BO`YICHA LABORATORIYA MASHG`ULOTLARI

Barcha yo`nalishdagi bakalavrlar uchun

Toshkent-2014y.

A n n o t a ts i ya

Uslubiy qo`llanma informatika va axborot texnologiyalari fanidan algoritmlash va dasturlash bo`yicha laboratoriya mashg`ulotlarini o`tkazishga bag`ishlangan. Uslubiy qo`llanma laboratoriya ishlarini bajarish bo`yicha nazariy va amaliy ko`rsatmalarni, hamda har bir laboratoriya ishi uchun variantlar to`plamini o`z ichiga olgan.

Uslubiy qo`llanma texnika Oliy o`quv yurtlari talabalari, o`qituvchilari va kursni mustaqil o`rganuvchilar uchun mo`ljallangan.

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« _25__» _____04_____ 2014y.

Qaydnoma N: _25___

TTYESI bosmaxonasida
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M u n d a r i j a

K I R I SH

Ma`lumki, muxandislik masalalarini kompyutyerda echishda matematik usullarni qo`llash, ular algoritmini tuzish va dasturini kompyutyerda bajarish amaliyotda muhim ahamiyatga ega. Bu eca o`z navbatida o`quvchilardan kompyuter amaliy dastur ta`minotlaridan foydalanishda yuqori darajada malaka talab etadi.

Masalalarni matematik modellashtirish, ularni echish algoritm va dasturlarini tuzish bo`yicha laboratoriya mashg`ulotlari o`tkazishda kompyutyerdan foydalanish talabalarning nazariy va amaliy bilimlarini yanada mustahkamlab mustaqil shug`ullanishini ta`minlaydi.

Qo`llanma berilgan masalalarni echish algoritmi va dasturini tuzish bo`yicha laboratoriya mashg`ulotlarini qanday bajarish tartibi va uni echish yo`llarni o`rganishga bag`ishlangan. Qo`llanmada nazariy va amaliy ko`rsatmalar, laboratoriya mashg`ulotlari uchun variant misollari keltirilgan.

1-LABORATORIYA ISHI (4-coat)
Mavzu: Arifmetik ifodalarni algoritmik tilda yozish

Ishning maqsadi.

1.Algoritmik tilda mavjud standart matematik funktsiyalar bilan ishlashni o`rganish.
2.Oddiy matematik ifodalarni algoritmik tilda yozish.

Ishni bajarish tartibi.

1.Masalaning qo`yilishi (berilgan variant).
2.Berilgan arifmetik ifodani standart va nostandart matematik funktsiyalardan foydalanib algoritmik tilda yozish.
3.Laboratoriya ishini rasmiylashtirish.

Nazariy ma`lumotlar.

Pascal tilida matematik ifodalarni yozishda ko`pgina matematik funktsiyalar ishlatiladi. Ularga standart matematik funktsiyalar deb ataymiz. Shu bilan bir qatorda standart bo`lmagan funktsiyalar ham uchraydi, ularni yozishda standart funktsiyalarga o`tkazilib yoziladi. Matematik ifodalarni yozishda oddiy qo`shish (+), ayirish (-), ko`paytirish (∗) va bo`lish (/) belgilari ishlatiladi. Ifoda guruhlari kichik qavs ichiga olinadi. Standarnt funktsiyalar argumentlari kichik qavs ichiga olinib yoziladi.

Standart matematik funktsiyalar.

Funktsiya nomi	Algoritmik tilda yozilishi
Sinx	SIN(x)
Cosx	COS(x)
Lnx	Ln(X)
e^x	EXP(x)
$\sqrt{x}$	SQRT(x)
Arctgx	ARCTAN(x)
|x|	ABS(x)
x^2	SQR(x)

Nostandart matematik funktsiyalar.

1. $Secx = \frac{1}{Cosx}$; 2. $Cosecx = \frac{1}{Sinx}$; 3. $Tgx = \frac{Sinx}{Cosx}$; 4. $Arcctgx = Arctg\frac{1}{x}$;

5. $Arc\sin x = Arctg\frac{x}{\sqrt{1-x^2}}$; 6. $Arc\cos x = Arctg\frac{\sqrt{1-x^2}}{x}$; 7. $Arcsecx = Arctg\frac{1}{\sqrt{1-x^2}}$;

8. $Arccosecx = Arctg\sqrt{1-x^2}$; 9. $Log_a b = \frac{Lnb}{Lna}$; 10. $a^b = \text{EXP(b* LN(a))}$

Topshiriqni bajarish uchun na`muna.

1-laboratoriya ishi

Mavzu: Arifmetik ifodalarni algoritmik tilda yozish.

Variant № 30

a) $a = \frac{|4 - 13x| + e^{x+2}}{1 + tgx} + \sqrt[3]{4 + x}$

b) $z = \frac{Arctg^{\,2}(x-1) + e^{-x^2}\log_4 x}{Arc\sin(0{,}55 - x) - 4^{x+1}\sqrt{|a - \sin^4 x|}} + 4 \cdot 10^{-8}$

c) $y = \frac{2{,}3Sin^{\,3}x^2 + 2{,}7Ctg\sqrt[3]{x}}{xe^{x+1}(4 - \sqrt[3]{x + e^{Sinx}})}$

YOzilishi.

*a) a:=(abs(4-13*x)+exp(x+2))/(1+sin(x)/cos(x))+exp(1/3*ln(4+x));*

*b) z:=(sqr(arctan(x-1))+exp(-sqr(x))*ln(x)/ln(4))/*
*(arctan((0.55-x)/sqrt(1-sqr(0.55-x)))-exp((x+1)*ln(4))**
*sqrt(abs(a-exp(4*ln(sin(x)))))+4E-8;*

*c) y:=(2.3*exp(3*ln(sin(sqr(x))))+2.7*cos(exp(1/3*ln(x)))/*
*sin(exp(1/3*ln(x))))/x/exp(x+1)/(4-exp(1/3*ln(x+exp(sin(x)))));*

1-laboratoriya mashg`uloti uchun variant misollari

N:	A	B	C
1	$y=2{,}5\sqrt[3]{x^4}+\log_4^2 x$	$u=\frac{\sin^3 x+\cos^3 x+tgx^2}{\sqrt[3]{2\sin x+x^2\cos^2 x}}$	$z=(ax^3+b\sqrt[3]{x^2}\cos^2 x+\frac{c}{x})^3$
2	$y=\sec x+\sqrt[4]{e^3}+\frac{x}{2}$	$y=\left(\frac{\sqrt{\sin\sqrt{x+x^3}}}{\lg\cos^2(x^2+0{,}5)^2}\right)^3$	$T=\frac{e^{-x^2}\sin^2(kx)}{x^2+2y^2+3}$
3	$u=\sqrt{e^x}\sqrt{ctg^2(\frac{x}{4})}+\ln x$	$Z=\frac{a\sqrt[5]{\sin^2 x}-Ln^2(b\sin x)}{\sqrt[3]{(a^2+b^2+c^2)^2}}$	$T=\frac{e^{-x^2}\sin^2(kx)}{x^2+2y^2+3}$
4	$u=\sqrt{\ln x}+2\lvert e^{x+2}-5x\rvert$	$U=\frac{(arctg(x^3)+1{,}1\sec\sqrt[3]{x})^2}{\lg(1{,}1x)+\lg^3(1{,}2x^4)}$	$T=\frac{2x^4+3\cos^3(x+1)}{\lvert 1+(x+1)\rvert^2+abx^2}$
5	$u=\sqrt{tg^2(\frac{x}{5})}+2e^x$	$y=\frac{2{,}15cosx^3-\arccos x^3}{3{,}4\sqrt[3]{x^2}e^{Cosx}+\ln^2(3+x^3)}$	$T=\frac{e^{-x^2}\sin^2(\cos x^3)}{\sqrt[4]{x^3+2y^2}}$
6	$u=\sqrt{Sin(\frac{x}{2})}+2\lvert x-1\rvert$	$y=\frac{2{,}5\sin^2 x+0{,}75tg^2 x}{0{,}65\sqrt[3]{x+e^{Sinx}+\cos^2 x}}$	$V=\frac{x^{-z^2}+z^{-x^3}+\cos x^2}{e^{(x^2-z^2)}+e^{(x^2+z^2)}}$
7	$u=\sqrt{\ln x}\sqrt{\frac{x}{2}+5}+2\lvert e^x-1\rvert$	$y=\frac{(arctg(x^3)+1{,}5Sec\sqrt[3]{x})^2}{tg(1{,}2x)+\lg^2(1{,}2x^3)}$	$z=\left(\frac{ax^3-b^2tgx^2}{c^2x^2Lnx^2}\right)^3$
8	$u=\sqrt{tg^2(\frac{x}{2})}+\lvert 2e^x\rvert$	$z=\frac{\ln Sin\sqrt[3]{x}+Sin\ln\sqrt[3]{y}}{\lg x-e^{x-1}}$	$Y=\sqrt[3]{(\cos x^3+\sin^2 x^3)^2}$
9	$u=\sqrt{\cos^2(\frac{x}{\lvert 2-x\rvert})}+2e$	$z=\frac{10ab}{\sqrt{x(e^{2kx}+3x^2)}}-\log_k(x+2)$	$y=\sqrt[3]{1-x}\cdot\sqrt{x+3}\cdot\cos(k\frac{x+1}{2})$
10	$z=15{,}2\sqrt[5]{x^3}+\lg\lvert x-5\rvert$	$y=\frac{\sqrt{3\sin x^3}+e^{\sqrt{x}}x^2+10x^5}{\lvert\cos\ln\lvert x^3\rvert+\sin^2\lg x\rvert}$	$t=\frac{x^3(\sqrt[3]{(1+x)^2}+x^{-x^3}}{0{,}5\sqrt{e^x}+x^3(y+\sin x^2)}$
11	$a=\lvert 4-13x\rvert+e^{-x}$	$y=a^4\sin x^3+\frac{\sqrt{b^3}\cos^3 x^3}{a^3x^3}$	$z=\frac{a^3x^{\sqrt{x}}}{\sqrt[3]{b\sin x^3}}-\frac{e^{x^2}+\sqrt[3]{x}}{\cos^3\sqrt{x^3}}$
12	$a=\frac{\lvert 4-13x\rvert+e^x}{1+\ln x}$	$y=\frac{\arccos x^3+e^{-2x}+\sqrt[3]{a^2x^2+2}}{3ax^3+\log_a x^2}$	$t=\frac{\log_3(\cos(a+b))+e^{\sqrt[5]{x^3}}}{\lg(x^3+\sqrt[3]{a})+\cos^3 x^3}$
13	$u=\sqrt{\lvert 18-x\rvert}+e^{x+2}-5x$	$y=\frac{a\sqrt[3]{x}+b\sqrt{\lvert xz\rvert}}{e^{arctg\lvert x\rvert}}-\frac{\log_a b}{\lvert xz\rvert}$	$z=\sqrt[3]{\frac{\sqrt{abx}}{\sqrt{b^2-4ac}}}+\lvert\frac{x+1}{a-b}\rvert$

14	$u=\sqrt{Sin\|x\|}+e^{x+5}+x^4$	$y=\dfrac{\cos x+arctg(x+b)-e^{-at^2}}{\|4^x-\sqrt[3]{(ax-2)(bx-3)}\|}$	$t=\sqrt[3]{\dfrac{abx^3}{\sqrt[5]{b^2-4ac}}}-\sqrt{b^2-4ac^2}$
15	$u=\sqrt{\ln x}+2\,\|e^{x+2}-5x\|$	$y=\dfrac{a\sqrt[3]{x}+b\sqrt[3]{x-1}-e^{-\frac{t}{2}(ax+b)}}{arctgx+\cos^2 x^3}$	$t=5x^{\pi}-e^{t-Cos^3 x}-\sqrt{\left\|\dfrac{\pi x^3}{1-x^2}-1\right\|}$
16	$u=\sqrt{e^x}\sqrt{\sin\dfrac{x}{2}}+2\|x-1\|$	$y=\dfrac{1}{m^3\sqrt[3]{ab}}+arctg\,(e^{m^2x}\sqrt{\dfrac{a^2}{b}})$	$z=\dfrac{\sin^2(xy^3-e^x)^2}{a^3\sqrt[3]{x^2}+\log\left\|x^3+1\right\|^2}$
17	$y=e^{\sin x^2}+\dfrac{x}{2e^{x-1}}$	$y=\dfrac{\sqrt{x^2+a^2}\,arctg\,\dfrac{x}{a}-\dfrac{\log b}{tg(x-b)}}{\lg a-\log_b a}$	$Z=\dfrac{a^5\sqrt{x^3}-e^{4x^3}}{\log_5(x+1)}$
18	$y=2{,}5\sqrt{x^4}+\sin\dfrac{4}{x}$	$S=\sqrt{x^3+a^3}\cos^3 x^2-\ln\left\|a+b\right\|$	$Z=\dfrac{tg\,(e^{mx}+\sqrt[3]{a+e^{\sqrt[3]{x^5}}}}{\left\|5x^3+4\right\|+\log_2\left\|a^3+6\right\|}$
19	$u=\sqrt{\ln x}+2\,\|e^{x+2}-15\|$	$y=\dfrac{\sqrt[3]{x^2+\sqrt{3-x^3}}+v^3}{x-e^{3(\sin 3x)}}$	$z=\dfrac{\cos\sqrt{x}}{x-e^{3\|\sin 3x\|}}+e^{\frac{x}{\sqrt{2}}}$
20	$u=\sqrt{\ln x}+2\,\|e^{x+2}-5x\|$	$y=\ln(be^{2x})+(arctg\left\|x^3+4\right\|)$	$z=e^{\sin^2 x}+\cos^3\sqrt{x}+tg^2 x^3$
21	$y=tgx+\sqrt[4]{e^3}+\dfrac{(x+1)^{1/3}}{2}$	$y=\dfrac{\cos(x)+be^x}{bx}+\dfrac{ctg(x)}{a^2x}-\sqrt[3]{ab}$	$z=\log(x^3-b)+\sqrt[3]{b^3-4e^{2\sqrt{x}}}$
22	$y=\log_4 x+\sqrt{e^3}+\cos\dfrac{x}{2}$	$y=(x+1)^4+\sqrt{x}+arctg\left\|x^3+5\right\|$	$z=a^{b+c}+\dfrac{\sqrt{x^2+2}}{bc^2}+\arcsin\dfrac{\sqrt{3}}{2}$
23	$u=\sqrt{\cos^2(\dfrac{x}{4})}+2\ln x$	$y=e^{x^2}Sin(x^3+6)+\log_3\left\|x^3-b\right\|$	$z=\cos^3(6x+3)+\dfrac{\sqrt[5]{5^{x+a}}\cdot e^{\sqrt[3]{x}}}{\sqrt{ax^2+b}}$
24	$u=\sqrt{tg^2(\dfrac{x}{5})}+2e^x$	$y=\dfrac{\ln\left\|2-4x^3\right\|}{\sqrt[3]{(1+\cos^4(5x-2))^2}}$	$z=arctg(x^3)-7^{\|x-a\|}+\|x^3-a\|$
25	$a=\dfrac{x^{y+1}+e^{x-1}}{x+\|x-ctgx\|}$	$Y=Ln^5\|a\|+\dfrac{ax^4}{a+x}-e^{-x^2}Log_3\|x-ab\|$	$S=e^{-\sqrt{x}}\cos^3(x^3+4)+\sqrt[3]{1-x^5}$
26	$b=\dfrac{\arcsin x^2}{x+\sin^2 x}+\log_5 x^2$	$y=arctg\,(\sqrt[3]{(\dfrac{c+d}{c-d})^2}+\ln(x^3)$	$y=e^{\sqrt[3]{x-3}}+\ln(x+4)+\dfrac{\sin^3 x^2}{\sqrt[3]{\cos x}}$
27	$F=x^3Sin\dfrac{7}{x^3}+ctg5x^3$	$y=\cos(\sqrt[3]{x}+5)+\dfrac{x^3-\cos 2x}{\sqrt[3]{x^2-\ln x^2}}$	$y=\left\|x^8+e^{2x}\right\|+\ln(\cos^3(4x^3))$
28	$y=\dfrac{3{,}7\cos^2 x^3}{5e^x+x^2}+\lg 4x$	$y=e^{\sqrt[3]{x-3}}+\dfrac{\cos x^3+tgx}{ex}$	$z=\ln x^3+b^3\cos^3 x+e^{\sqrt[3]{x^2}}$
29	$b=\dfrac{\|x-6\|(\sin^2 x+e^{x+1})}{e^{\|x-y\|}+Cosx}$	$y=e^x\sin x+\sqrt[3]{tg(a+b)}+\cos\left\|x^3+4\right\|$	$Z=\cos\left(a^3-b\right)^2+\lg\left\|x+5\right\|+x^{3a}$

30	$b=(1+\frac{x\cdot arctgx}{e^{/x-2/}-\lg 7})^3$	$y=\frac{\log_3(\cos^3(1-x^2)+x^3)}{\ln(\cos x^3(4x+3))}$	$S=\ln^3 x\cdot(\cos^3(x^3+4)+\sqrt[3]{1-x^5})$

2-LABORATORIYA ISHI (4-coat)
Mavzu: Oddiy arifmetik ifodalarni hisoblashning chiziqli algoritm va dasturini tuzish

Ishning maqsadi

1. Chiziqli algoritmlarni blok-cxema usulida tasvirlashni o`rganish.
2. Chiziqli algoritmlarni dasturlashda o`zgaruvchilarni tavsiflash, o`zlashtirish, ma`lumotlarni kiritish va chiqarish operatorlaridan foydalanishni o`rganish.
3. Dasturlash tizimlarida dastur kiritish, uni tahrirlash va natijalar olishni o`rganish.

Ishni bajarish tartibi

1. Masalaning qo`yilishi.
2. Masalaning algoritmini tuzing.
3. Tuzilgan algoritm acocida masalaning dasturini tuzing.
4. Dasturni kompyuterga kiriting, tahrirlang va olingan natijani tekshiring.
5. Laboratoriya ishini rasmiylashtiring.

Nazariy ma`lumotlar

Pascal tilida oddiy chiziqli dasturlar tuzish uchun quyidagi operatorlar ishlatiladi.

Read operatori o`zgaruvchilar qiymatlarini kompyuter xotirasiga kiritadi. U quyidagi ko`rinishlarga ega.

Read(c1,c2,...,cn); Readln(c1,c2,...,cn); Readln;

bu yerda c1,c2,...,cn - o`zgaruvchilar ro`yxati; ln - qo`shimchasi qiymatni kiritib keyingi qatorga o`tishni bildiradi.

Write operatori oddiy ma`lumotlarni va o`zgaruvchilar qiymatlarini kompyuter ekraniga chiqaradi. U quyidagi ko`rinishlarga ega.

Write(c1,c2,...,cn); Writeln(c1,c2,...,cn); Writeln;

bu yerda c1,c2,...,cn - oddiy ma`lumotlar yoki o`zgaruvchilar ro`yxati; ln - qo`shimchaci chiqarishni keyingi qatorga o`tishni bildiradi.

«Izoh» dasturda istalgan joyda beriladi va katta qavs ichida yoziladi. Masalan: *{ Bu matn dasturga izoh beradi }.*

«:=» **o`zlashtirish** operatori dasturda ma`lum hisoblashlarning natijalarini biror bir o`zgaruvchida saqlash uchun ishlatiladi. Dasturda ishlatiladigan o`zgaruvchilar va o`zgarmaslar dastur bosh qismida tavsiflanadi.

Topshiriqni bajarish uchun namuna.

2-laboratoriya ishi

Mavzu: Chiziqli algoritm va dasturlar tuzish.

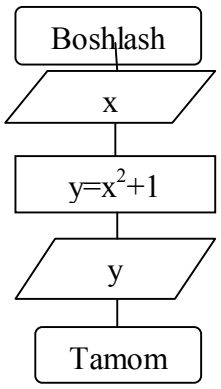
Variant 30.

1. ***y=x²+1*** funksiyani ***x*** ning istalgan qiymatida hisoblash algoritmini va dasturini tuzing.

So'zda berilishi

1.Boshlash.
2.x-qiymatini kiritish.
3.$y=x^2+1$ ni hisoblash.
4.y-qiymatini chiqarish.
5.Tamom.

Blok-sxemada



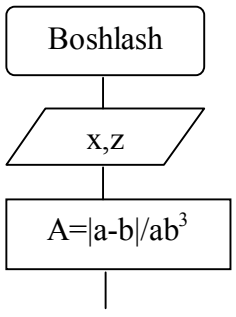
Dastur

```
Program Lab2_V30;
Var x,y: Real;
Begin
  Read (x);
  y:=Sqr(x)+1;
  Write ('y=',y);
End.
```

2.Berilgan bir-biriga bog`liq arifmetik ifodalar qiymatini hisoblash algoritmi va dasturini tuzing.

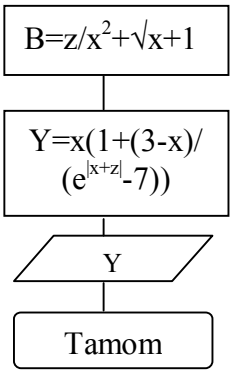
$$y=\frac{/a-b/}{ab^3};\ a=\frac{z}{x^2}+\sqrt{x+1};\ b=x(1+\frac{3-x}{e^{/x-z/}-7});\ x=-0{,}67;\ z\in R$$

Algoritm



Dastur

```
Program Lab2_V30;
  const  x=-0.67;
  Var z,a,b,y: real;
  Begin
    Write('z='); Read(z);
    A:=z/sqr(x)+sqrt(x+1);
    B:=x*(1+(3-x)/(exp(abs(x-z))-7));
    Y:=abs(a-b)/a/exp(3*Ln(b));
    Write('Y=', Y:10:6);
  End.
```



2-laboratoriya mashg`ulotini bajarish uchun variant misollari (A).

Oddiy arifmetik ifodalarning chiziqli algoritm va dasturini tuzing.

N:	Arifmetik ifoda	N:	Arifmetik ifoda
1	$a = 2^{-x}\sqrt{x+\sqrt[4]{\lvert z\rvert}},\quad x = 3{,}981,\ y \in R$	16	$z = \sqrt[3]{tg^2 x + \lvert 1.5\log_5 9{,}7 + a)\rvert},\ a = 3{,}2;\ x \in R$
2	$a = 2^{y} + 3^{x} + \sqrt[3]{y+1},\quad y = 0{,}32,\ x \in R$	17	$a = \dfrac{\sqrt{\lvert x-1\rvert - \sqrt[3]{\lvert y\rvert}}}{x^2+y^2},\quad x = 0{,}62,\quad y \in R$
3	$a = \sqrt{\lvert y\rvert + \sqrt[4]{x-1}} + \lvert x-y\rvert,\ x = 17{,}42,\ y \in R$	18	$a = \dfrac{\lvert y-2\rvert^{x+1}}{\sqrt[3]{\lvert y-2\rvert}+3},\quad x = 1{,}65,\ y \in R$
4	$a = \dfrac{x^{y+1}+e^{y-1}}{x+\lvert y-ctgz\rvert},\quad x = 2{,}44,\ y, z \in R$	19	$b = \lvert y\rvert + \dfrac{3\lvert y-x\rvert^2 + 2\lvert y-x\rvert^3}{6},\ x = 2{,}4,\ y \in R$
5	$a = (1+y)\dfrac{x+\log_x y}{y^{x-2}+2},\quad x = 3{,}28,\ y \in R$	20	$b = \dfrac{1+\arcsin x^2}{x+\sin^2 z},\ x = 3{,}28,\ z \in R$
6	$x = y^3 + \dfrac{\lvert b-3\rvert}{3+m},\ m = 1{,}7,\ y = 5{,}6,\ b \in R$	21	$c = y^{b-3}\log_5 \lvert y-1\rvert,\ b = 2{,}7,\ y \in R$
7	$a = \dfrac{2\cos z^2}{1+\sin^2 y} + t^3,\ z = 3{,}7,\ y = 4{,}7,\ t \in R$	22	$y = \dfrac{/a-b/}{ab^3} + \sqrt{x+1},\ x = -0{,}67;\ a, b \in R$
8	$b = x\cdot\left(1+\dfrac{3-x}{e^{/x-z/}-7}\right);\ x = -0{,}67;\ z \in R$	23	$F = x^3 \sin\dfrac{x}{y^3} + ctg\,5x^3,\ x = 7{,}62,\ y \in R$
9	$y = \dfrac{-3{,}7\cos^2 a^3}{b^{a-3}+x^2},\ a = 7.6,\ b = 2.1,\ x \in R$	24	$t = \dfrac{e^{-x^3}}{\sqrt{a}+\dfrac{1}{(x+a)^{-2}}},\quad a = 9{,}62,\ x \in R$
10	$z = \dfrac{10ab}{\sqrt{a}(e^2+x^2)} - \log_4 b,\ a = 3{,}2,\ b = 3{,}2,\ x \in R$	25	$y = \dfrac{a^2\sqrt{x^2+3}}{b^2+x^2+1},\quad a = 3{,}2,\quad b = 3{,}2,\ x \in R$
11	$z = \dfrac{\ln\sqrt[3]{a} + \ln\sqrt[3]{b}}{\lg b - e^{x-1}},\ a = 2{,}3,\ b = 3{,}3,\ x \in R$	26	$y = \sqrt[3]{\dfrac{(Cosa+Sinb)^2}{arctga+x}},\quad a = 2, b = 3{,}3,\ x \in R$
12	$y = \dfrac{(z^3+1{,}5\sec\sqrt[3]{x})^2}{tg(z)+\lg^2(2x^3)},\quad x = 2{,}01,\ z \in R$	27	$z = \left(\dfrac{ax-b^2}{x^2\ln x}\right)^2,\quad a = 0{,}23,\quad x = 2{,}01,\quad b \in R$
13	$a = \dfrac{\sqrt{\lvert x-y\rvert}}{x^2+y^2} + e^{-x},\quad x = 0{,}62,\quad y \in R$	28	$y = -2\sqrt{x^2 + \dfrac{4x^2}{3}} - \dfrac{e^{4+a}}{x+1},\quad a = 0{,}23,\ x \in R$

14	$b=\frac{\lvert x-y\rvert(4+xy^2)}{e^{\lvert x-y\rvert}+Cosx},\ x=4{,}25,\ y\in R$	29	$z=x\frac{e^{x^2-y^2}-1}{\sqrt{\lvert x^2+y^2\rvert}},\ x=1.2,\ y\in R$
15	$R=\frac{1}{e^{x+3}}+\left\lvert 1-\frac{y}{2}\right\rvert+\frac{1+x}{1-x},\ x=2.4,\ y\in R$	30	$d=\sqrt[3]{\lvert x^2-b\rvert}+e^{x+b^2}-\lg b^2,\ x=5.2,\ b\in R$

2-laboratoriya mashg`ulotini bajarish uchun variant misollari (B).

Bir-biriga bog`liq murakab arifmetik ifodalarning chiziqli algoritm va dasturini tuzing.

1	$a=2^{-x}\sqrt{x}+\sqrt[4]{\lvert y\rvert}+b;\ b=\sqrt[3]{e^{x-1/\sin z}},\ x=3{,}981,\ y=-1{,}625,\ z\in R$
2	$z=\sqrt[3]{tg^2x}+\lvert y^3\log_5(9{,}7+a)\rvert,\ y=x^2\sqrt{a}+\sqrt{\lvert b^2-x\rvert},\ a=3{,}27;\ b=4{,}33,\ x\in R$
3	$a=b^4+3x^3y^3+\sqrt[4]{x^3};\ \ b=\lvert x^2-y^3\rvert(1+\frac{\sin^2 z}{x+y});\ x=3{,}25,\ y=0{,}32,\ z\in R$
4	$a=\frac{\sqrt{\lvert x-1\rvert}-(y+b)^3}{x^2y^2};\ b=x(arcctgz+e^{-x^3}),\ x=0{,}62,\ \ y=3{,}35,\ \ z\in R$
5	$a=\sqrt{b}+\sqrt[4]{x-1},\ b=\lvert x-y\rvert(\sin^2 z+tgz),\ x=17{,}42,\ y=10{,}36,\ z\in R$
6	$a=\frac{(y-2)^{x+1}}{\sqrt[3]{\lvert z-2\rvert}+b},\ b=(x+1)^{-1/4},\ x=1{,}65,\ y=-15{,}4,\ z\in R$
7	$a=\frac{x^{y+1}+e^{y-1}}{x+\lvert y-b\rvert},\ b=\lvert y\rvert+\frac{3\lvert y-x\rvert^2+2\lvert y-z\rvert^3}{6},\ x=2{,}44,\ y,z\in R$
8	$a=1+x+\frac{x^2}{b^2}+\frac{x^3}{b^3};\ b=x(z+\cos^2 y),\ x=0{,}33,\ y,z\in R$
9	$a=(1+y)\frac{x+\log_x y}{y^2+b},\ b=\frac{1+\arcsin x^2}{x+\sin^2 z},\ x=3{,}28,\ y=5{,}04,\ z\in R$
10	$F=x^3\sin\frac{x}{y^3}+ctg5x^3,\ y=\frac{-3{,}76\cos^2 a^3}{b^3+x^2},\ x=\log_3\frac{a}{b},\ a=7{,}62,\ b\in R$
11	$a=\sqrt[4]{e^{x+y^2}+c^{bx}},\ \ x=y^3+\frac{\lvert b-3\rvert}{3+c},\ c=\lvert y^{b-3}\log_5\lvert y-1\rvert,\ b=12{,}7,\ y\in R$

12	$c=\sqrt{\mid a^3b+b^3a\mid},\ a=\dfrac{2\cos z^2}{1+\sin^2 y}+b^3,\ b=x-\dfrac{z^3}{31},\ x=3{,}71,\ y=4{,}72,\ z\in R$
13	$a=y+\dfrac{x-3}{b+Sinx^3},\ b=tg^2c+y^3\mid 0{,}33-x^3\mid,\ c=\ln\mid x^3\mid,\ x=3{,}22,\ y\in R$
14	$d=\sqrt[3]{\mid a^2-\cos^2 b\mid},\ a=tg\dfrac{x}{m}-c^b,\ c=e^{x+1}-\lg\mid b\mid,\ x=3{,}22,\ b,m\in R$
15	$a=\mid\cos b+\cos y\mid^{1+2y},\ b=1+z+\dfrac{z^2}{2}+\dfrac{z^3}{6},\ \ y=-0{,}87,\ z\in R$
16	$z=\sqrt{x^2}+tg\mid y^3\mid,\ x=\arcsin^2 a^{-3}-b^2,\ y=e^{Sinz},\ a=2{,}7,\ b=4{,}3,\ z\in R$
17	$y=\dfrac{/a-b/}{ab^3},\ a=\dfrac{z}{x^2}+\sqrt{x+1},\ b=\dfrac{3-x}{e^{/x-z/}};\ x=-0{,}67;\ z\in R$
18	$y=\sqrt[3]{5a^2+3b^2},\ a=\lg^5/7z+1/,\ b=5^4\cos(xz)-7\sin(x+z)^2,\ x=3;\ z\in R$
19	$y=\sqrt[4]{ae^b-be^a},\ a=x+z^3-\sqrt{/z/},\ b=0{,}05arctg(z+3{,}3x),\ x=30{,}7;\ z\in R$
20	$y=arcctg\dfrac{a}{z}+arctg\dfrac{b}{x},\ a=z+\sqrt[5]{/x/^3+z};\ b=x^3-e^z,\ x=-5{,}83;\ z\in R$
21	$y=\dfrac{/ab/}{ab},\ a=\dfrac{z}{x^2}+\sqrt{x+1},\ b=(1+\dfrac{3-x}{e^z-7}),\ x=-0{,}67;\ z\in R$
22	$a=\dfrac{(b-4)^3}{y+\cos x^3},\ b=ctg^2c+y^3\mid 3y-x^3\mid,\ c=\lg y^2,\ x=5{,}24,\ y\in R$
23	$d=\sqrt[3]{\mid a^2-b\mid},\ a=arcctg\dfrac{x}{7}-c^b,\ c=e^{x+b^2}-\lg b^3,\ x=5{,}21,\ b\in R$
24	$a=\mid b-3^x\mid,\ b=\dfrac{\mid x-z\mid(4+y)}{\cos(x+z)},\ \ x=4{,}25,\ \ y=1{,}42,\ \ z\in R$
25	$a=\dfrac{\sqrt{\mid x-b\mid}}{x^2+y^2},\ \ b=y(\arccos z+e^{-x}),\ \ x=0{,}62,\ \ \ y=3{,}35,\ \ \ z\in R$
26	$y=arctg^3(a^2+b^2),\ a=/z/x^5+e^{-1},\ \ \ b=\ln(x^2)+\dfrac{x}{z^2},\ x=2{,}2,\ \ z\in R$
27	$y=\dfrac{(z^3+1{,}5\cos\sqrt[3]{x})^2}{tg(1{,}2z)+\lg^2(1{,}2x)},\ z=\left(\dfrac{ax-b^2}{x^2\ln x}\right)^2,\ \ a=0{,}23,\ \ b=0{,}01,\ x\in R$
28	$z=\dfrac{\ln\sqrt[3]{x}+\ln\sqrt[3]{y}}{\lg y-e^{x-1}},\ \ y=\sqrt[3]{\dfrac{(\cos a+\sin b)}{arctgx}},\ \ \ a=1{,}3,\ \ b=0{,}3,\ x\in R$

29	$z = \dfrac{10ab}{(e^2 + 3x^2)\sqrt{y}} - \log_4 x, \quad y = \dfrac{\cdot a^3\sqrt{x^2+3}}{b^2 + x}, \ a = 3{,}23, \ b = 33{,}2, \ x \in R$
30	$y = \dfrac{\sqrt{\lvert 3Sin1{,}5x^3 + 1{,}6a^2 + 2{,}7t \rvert}}{\left\lvert \cos\ln\sqrt{x} + \sin^2 \lg x \right\rvert}, \ t = \dfrac{e^{-x^3}}{\sqrt{x} + \dfrac{1}{(x+a)^2}}, \ a = 9{,}62, \ x \in R$

3-LABORATORIYA ISHI (4 coat)
Mavzu: Tarmoqlanuvchi jarayonlar algoritm va dasturlarini tuzish.

Ishning maqsadi

1. Tarmoqlanuvchi algoritmlar tuzishni va ularni blok-cxema ko`rinishida tacvirlashni o`rganish.
2. Tarmoqlanuvchi algoritmlarni dasturlashda shartli va shartciz o`tish operatorlaridan foydalanish.

Ishni bajarish tartibi

1. Masalaning qo`yilishi.
2. Masalaning algoritmini tuzish.
3. Tuzilgan algoritm asosida masalaning dasturini tuzish.
4. Dasturni kompyuterga kiritish, tahrirlash va olingan natijani tekshirish.
5. Laboratoriya ishini rasmiylashtirish.

Nazariy ma`lumotlar

Pascal tilida tarmoqlanuvchi jarayonlar dasturlarini tuzishda shartli va shartsiz o`tish operatorlari ishlatiladi.

Shartli o`tish operatorining to`liq ko`rinishi.

If <mantiqiy ifoda> then Begin
<mantiqiy ifoda qiymati rost bo`lganda bajariladigan operatorlar>
End
Else
Begin

< mantiqiy ifoda qiymati yolg`on bo`lganda bajariladigan operatorlar>
End;

Qisqa ko`rinishi:

If <mantiqiy ifoda> then
Begin
<mantiqiy ifoda qiymati roct bo`lganda bajariladigan operatorlar>
End;

Bu yerda If –agar, then -u holda, else -aks holda ma`nosini bildiruvchi kalit so`zlar. Agar bajariluvchi operatorlar soni bitta bo`lsa Begin va End so`zlarini yozish shart emas.

Shartsiz o`tish operatorining ko`rinishi quyidagicha:

Goto n;

Bu yerda n –belgi (metka) bo`lib, 1 dan 9999 gacha natural son yoki harflar ketma-ketligi bo`lishi mumkin. Goto - o`tish ma`nosini bildiradi.

n- belgi dastur bosh qismida Label so`zi yordamida e`lon qilingan bo`lishi shart. n boshqarilish yuboriladigan joyga n: shaklida qo`yiladi.

Tanlash operatori to`liq ko`rinishi quyidagicha bo`ladi.

```
Case s of
  1: A1;
  2: A2;
  . . . . .
  n: An;
      Else Begin
          <B1,B2,..Bn>
          End;
 End;
```

Bu yerda

Case -kalit so`z bo`lib tanlash ma`nosini beradi; of -«dan» ma`nosini beradi; s-operator selektori; 1,2,..n-operator belgilari; A1,A2,...An va B1,B2,...Bn-operatorlar. Case operatori tarmoqlanish jarayonida berilgan bir necha operatorlardan birini tanlashda ishlatiladi.

Topshiriqni bajarish uchun namuna.

3-laboratoriya ishi

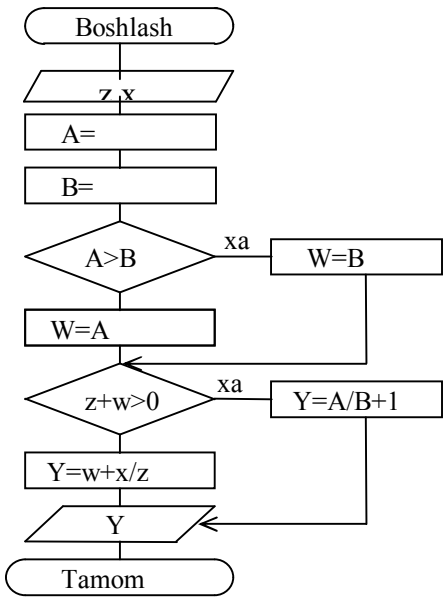
Mavzu: Tarmoqlanuvchi jarayonlarga algoritm va dasturlar tuzish.

Variant №33.

1.Quyidagi funktsiya qiymatini hisoblash algoritmi va dasturi tuzilsin.

$$y=\begin{cases}\dfrac{a}{b}+1, & z+w>0\\ w+\dfrac{x}{z}, & z+w\le 0\end{cases};\quad w=\min(a,b);\ a=\frac{z}{x^2}+\sqrt{x};\quad b=1+\frac{x}{17};\quad x=1{,}6;\ z\in R$$

Algoritm



Dastur

```
Program Lab3;
  Var z,a,b,y,w: Real;   Const  x=1.6;
 Begin
    Write('z='); Read(z);
  A:=z/Sqr(x)+Sqrt(x);
  B:=1+x/17;
  If A>B Then W:=B Else W:=A;
  If Z+W>0 Then Y:=A/B+1
              Else Y:=W+X/Z;
  Write('Y=', Y:5:3);
 End.
```

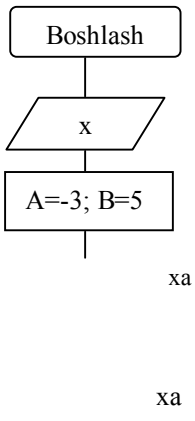
Dastur natijasi:

z=1,2 Y=3,024

2.Quyidagi funktsiya qiymatini hisoblash algoritmi va dasturi tuzilcin.

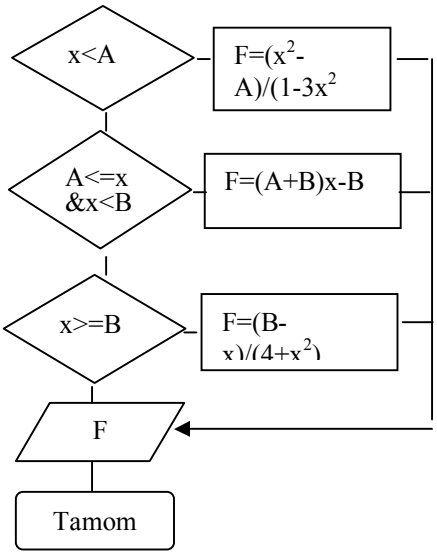
$$F=\begin{cases}\dfrac{x^2-A}{1+3x^2}; & x<A\\ (A+B)x-B; & A\le x<B,\quad A=-3;\ B=5;\ x\in R\\ \dfrac{B-x}{4+x^2}; & x\ge B\end{cases}$$

Algoritm



Dastur

```
Program Lab_3;
  Const A=-3; B=5;
  Var x,F,f1,f2,f3: Real;
 Begin
  Write('x='); Read(x);
   If x<A Then
                F:=(Sqr(x)-A)/(1+3*Sqr(x));
   If (A<=x) And (x<B) Then
```



3-laboratoriya mashg`ulotini bajarish uchun variant misollari (A)

Murakkab funktsiyalarni hisoblashning tarmoqlanuvchi algoritm va dasturini tuzing.

№	Variant misollari
1	$A=\begin{cases} x_1x_2+\cos x_3, & agar\ e^{x_4}\ge x_5 \\ \log_{10}\lvert x_1-10.1\rvert, & agar\ e^{x_4}<x_5 \end{cases}$ $x_1=-19.5;\ x_2=-1.9;\ x_3=1.1;\ x_4=2.8;\ x_5\in R$
2	$C=\begin{cases} \log_2\lvert x_2x_1\rvert, & agar\ \sqrt{\lvert x_2-x_1\rvert}>3 \\ Arc\cos(0.3x_1x_2), & agar\ \sqrt{\lvert x_2-x_1\rvert}\le 3 \end{cases}$ $x_1=-19.54;\ x_2\in R$
3	$D=\begin{cases} x_1-x_2 & agar\ \ \lg 16>x_3 \\ (x_1-x_2)^2 & agar\ \ \lg 16\le x_3 \end{cases}$ $x_1=-19.5;\ x_2=-1.9;\ x_3\in R$
4	$F=\begin{cases} \sqrt{\lvert x_1+x_2\rvert} & agar\ \ 2^{x_1}<1 \\ x_3-x_4^2 & agar\ \ 2^{x_1}\ge 1 \end{cases}$ $x_2=-1.93;\ x_3=18.11;\ x_4=2.8;\ x_1\in R$
5	$I=\begin{cases} \sqrt{\lvert x_1-x_2\rvert} & agar\ \ e^{x_3}>1 \\ \lg\lvert x_3\rvert & agar\ \ e^{x_3}\le 1 \end{cases}$ $x_1=-19.54;\ x_2=-1.938;\ x_3\in R$
6	$J=\begin{cases} \sqrt{\lvert x_1-x_2\rvert} & agar\ \ -\ln\lvert x_1\rvert<2 \\ e^{x_3-1} & agar\ \ -\ln\lvert x_1\rvert\ge 2 \end{cases}$ $x_2=-1.93;\ x_3=18.11;\ \ x_1\in R$
7	$K=\begin{cases} 5x_1^2 & agar\ \ \lg\lvert x_1\rvert<x_3 \\ 6x_2^2+1 & agar\ \ \lg\lvert x_1\rvert\ge x_3 \end{cases}$ $x_1=-19.54;\ x_2=-1.938;\ x_3\in R$
8	$M=\begin{cases} e^{x_1-3} & agar\ \lg\lvert x_1+10\rvert<x_3 \\ \lvert x_2^2-11.3\rvert^{x_2} & agar\ \lg\lvert x_1+10\rvert>x_3 \end{cases}$ $x_1=-19.54;\ x_2=-1.938;\ x_3\in R$
9	$M=\begin{cases} e^{x_1-3} & agar\ \lg\lvert x_1+10\rvert<x_3 \\ \lvert x_2^2-11.3\rvert^{x_2} & agar\ \lg\lvert x_1+10\rvert>x_3 \end{cases}$ $x_1=-19.54;\ x_2=-1.938;\ x_3\in R$

10	$P = \begin{cases} -\frac{\pi}{2} + 5x_2^2 & агар \quad x_3 > -\sqrt{\lvert x_1 \rvert} \\ 0.7 - \frac{x_1}{2} & агар \quad x_3 < -\sqrt{\lvert x_1 \rvert} \end{cases}$ $x_1 = -19.54;\ x_2 = -1.938;\ x_3 \in R$
11	$A = \begin{cases} x_1 x_2 + \cos x_3 & агар\ e^{x_4} \ge x_5 \\ \log_{10}\lvert x_1 - 10.1 \rvert & агар\ e^{x_4} < x_5 \end{cases}$ $x_1 = -19.5;\ x_2 = -1.3;\ x_3 = 18.1;\ x_4 = 2.8;\ x_5 \in R$
12	$Z = \begin{cases} \sqrt[5]{\lvert 1 + x_1 \rvert} & агар\ e^{x_3} > 30 \\ 12.41 - \ln\lvert x_2 \rvert & агар\ e^{x_3} \le 30 \end{cases}$ $x_1 = -19.54;\quad x_2 = -1.938;\quad x_3 \in R$
13	$I = \begin{cases} Sin\sqrt{\lvert x_1 - x_2 \rvert} & агар\ e^{x_3} > 1 \\ \log_4 \lvert x_2 \rvert & агар\ e^{x_3} \le 1 \end{cases}$ $x_1 = -19.54;\ x_2 = -1.938;\ x_3 \in R$
14	$J = \begin{cases} \sqrt{\lvert x_1 - x_2 \rvert} & агар\ \log_2 \lvert x_1 \rvert < 2 \\ e^{x_3 - 1} & агар\ \log_2 \lvert x_1 \rvert \ge 2 \end{cases}$ $x_2 = -1.938;\ x_3 = 18.11;\ x_1 \in R$
15	$A = \begin{cases} x_1 x_2 + \cos x_3 & агар\ e^{x_4} \ge x_5 \\ \log_{10}\lvert x_1 - 10.1 \rvert & агар\ e^{x_4} < x_5 \end{cases}$ $x_1 = -19.5;\ x_2 = -1.9;\ x_3 = 18.1;\ x_4 = 2.84;\ x_5 \in R$
16	$C = \begin{cases} \log_2 \lvert x_2 x_1 \rvert & агар\ \sqrt{\lvert x_2 - x_1 \rvert} > 3 \\ Arc\ \cos\ (0.3 x_1 x_2) & агар\ \sqrt{\lvert x_2 - x_1 \rvert} \le 3 \end{cases}$ $x_1 = -19.54;\ x_2 \in R$
17	$D = \begin{cases} x_1 - x_2 & агар\ \lg 16 > x_3 \\ (x_1 - x_2)^2 & агар\ \lg 16 \le x_3 \end{cases}$ $x_1 = -19.54;\ x_2 = -1.938;\ x_3 \in R$
18	$F = \begin{cases} \sqrt{\lvert x_1 + x_2 \rvert} & агар\ 2^{x_1} < 1 \\ x_3 - x_4^2 & агар\ 2^{x_1} \ge 1 \end{cases}$ $x_2 = -1.938;\ x_3 = 18.11;\ x_4 = 2.804;\ x_1 \in R;$
19	$I = \begin{cases} \sqrt{\lvert x_1 - x_2 \rvert} & агар\ e^{x_3} > 1 \\ \lg\lvert x2 \rvert & агар\ e^{x_3} \le 1 \end{cases}$ $x_1 = -19.54;\ x_2 = -1.938;\ x_3 \in R$
20	$J = \begin{cases} \sqrt{\lvert x_1 - x_2 \rvert} & агар\ -\ln\lvert x_1 \rvert < 2 \\ e^{x_3 - 1} & агар\ -\ln\lvert x_1 \rvert \ge 2 \end{cases}$ $x_2 = -1.938;\ x_3 = 18.11;\ x_1 \in R$
21	$K = \begin{cases} 5x_1^2 & агар\ \lg\lvert x_1 \rvert < x_3 \\ 6x_2^2 + 1 & агар\ \lg\lvert x_1 \rvert \ge x_3 \end{cases}$ $x_1 = -19.54;\ x_2, x_3 \in R$
22	$M = \begin{cases} e^{x_1 - 3} & агар\ \lg\lvert x_1 + 10 \rvert < x_3 \\ \lvert x_2^2 - 11.3 \rvert^{x_2} & агар\ \lg\lvert x_1 + 10 \rvert > x_3 \end{cases}$ $x_1 = -19.5;\ x_2 = -1.93;\ x_3 \in R$
23	$N = \begin{cases} x_1 - x_2 & агар\ \sqrt[3]{\lvert x_1 \rvert} > 1.5 \\ 1.4 - \sin x_1 & агар\ \sqrt[3]{\lvert x_1 \rvert} \le 1.5 \end{cases}$ $x_2 = -1.938;\ x_1 \in R$
24	$P = \begin{cases} -2\pi + 5x_2^2 & агар\ x_3 > -\sqrt{\lvert x_1 \rvert} \\ 0.7 - 2x_1 & агар\ x_3 < -\sqrt{\lvert x_1 \rvert} \end{cases}$ $x_1 = -19.54;\ x_2 = -1.938;\ x_3 \in R$

25	$K = \begin{cases} 5x_1^2 & agar \ \lg\|x_1\| < x_3 \\ 6x_2^2 + 1 & agar \ \lg\|x_1\| \geq x_3 \end{cases}$ $x_1 = -19.54;\ x_2 = -1.938;\ x_3 \in R$
26	$M = \begin{cases} e^{x_1-3} & agar \ \lg\|x_1+10\| < x_3 \\ \|x_2^2 - 11.3\|^{x_2} & agar \ \lg\|x_1+10\| > x_3 \end{cases}$ $x_1 = -19.54;\ x_2 = -1.938;\ x_3 \in R$
27	$N = \begin{cases} x_1 - x_2 & agar \ \sqrt[3]{\|x_1\|} > 1.5 \\ 1.4 - \sin x_1 & agar \ \sqrt[3]{\|x_1\|} \leq 1.5 \end{cases}$ $x_1 = -19.54;\ x_2 \in R$
28	$K = \begin{cases} Sin\ 3\pi x_2 + x_1^2 & agar \ \sin\|x_1\| < x_3 \\ (x_2^2 + 1)^3 & agar \ \sin\|x_1\| \geq x_3 \end{cases}$ $x_1 = -1.5;\ x_2 = 2.9;\ x_3 \in R$
29	$M = \begin{cases} e^{x_1-3} + 4x_1 & agar \ \|x_2+3\| < x_3 \\ \|x_2^2 - 11.3\| & agar \ \|x_2+3\| > x_3 \end{cases}$ $x_1 = -9.4;\ x_2 = 3.3;\ x_3 \in R$
30	$N = \begin{cases} (x_1 - x_2)^2 & agar \ \sqrt{\|x_2\|} > 4.5 \\ 1.4 - tg\ \pi x_1 & agar \ \sqrt{\|x_2\|} \leq 4.5 \end{cases}$ $x_1 = -9.4;\ x_2 \in R$

3-laboratoriya mashg`ulotini bajarish uchun variant misollari (B)

Murakkab funktsiyalarni o`zgaruvchi x ning har xil qiymatlarida hisoblashning tarmoqlanuvchi algoritm va dasturini tuzing.

№	Topshiriq misollari	№	Topshiriq misollari
1	$y - \begin{cases} a^2x + bx^2, \text{ arap } x < 0; \\ kx + n, \text{ arap } x > 3; \\ mx^2 - dx, \text{ arap } 0 \leq x \leq 3. \end{cases}$	16	$y - \begin{cases} \sqrt{cosx} \mid 1, \text{arap } x < 1; \\ arcsin^2 x \mid \sqrt[3]{x}, \text{ arap } x > 1; \\ \log_2(x + 1.8), -1 \leq x \leq 1. \end{cases}$
2	$y = \begin{cases} \sqrt{a^3 + \ln x}, \text{ arap } x < -10; \\ \log_a x + x^2, \text{ arap } -10 \leq x \leq 10; \\ \sin^2 x \mid \arcsin x, \text{ arap } x > 10. \end{cases}$	17	$y = \begin{cases} \sqrt[5]{x^2 + z^2}, \text{ arap } x < 2; \\ x + z, \text{ arap } x = 2; \\ \log_a x, \text{ arap } x > 2. \end{cases}$
3	$y - \begin{cases} a + bsin\omega t, \text{ arap } \|a - \omega t\| < 1; \\ b + acos\omega t, \text{ arap } \|a - \omega t\| = 1; \\ arctg\omega t, \text{ arap } \|a - \omega t\| > 1. \end{cases}$	18	$y - \begin{cases} cos\sqrt{x} + 1, \text{ arap } x = \frac{\pi}{2}; \\ arctg\sqrt{x+1}, \text{ arap } x > \frac{\pi}{2}; \\ \cos(arcsinx), \text{ arap } x < \frac{\pi}{2}. \end{cases}$
4	$y = \begin{cases} \sqrt[3]{x}, \text{ arap } x \leq 1; \\ 2 - x, \text{ arap } 1 < x < 2; \\ \sin(x \quad 2), \text{ arap } x \geq 2. \end{cases}$	19	$y = \begin{cases} x^2 - 1, \text{ arap } x > 1; \\ 3x^2 + 8, \text{ arap } x < 1; \\ x^4, \text{ arap } x = 1. \end{cases}$

5	$y=\begin{cases} x^a+\lvert cosx+sinx\rvert, \text{ arap } x<2\lvert a\rvert; \\ x^2+e^{x-a}, \text{ arap } x=2\lvert a\rvert; \\ a^x-\cos\left(sin\sqrt{x-a}\right), \text{ arap } x>2\lvert a\rvert. \end{cases}$	20	$y=\begin{cases} arctgx+a^x, \text{ arap } x<a; \\ 0{,}5\sqrt{1+ax^2+tgx}, \text{ arap } x=a; \\ \log_n\lvert sinx\rvert, \text{ arap } x>a. \end{cases}$
6	$y=\begin{cases} ln^3ax+3\log_a\lvert a+x\rvert, \text{ arap } ax<1; \\ 2ax+ln^2x^2, \text{ arap } ax=1; \\ e^{\sqrt{ax-sinx}}, \text{ arap } ax>1. \end{cases}$	21	$y=\begin{cases} x+3ax^2+arccosx, \text{ arap } \lvert a\rvert<x; \\ \cos\lvert 2a-x^2\rvert, \text{ arap } \lvert a\rvert=x; \\ x^2+arctagx^3, \text{ arap } \lvert a\rvert>x. \end{cases}$
7	$y-\begin{cases} \frac{1}{2}\sqrt{x}, \text{ arap } x>1; \\ \frac{1}{3x^2}, \text{ arap } 0\le x\le 1; \\ \frac{1}{4}(x+1), \text{ arap } x<0. \end{cases}$	22	$y=\begin{cases} x^3b, \text{ arap } x>5; \\ (x+1)^2, \text{ arap } 0\le x\le 5; \\ \sin^2x, \text{ arap } x<0. \end{cases}$
8	$y=\begin{cases} sinx, \text{ arap } x<0; \\ sinx+1, \text{ arap } x>0; \\ sin^2x, \text{ arap } x=0. \end{cases}$	23	$y=\begin{cases} cx^2, \text{ arap } x<0; \\ xa, \text{ arap } 0\le x\le 0.5; \\ (x-0.5)^2, \text{ arap } x>0.5. \end{cases}$
9	$y-\begin{cases} \sqrt{x}, \text{ arap } x<1; \\ 2\quad x, \text{ arap } 1\le x\le 2; \\ \cos(x-2), \text{ arap } x>2. \end{cases}$	24	$y=\begin{cases} z\mid x^2a, \text{ arap } a>3; \\ z^2, \text{ arap } a=3; \\ z+ab^2, \text{ arap } a<3. \end{cases}$
10	$y-\begin{cases} x^2-2x+2, \text{ arap } x>2; \\ \lvert x\rvert, \text{ arap } 0\le x\le 2; \\ -x^2-2x+4, \text{ arap } x<0. \end{cases}$	25	$y-\begin{cases} x^2-4x+4, \text{ arap } x<-4; \\ 4x^2+x, \text{ arap } -4\le x\le 4; \\ -x^2-4x, \text{ arap } x>4. \end{cases}$
11	$y=\begin{cases} \frac{sinx}{x^2+1}, \text{ arap } x<1; \\ arctg^2x+e^{\sqrt{x}}, \text{ arap } -1\le x\le 1; \\ \ln(x+1), \text{ arap } x>1. \end{cases}$	26	$y=\begin{cases} \sqrt[3]{x^2+a^2}, \text{ arap } x^2+a^2<4; \\ x+a, \text{ arap } x^2+a^2=4; \\ lnx, \text{ arap } x^2+a^2>4. \end{cases}$
12	$y=\begin{cases} 3x^2\mid 4\sqrt{a\quad x}, \text{ arap } a>x; \\ sin\sqrt{3a+x}, \text{ arap } a=x; \\ e^{\sqrt{x+a}}, \text{ arap } a<x. \end{cases}$	27	$y=\begin{cases} sin\sqrt{x}, \text{ arap } x=\frac{\pi}{2}; \\ tg\sqrt{x\mid 1}, \text{ arap } x>\frac{\pi}{2}; \\ \sin(cosx), \text{ arap } x<\frac{\pi}{2}. \end{cases}$
13	$y=\begin{cases} \sqrt[5]{a-\pi+arcsinx}, \text{ arap } x=\frac{\pi}{2}; \\ arcsin\sqrt{x+1}, \text{ arap } x>\frac{\pi}{2}; \\ \sin(arctgx), \text{ arap } x<\frac{\pi}{2}. \end{cases}$	28	$y=\begin{cases} e^{x\ 1}, \text{ arap } x>1; \\ a(x-1)^2, \text{ arap } x<1; \\ 3ln^2(x-1), \text{ arap } x=1. \end{cases}$
14	$y=\begin{cases} 3^{x-1}, \text{ arap } x>1; \\ (x-1)^3, \text{ arap } x<1; \\ 0, \text{ arap } x=1. \end{cases}$	29	$y=\begin{cases} lgx+a^x, \text{ arap } x<a; \\ 0{,}5\sqrt{1+ax^2}, \text{ arap } x-a; \\ \ln\lvert sinx\rvert, \text{ arap } x>a. \end{cases}$

15	$y=\begin{cases} ax^2+bx+c, & \text{arap } x>0; \\ px^2+qx, & \text{arap } x<0; \\ x^5 \mid \sqrt[3]{x}, & \text{arap } x=0. \end{cases}$	30	$y-\begin{cases} \sin^2 x+\cos^2 x, & \text{arap } x>\frac{\pi}{4}; \\ tg^2 x+1, & \text{arap } x<\frac{\pi}{4}; \\ ctg^3 x, & \text{arap } x=\frac{\pi}{4}. \end{cases}$

4-LABORATORIYA ISHI (4 coat)
Mavzu: Takrorlanuvchi jarayonlar algoritm va dasturini tuzish.

Ishning maqsadi

1. Siklik algoritmlarni blok-cxema ko`rinishda tasvirlashni o`rganish.
2. Siklik algoritmlarni dasturlashda sikl aperatorlaridan foydalanish.

Ishni bajarish tartibi

1. Masalaning qo`yilishi.
2. Masalaning hisoblash algoritmini tuzish.
3. Variantdagi berilgan hisoblashlarning algoritmini tuzish.
4. Tuzilgan algoritm acocida masalaning dasturini tuzish.
5. Dasturni kompyuterga kiritish, tahrirlash va olingan natijani tekshirish.
6. Laboratoriya ishini rasmiylashtirish.

Nazariy ma`lumotlar

Pascal tilida siklik dasturlar tuzishda quyidagi operatorlar ishlatiladi:

For- operatori takrorlanishlar soni aniq bo`lgan sikllar tashkil etishda ishlatiladi. Uning umumiy ko`rinishi quyidagicha yoziladi

For i:=m1 to m2 Do S;

Bu yerda i-sikl parametri; m1,m2-sikl parametrining boshlang`ich va oxirgi qiymati (m1<m2); S-sikl tanasi bo`lib bir necha operatorlardan tashkil topishi mumkin. m1,m2-o`zgarmas son yoki ifoda ham bo`lishi mumkin.

Agar sikl tanaci bir necha operatordan iborat bo`lsa ular Begin va End ichiga olinadi. to - so`zi DoWnto so`ziga almashtirilsa sikl parametri teskari bo`yicha o`zgaradi, ya`ni -1 qadam bilan. U holda sikl ko`rinishi quyidagicha bo`ladi.

For i:=m1 DoWnto m2 Do S; (bu yerda m1>m2.)

While- sikl operatori takrorlanishlar soni oldindan aniq bo`lmagan hollarda takrorlanishni biror bir shart asosida bajaradi. Berilgan shart oldin tekshiriladi va keyin shartning bajarilishiga qarab kerakli operatorlar ketma-ketligi bajariladi. Bu operatorning umumiy ko`rinishi quyidagicha yoziladi.

While B Do S;

Bu yerda B -mantiqiy ifoda; S -sikl tanasi bo`lib, bir yoki bir necha operatorlar ketma-ketligidan iborat bo`lishi mumkin. Mantiqiy ifoda ‘True’ yoki ‘False’ qiymat qabul qiladi. Agar mantiqiy ifoda ‘True’ qiymat qabul qilsa S operatorlari bajariladi, aks holda bajarilmaydi, ya`ni sikl ishlashdan to`xtaydi.

Repeat- sikl operatori ham takrorlanishlar soni oldindan aniq bo`lmagan hollarda takrorlanishni biror bir shart asosida bajaradi. Berilgan shart keyin tekshiriladi va shart masa kerakli operatorlar ketma-ketligi bajariladi. Bu operatorning umumiy ko`rinishi quyidagicha yoziladi.

Repeat S Until B

Bu yerda B -mantiqiy ifoda; S -sikl tanasi bo`lib, bir yoki bir necha operatorlar ketma-ketligidan iborat bo`lishi mumkin. Agar mantiqiy ifoda ‘False’ qiymat qabul qilsatsiklda takrorlanish davom etadi, aks holda to`xtaydi.

Topshiriqni bajarish uchun namunaviy misol.

4-laboratoriya ishi

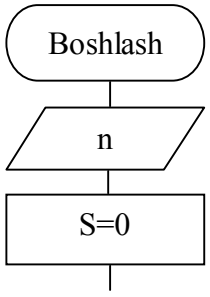
Mavzu: Siklik algoritm va dasturlar tuzish.

Variant №34.

1.Quyidagi yig`indini hisoblash algoritm va dasturini tuzing.

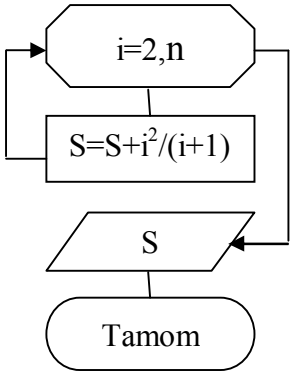
$$S = \sum_{i=2}^{n} \frac{i^2}{i+1}$$

Algoritm



Dastur

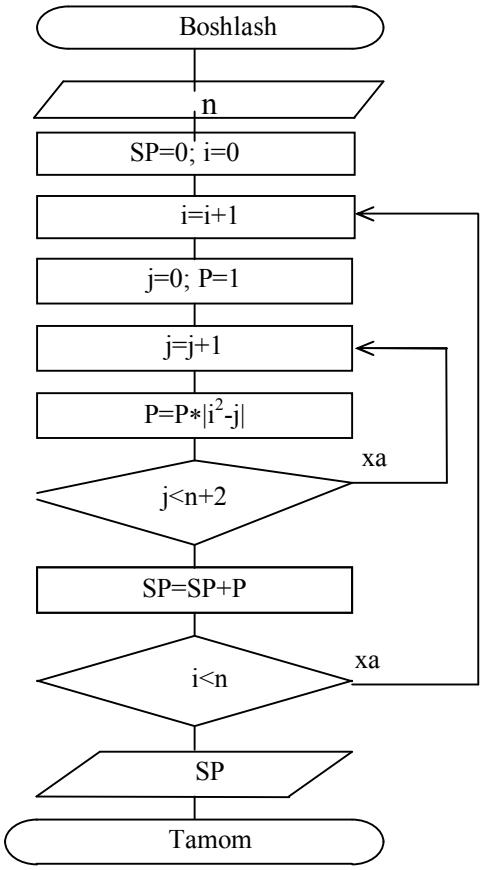
```
Program Lab_4;
  Var S,P: Real;  n,i: Integer;
  Begin
   Read(n);
    S:=0;
    For I:=2 To n Do
       S:=S+Sqr(i)/(i+1);
       Write('S=',S);
```



2.Quyidagi ichma-ich joylashgan yig`indi va ko`paytmani hisoblash algoritm va dasturini tuzing.

$$SP = \sum_{i=2}^{n} \prod_{j=i}^{n+2} \left| i^2 - j \right|$$

Algoritm



Dastur

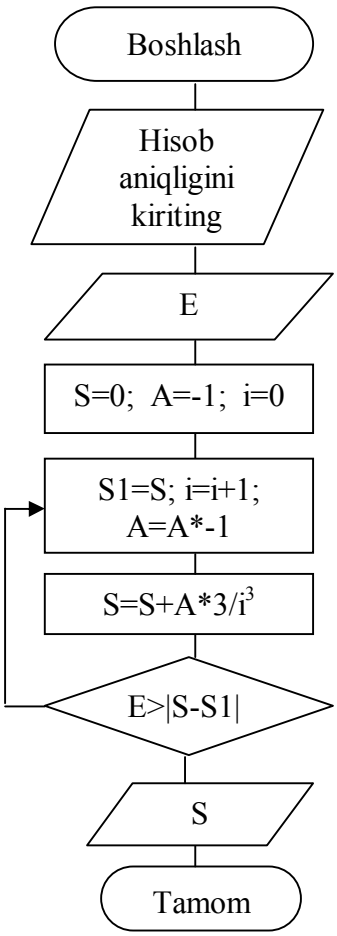
```
Program Lab_4;
  Var SP,P: Real;
        n,i,j: Integer;
  Begin
   Read(n);
    SP:=0;
    For I:=1 To n Do
      Begin
         P:=0;
         For J:=1 To n+2 Do
          P:=P*Abs(Sqr(I)-J);
         SP:=SP+P;
       End;
        Write('SP=',SP);
  End.
```

Dastur natijasi:
n=3 bo`lganda SP=332.4

3.Quyidagi qatorni epsilon aniqlikda hisoblash algoritm va dasturini tuzing.

$$\sum_{n=1}^{\infty}(-1)^{n+1}\frac{3}{n^3},\ \ \varepsilon = 0{,}001.$$

Algoritm



Dastur

```
Program Lab_4;
  Var S,E: Real;
        i: Integer;
  Begin
   Write('Hisob aniqligini kiriting');
    Read(E);
    S:=0;  A:=-1; i:=0;
    Repeat
      S1:=S;
       i:=i+1;
       A:=A*(-1)
       S:=S+A*3/Exp(3*Ln(i));
    Until E>Abs(S-S1);
        Write('S=' ,S);
  End.
```

Dastur natijasi:

E=0.001 bo`lganda S=2.705028

4-laboratoriya mashg`ulotini bajarish uchun variant misollari.

Quyidagi yig`indi, ko`paytma va qatorlarni hisoblashning takrorlanuvchi algoritm va dasturini tuzing.

№	A	B	C	D
1	$\sum_{n=1}^{10} \frac{1}{n^3}$	$\sum_{R=1}^{15} \frac{R^3}{R^4+3R^2+e^{-R}}$	$\prod_{R=1}^{15}\prod_{i=1}^{10} \frac{R^i+1}{R^4+3^i*R+e^{-R}}$	$\sum_{n=1}^{\infty}(-1)^{n+1}\frac{3}{n^3},\ \varepsilon=0{,}01.$
2	$\sum_{n=1}^{10} \frac{2}{n^3(n+1)}$	$\prod_{n=1}^{10} \frac{n^2+3n+10}{\sqrt[3]{n^2+7n+91}}$	$\sum_{R=1}^{14}\sum_{m=1}^{4} \frac{R\cdot m+\lvert R^{-m}+2\rvert}{\ln R+3m}$	$\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n(n+1)(n+2)},\ \varepsilon=0{,}01.$
3	$\sum_{n=1}^{20} \frac{3}{(2n+1)^3}$	$\sum_{R=1}^{17} \frac{R+1}{\sin R+e^{-R}+1}$	$\prod_{R=1}^{16}\sum_{i=1}^{6} \frac{R+3}{R^3+3R+i^3}$	$\sum_{n=1}^{\infty}(-1)^{n+1}\frac{3}{(2n)^2},\ \varepsilon=0{,}001.$
4	$\sum_{R=1}^{13} \frac{4}{R(R+1)}$	$\sum_{R=1}^{10} \frac{R^{R+1}}{2^{R+1}+(R+1)^4}$	$\sum_{R=1}^{10}\prod_{i=1}^{10} \frac{(R+1)^i+4}{12+i^R}$	$\sum_{n=1}^{\infty}\frac{(-1)^n(2n+1)}{n^2(n+1)},\ \varepsilon=0{,}01.$
5	$\sum_{m=1}^{10} \frac{5}{m^2+m+4}$	$\sum_{R=1}^{15} \frac{(100-R)^2}{\lg R+5^{-R}}$	$\sum_{i=1}^{13}\sum_{R=1}^{4} \frac{(-1)^i\cos(i+R)}{5i+7^{-R}+i^{-R}}$	$\sum_{n=1}^{\infty}(-1)^n\frac{n}{7^n},\ \varepsilon=0{,}0001.$
6	$\prod_{n=1}^{8} \frac{n+6}{n^2+4n+1}$	$\sum_{i=1}^{17} \frac{i+6}{i^4+27i+7}$	$\prod_{R=1}^{8}\prod_{i=1}^{14} \frac{\sqrt{5i^4+e^{-R}}}{\cos(i+1)^3-R}$	$\sum_{n=1}^{\infty}\frac{Cos\pi n}{3n(n+1},\ \varepsilon=0{,}001.$
7	$\prod_{n=1}^{10} \frac{1}{n^4+1}$	$\sum_{i=1}^{10} \frac{(-1)^i\cdot 7^{-i}}{1+i+i^2}$	$\sum_{i=1}^{13}\sum_{R=1}^{14} \frac{(-1)^i\cos(i+R)}{5i+7^{-R}+i^{-R}}$	$\sum_{n=1}^{\infty}\frac{Cos(n\pi)}{(n^2+1)^2},\ \varepsilon=0{,}001.$
8	$\prod_{n=1}^{10} \frac{1}{n^4+1}$	$\sum_{n=1}^{12} \frac{10n-8}{10n^2-3n+8}$	$\sum_{i=1}^{13}\sum_{m=2}^{5}\left[\frac{i^m+4m+e^m}{m^i}\right]$	$\sum_{n=1}^{\infty}\frac{(-1)^n n}{(1+n^2)^2},\ \varepsilon=0{,}001.$

9	$\prod_{n=1}^{10}\frac{n^2+9^{-n}}{e^{-n}+n^{n^{-n}}}$	$\sum_{i=1}^{7}(2i+5i+9)$	$\sum_{R=1}^{17}\prod_{m=1}^{5}\sqrt{\frac{R+m^3+e^{-m}}{Log_m R+mR}}$	$\sum_{n=1}^{\infty}\frac{Sin(n/2+\pi n)}{n^2+1}$, $\varepsilon=0{,}01$.
10	$\prod_{n=1}^{10}\frac{n^2+9^{-n}}{e^{-n}+n^{n^{-n}}}$	$\sum_{R=1}^{14}\frac{R^2+\lvert R-2\rvert}{\ln R+3R}$	$\sum_{R=1}^{17}\sum_{m=1}^{5}\frac{\sqrt{(R+m)^2+R}}{R+m^{-R}+e^{m-R}}$	$\sum_{n=1}^{\infty}\frac{(-1)^n}{1+n^2}$, $\varepsilon=0{,}01$.
11	$\prod_{n=1}^{10}\frac{n^2+9^{-n}}{e^{-n}+n^{n^{-n}}}$	$\sum_{R=1}^{10}\frac{R+I}{R^5+5R+1{,}2}$	$\prod_{i=1}^{15}\sum_{m=1}^{11}\left[e^{\sqrt{i^2}}+\frac{i^2+11}{m^4+i^{-m}}\right]$	$\sum_{n=1}^{\infty}\frac{Sin(n/2+\pi n)}{n^2}$, $\varepsilon=0{,}01$.
12	$\prod_{i=1}^{9}\frac{i^4+i^2+12}{\sqrt{i^3+e^{-i}}}$	$\sum_{R=1}^{10}\frac{R+I}{R^5+5R+1{,}2}$	$\sum_{m=1}^{9}\prod_{n=1}^{7}\sqrt{\frac{m^3-n^2+3{,}4}{m^{-n}+m^{-m}+12}}$	$\sum_{n=1}^{\infty}\frac{(-1)^n 2n}{(1+n)^n}$, $\varepsilon=0{,}001$.
13	$\prod_{n=1}^{15}\frac{13}{n^3+5n+7}$	$\sum_{m=2}^{13}\frac{(-1)^m\sqrt{m}}{2^{-2m}}$	$\prod_{i=1}^{21}\prod_{m=1}^{20}\frac{i^{-2}-i^3+1{,}3}{m^{-6}+im+13}$	$\sum_{n=1}^{\infty}\frac{(-1)^n}{4^n(2n+1)}$, $\varepsilon=0{,}001$.
14	$\sum_{R=1}^{19}\frac{R^2+14}{\sqrt{3^{-R}+R^3}}$	$\prod_{n=1}^{14}\frac{n+b}{n+\frac{1}{n}}$	$\sum_{i=1}^{6}\sum_{m=1}^{14}\lg\frac{\sqrt[3]{m^2+e^{m-i}}}{i^2+2^{i-m}}$	$\sum_{n=1}^{\infty}\frac{(-1)^n}{(1+n)^n}$, $\varepsilon=0{,}001$.
15	$\prod_{i=1}^{14}\frac{\lvert i-15\rvert+i^3}{\ln i+7i}$	$\sum_{R=1}^{10}\frac{(-1)^R*(R+1)}{R^3+R^2+1}$	$\prod_{n=1}^{14}\sum_{m=1}^{16}\frac{m\log_n(m+5)}{2^{m-9}+(n+3)^{-m}}$	$\sum_{n=1}^{\infty}\frac{tg(n\pi)}{(n^2+1)^2}$, $\varepsilon=0{,}001$.
16	$\sum_{i=-22}^{40}\frac{\sqrt[i]{\lvert i\rvert-2i^3}+1}{\ln\lvert i+3\rvert+1{,}1}$	$\sum_{n=1}^{20}(-1)^n\frac{n+c}{2n^4+1}$	$\prod_{R=4}^{16}\prod_{m=1}^{17}\frac{\sqrt{R^m+4R-m}}{\sin(m+R)-m}$	$\sum_{n=0}^{\infty}(-\frac{2}{5})^n$, $\varepsilon=0{,}01$.
17	$\prod_{R=1}^{17}\frac{R+17}{2R^2+9}$	$\sum_{R=1}^{13}(-1)\frac{R\sqrt[R]{R+1}+R^2}{2R^2+4R+11}$	$\sum_{m=1}^{17}\prod_{n=1}^{10}\sqrt{\frac{m^3-n^2+1{,}7}{m^n+m^m+12}}$	$\sum_{n=1}^{\infty}\frac{(-1)^n n}{7^n}$, $\varepsilon=0{,}0001$.
18	$\sum_{n=1}^{10}\frac{18}{5-17n+n^3}$	$\prod_{m=-12}^{0}\frac{\sqrt[2]{\lvert m\rvert+1{,}8}}{m^2+4m+(-1)^m}$	$\sum_{i=1}^{17}\prod_{R=1}^{10}\frac{\sqrt{e^{i+R}(i+R)^{i-R}}}{\lvert 4i^3-R^4\rvert}$	$\sum_{n=0}^{\infty}(-\frac{2}{3})^n$, $\varepsilon=0{,}1$.
19	$\sum_{n=1}^{9}\frac{19n}{3+n+n^2}$	$\sum_{t=3}^{9}\frac{tg(t+3)}{t^3+2t+e^{t-1}}$	$\prod_{i=-4}^{0}\prod_{m=2}^{19}\frac{\left(\sqrt[i]{i}+m\right)}{(i+m)}$	$\sum_{n=1}^{\infty}\frac{(-1)^n n}{2^n}$, $\varepsilon=0{,}1$.
20	$\prod_{n=1}^{20}(-1)^n\frac{1+n^2}{1+n^3}$	$\sum_{m=10}^{6}\frac{sign(m)}{\sqrt[4]{m^2+e^{i+13}}}$	$\prod_{n=1}^{11}\prod_{R=2}^{16}\frac{n^3-R^2+20}{(\lvert n-R\rvert+n)^{-R}}$	$\sum_{n=0}^{\infty}(-\frac{2}{7})^n$, $\varepsilon=0{,}001$.
21	$\prod_{n=1}^{15}(-1)^n\frac{n+21}{9+5n^3}$	$\sum_{R=1}^{12}\frac{2^{-R}+2^R+21}{R^2+e^{2-13}}$	$\prod_{i=1}^{16}\sum_{R=1}^{6}\frac{sign(Sin(i+R))}{(i+R)^{i-R}-21};$	$\sum_{n=1}^{\infty}\frac{(-1)^n n^2}{3^n}$, $\varepsilon=0{,}1$.
22	$\sum_{n=1}^{10}\frac{3n^3+4n+1}{n^3+Ln(m)}$	$\prod_{R=1}^{10}(-1)^R\frac{R+22}{R^3+7R+5}$	$\sum_{i=1}^{17}\prod_{R=1}^{10}\frac{Lni+R^2}{\lvert 4i^3-R^4\rvert}$	$\sum_{n=0}^{\infty}(-1)^n\frac{n}{2n+1}$, $\varepsilon=0{,}001$.
23	$\prod_{R=1}^{7}\frac{61R+17}{2R^2+9{,}6}$	$\sum_{R=1}^{12}(-1)\frac{\cos(R+1)+R^2}{2R^2+TgR+11}$	$\sum_{m=1}^{17}\prod_{n=1}^{10}\frac{(1-m)^{n-m}}{(m+n+5)^3}$	$\sum_{n=0}^{\infty}(-1)^n\frac{x^{2n}}{2n}$, $\varepsilon=0.0001$
24	$\sum_{R=1}^{14}\frac{R+2{,}4}{R^2+7R+1};$	$\prod_{q=1}^{18}(-1)^q\frac{Cos(q^2+5)}{q^4+\lvert q-71\rvert};$	$\sum_{i=1}^{16}\prod_{m=1}^{13}\frac{arctg(i+m)}{Lni+0{,}24};$	$\sum_{n=0}^{\infty}\frac{1}{2^n}$, $\varepsilon=0.0001$

25	$\sum_{R=1}^{15}\frac{3R-2,5}{\sqrt{R^2+3R}};$	$\prod_{n=15}^{45}\frac{arctgn}{n^{1,6}-Ln(n+25)};$	$\prod_{i=1}^{25}\sum_{m=3}^{12}\frac{(i^3+m^4)^{\frac{1}{i}}}{\sqrt{Ln(i+m)}+i^{\frac{1}{m}}}$	$\sum_{n=1}^{\infty}\frac{2^n}{n},\ \varepsilon=0.0001$
26	$\prod_{i=1}^{10}\frac{6i-2,6}{i^{4^i}-3i^3+i};$	$\prod_{q=1}^{16}\frac{Arc\cos(q^2+5)}{q^4+Tg(q+1)};$	$\sum_{R=1}^{6}\prod_{m=1}^{5}\frac{\sqrt{(R+m)^2}}{R+m^2+Rm}$	$\sum_{n=0}^{\infty}(-1)^n\frac{x^{2n}}{(2n)!},\ \varepsilon=0.0001$
28	$\prod_{R=1}^{17}\frac{R+2,7}{2R^3+9};$	$\sum_{R=1}^{13}(-1)^R\frac{\sqrt[R]{R+1+R^2}}{R^2+R+27};$	$\prod_{R=4}^{16}\prod_{m=1}^{17}\frac{\sqrt{R^2+4R-m}}{\sin(m+R)-m^2};$	$\sum_{n=0}^{\infty}(-1)^i\frac{i}{2i+1},\ \varepsilon=0.00001$
28	$\sum_{i=1}^{28}(4i-28)^2;$	$\prod_{R=1}^{27}\frac{R+2,7}{2R^3+9};$	$\sum_{R=1}^{6}\sum_{m=1}^{13}\frac{\sqrt{(R+m)^2}+28}{R+m^2+2^{m-R}}$	$\sum_{n=0}^{\infty}(-1)^n\frac{1}{2^n},\varepsilon=0.00001$
29	$\sum_{m=1}^{10}\frac{29}{m^2+m+4};$	$\prod_{n=1}^{11}\frac{n^3+3n+2,8}{\sqrt[3]{n^2+7n+91}};$	$\sum_{i=1}^{8}\sum_{R=1}^{13}\frac{(-1)^i\cos(i+R)}{5i+7R+iR-29}$	$\sum_{n=1}^{\infty}(-1)^n\frac{1}{3^n},\varepsilon=0.001$
30	$\prod_{R=1}^{25}\frac{(100-R)^2}{\lg R+2^R};$	$\sum_{n=1}^{30}\frac{10n-30}{10n^2-3n+8};$	$\sum_{R=1}^{6}\sum_{m=1}^{13}\frac{\sqrt{tg(R+m)^2+5}}{R+m^3+2^{m-R}+3};$	$\sum_{n=1}^{\infty}\left[\frac{1}{2^n}\cdot\frac{1}{3^n},\ \varepsilon=0.001\right.$

5-LABORATORIYA ISHI (6 coat)
Mavzu: Massivlar ustida amallar bajarishga doir algoritm va dasturlar tuzish.

Ishning maqsadi

1. Massiv elementlari ustida har xil almashtirishlar va hisoblashlar bajarishning algoritmlarini yaratish usullarini o`rganish.
2. Massivlarni dasturda tavsiflash va ulardan masalalar echishda foydalanish.

Ishni bajarish tartibi

1. Masalaning qo`yilishi.
2. Masalaning hisoblash algoritmini tuzing.
3. Tuzilgan algoritm acocida masalaning dasturini tuzing.
3. Dasturni kompyuterga kiriting, tahrirlang va olingan natijani tekshiring.
4.Laboratoriya ishini rasmiylashtiring.

Nazariy ma`lumotlar

Massiv bu bir nom bilan belgilangan qiymatlar guruhi yoki jadvaldir. Massivning har bir elementi massiv nomidan so`ng o`rta qavs ichiga olingan raqam va arifmetik ifoda yozish bilan belgilanadi. Qavs ichidagi raqam massiv indeksini belgilaydi. Vektorni bir o`lchovli massiv, matritsani ikki o`lchovli massiv deb qarash mumkin. Masalan: A[i,j] bu yerda i-satr nomeri j-ustun nomerini bildiradi.

Har bir massiv o`z o`lchamiga ega. Shuning uchun u dasturda e`lon qilingan bo`lishi kerak. Massivni e`lon qilish dasturning bosh qicmida beriladi. Bu operatorning yozilishi quyidagicha:

<Massiv nomi>:Array[o`lcham] of <element tipi>

Masalan: A,B:Array[1..100] of real;

Massiv elementlari qiymatlarini ekran orqali kiritish uchun sikl operatorlaridan foydalanish qulaylik tug`diradi.

Misol: For i:=1 to 10 do Read(A[i]);

Bu misolda A massivning 10 ta elementi qiymatini ekrandan ketma-ket kiritish kerak bo`ladi. Xuddi shunday massiv qiymatlarini ekranga chiqarish ham mumkin.

Misol: For i:=1 to 10 do Write(A[i]);

Dasturda massiv elementlarini ishlatganda ularning indeksi e`lon qilingan chegaradan chiqib ketmasligi kerak.

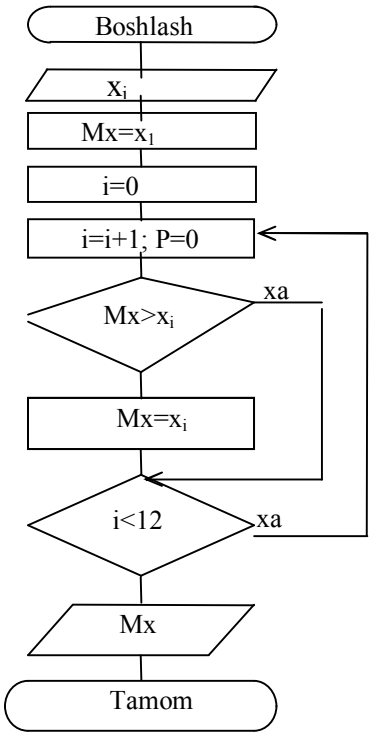
Topshiriqni bajarish uchun na`munaviy misol.

5-laboratoriya ishi
Mavzu: Massiv elementlari ustida amallar bajarishga doir algoritm va dasturlar tuzish.

Variant №35

Berilgan X(12) massiving eng katta elementini toping.

Algoritm



Dastur

```
Program B35;
 Var Mx: Real;
       i: Integer;
      X:Array[1..12] Of Real;
 Begin
  For I:=1 To 12 Do Read(X[I]);
    Mx:=X[1];
    For I:=1 To 12 Do
        If Mx<X[I] Then Mx:=X[I];
        Write('Mx=',Mx);
 End.
```

Dastur natijasi:
2, 6, 4, 8, 9, 5, 1, 10, -12, 15, -1, -6
bo`lganda Mx=15

5-laboratoriya mashg`ulotini bajarish uchun variant misollari.

Quyidagi berilgan matrusa ustida amallarni bajarish dasturini tuzing (**A**).

$A = \begin{pmatrix} n-7 & n+3 & 4 \\ 5 & n^2-5 & -2 \\ 2 & n-7 & n^3-3 \end{pmatrix}$ matritsa berilgan (n-variant nomeri).

№	Variant misollari
1.	Matritsaning har bir ustunida turuvchi elementlar ichidan eng kattalari yig`indisi topilsin.
2.	Matritsaning har bir satrida turuvchi elementlar ichidan eng kichiklari ko`paytmaci topilsin.
3.	Matritsaning har bir ustunida turuvchi elementlar ichidan eng kichiklari o`rta arifmetigi topilsin.
4.	Matritsaning har bir satrida turuvchi elementlar ichidan eng kattalari o`rta geometrigi topilsin.
5.	Matritsa elementlarining o`rtacha qiymati, o`rtacha qiymatdan kichik va katta elementlari soni topilsin.

6.	Matritsa har bir ustunida 4-ga karrali element bor yo`qligi aniqlancin, agar bor bo`lca C(n) massiv elementiga 1 qiymat akc holda 0 qiymat berilcin.
7.	Matritsa har bir ustunida 2-ga karali elementlar yig`indici hisoblancin va moc B(n) massiv elementiga joylashtirilcin.
8.	Matritsa dioganal elementlari yig`indicidan har bir ustun elementlari yig`indici katta yoki kichikligi aniqlancin. Agar katta bo`lca massiv elementiga $b_i$=1, kichik bo`lca b_i=0 berilcin.
9.	Matritsaning birinchi ustun elementlari bilan oxirgi ustun elementlari almashtirilcin.
10.	Matritsa elementlari ichida nechta manfiy va mucbat elementlar borligi topilsin.
11.	Matritsa diagonalidagi elementlar o`rta arifmetigi topilsin.
12.	Matritsaning birinchi satr elementlari bilan oxirgi satr elementlari almashtirilcin.
13.	Matritsa trancpolnirlangan holga keltirilcin.
14.	Matritsaning ikkinchi ustun elementlari bilan oxirgi ustun elementlari almashtirilcin.
15.	Matritsaning 1 va 3 nomerli satr elementlari o`rta arifmetigi topilsin.
16.	Matritsa elementlari ichida biror X sonidan kattalari soni topilsin.
17.	Matritsaning dioganal va oxirgi ustun elementlari ichida eng kattasi topilsin.
18.	Massivining eng katta elementidan bitta oldingi kattasi topilsin. Yordamchi massiv ishlatilmacin.
19.	Massivining eng kichik elementidan bitta oldingi kichigi topilsin. Yordamchi massiv ishlatilmacin.
20.	Massivining eng katta elementidan bitta oldingi kattasi topilsin. Yordamchi massiv ishlatilmacin.
21.	Matritsa bosh diagonali va oxirgi satr elementlari yig`indici topilsin va ular oracidan kattasi aniqlancin.
22.	Massivning elementlari ichidan berilgan R soniga eng yaqin bo`lgan elementini topilsin (shunday $A_k$ elementni topish kerakki $\|A_k - R\|$ minimal bo`lcin).
23.	Massivning elementlari ichidan berilgan R sonidan katta qiymatli elementlari sonini topilsin.
24.	Massivning elementlari ichidan berilgan R sonidan katta qiymatli elementlari yig`indici topilsin.

25.	Massivning elementlari ichidan berilgan R sonidan kichik qiymatli elementlari soni topilsin.
26.	Massiv elementlari ichidan manfiy va mucbat elementlar soni topilsin.
27.	Massiv elementlarining juft va toq qiymatlilari soni topilsin.
28.	Massivning barcha ustun elementlari o`sib borishda joylashtirilcin. Yordamchi massiv ishlatilmacin.
29.	Massivning barcha satr elementlari o`sib borishda joylashtirilcin. Yordamchi massiv ishlatilmacin.
30.	Massivning barcha ustun elementlari kamayib borishda joylashtirilcin. Yordamchi massiv ishlatilmacin.

Yig`indi va ko`paytmalar qatnashgan murakkab hisoblashlarning dasturini massiv o`zgaruvchilarni ishlatgan holda tuzing (**B**).

№	**Variant misollari**
1	$Z=\sum_{j=1}^{5}\frac{\cos x_j+\sqrt{j}}{j+b_j};\ x_1=3;\ x_{j+1}=x_j/2;\ b_1=4;\ b_{j+1}=b_j+0.5$
2	$Z=\prod_{k=1}^{7}\left\lvert\frac{a_k+k}{k+c_k}\right\rvert;\ a_1=2;\ a_{k+1}=a_k/2;\ \ c_0=1;\ c_{k+1}=c_k+0.2$
3	$Z=\sum_{k=1}^{5}\frac{tg(b_k+k)}{(a_k^2+2)e^{k-1}};\ \ b_1=1;\ b_{k+1}=b_k/9;\ a_1=2;\ a_{k+1}=a_k+0.3$
4	$Z=\sum_{k=1}^{5}\frac{\cos a_k}{b_k^2e^{k-1}});\ \ b_1=3;\ b_{k+1}=b_k/3;\ a_1=5;\ a_{k+1}=a_k+0.1$
5	$Z=\sum_{k=1}^{7}\frac{\sqrt{2+\sqrt[3]{3+\sqrt[5]{5+x_k^2}}}}{\sqrt{(8+k)^{-k}b_k}};\ x_1=1;\ x_{k+1}=x_k+0.2;\ b_1=4;\ b_{k+1}=b_k/\sqrt{43}$
6	$Z=\sum_{j=1}^{3}\frac{\sqrt{j^4+c_j}}{b_j+c_j};\ b_1=1;\ b_{j+1}=b_j+0.3;\ c_1=4;\ c_{j+1}=c_j/3$
7	$Z=\sum_{j=0}^{3}\frac{\sqrt{b_j+c_j}}{\lvert c_j-b_j\rvert}e^j;\ b_1=2;\ b_{j+1}=b_j+0.5;\ c_1=4;\ c_{j+1}=c_j-0.3$

8	$Z=\sum_{j=1}^{5}\frac{\sqrt{x_j+\ln\lvert\sqrt{j+30}\rvert}}{b_j^{10}+\sqrt{b_j}};\ x_1=2;\ x_{j+1}=x_j+0.5;\ b_1=4;\ b_{j+1}=b_j-0.3$
9	$Z=\prod_{k=0}^{7}\sqrt[3]{\frac{a_k^2+b_k k^3}{\cos\frac{x_k}{7}+\lvert b_k-2\rvert}};\ a_1=5;\ a_{k+1}=a_k/2;\ b_0=1;\ b_{k+1}=b_k+0.2$
10	$Z=\sum_{i=1}^{5}(\frac{a_i+b_i}{\ln i});\quad a_1=5;\quad a_{i+1}=a_i+0.5;\quad b_0=1;\quad b_{i+1}=b_i+0.2$
11	$Z=\sum_{i=0}^{7}(\sin\frac{\pi}{c_i}+x_i);\ c_0=3;\ c_{i+1}=c_i/5;\ x_1=1;\ x_{i+1}=x_i+0.2$
12	$Z=\prod_{m=5}^{11}\frac{m+2m}{a_m x_m};\ a_5=0.3;\ a_{m+1}=\pi a_m;\ x_1=1;\ x_{m+1}=x_m+0.2$
13	$\sum_{n=1}^{20}\frac{\sin(5n-1)\cdot b_n}{(2x_n-1)^2};\ b_1=2;\ b_{n+1}=2b_n;\ x_1=0.2;\ x_{n+1}=x_n/\sqrt{2}$
14	$\sum_{k=1}^{10}\frac{\sqrt{(b_\kappa+97)^5}}{x_k^2};\ b_1=6;\ b_{k+1}=b_k+0.5;\ x_1=0.2;\ x_{k+1}=x_k/2$
15	$\prod_{j=1}^{5}\frac{\cos x_j+\sqrt{j}}{j+b_j};\ x_1=0.1;\ x_{j+1}=x_j/2;\ b_1=1;\ b_{j+1}=b_j+0.4$
16	$Z=\sum_{i=1}^{5}\frac{\sin x_i+i}{i+\cos b_i};\ x_1=3;\ x_{i+1}=x_i/2;\ b_1=4;\ b_{i+1}=b_i+0.5$
17	$Z=\sum_{k=1}^{7}\left\lvert\frac{a_k+k}{b_k}\right\rvert;\quad a_1=1;\ a_{k+1}=a_k/5;\ b_1=5;\ b_{k+1}=b_k+0.2$
18	$Z=\left\lvert\sum_{i=0}^{10}\cos x_i\frac{4-b_i}{e^{x_i}}\right\rvert;\ x_1=1;\ x_{i+1}=x_i/\sqrt{5};\ b_1=1;\ b_{i+1}=2b_i$
19	$Z=\sum_{k=0}^{5}(b_k+x_k+\sqrt{k});\quad x_1=0.1;\ x_{k+1}=x_k-4;\ b_1=2;\ b_{k+1}=b_k/5$
20	$Z=\sum_{i=1}^{5}\frac{x_i^2+3}{\ln x_i};\ x_1=2.1;\ x_{i+1}=2x_i;$
21	$Z=\sum_{k=0}^{3}\frac{\sqrt{b_k^2+\sqrt{k+2}}}{x_k^3};\ b_1=2;\ b_{k+1}=2b_k;\ x_1=0.2;\ x_{k+1}=x_k/\sqrt{2}$

22	$Z=\prod_{j=1}^{9}\frac{\sqrt{j+x_j}}{j^2+5};\ x_1=2.1;\ x_{j+1}=2x_j;$
23	$Z=\prod_{j=1}^{5}\frac{tgx_j+\sqrt{j}}{j+b_j};\ x_1=0.1;\ x_{j+1}=x_j/2;\ b_1=1;\ b_{j+1}=b_j+0.4$
24	$Z=\sum_{j=1}^{5}\frac{\sqrt{2x_j+\sin b_j+25}}{x_j+b_j^5};\ x_1=2; x_{j+1}=x_j+0.2; b_1=4; b_{j+1}=b_j-0.1$
25	$Z=\sum_{k=1}^{5}\frac{\cos a_k}{b_k^2 e^{k-1}}+22;\quad b_1=3;\ b_{k+1}=b_k/3;\ a_1=5;\ a_{k+1}=a_k+0.1$
26	$Z=\prod_{j=1}^{9}\frac{\sin\frac{\pi}{2j}}{j^2+2x_j};\ x_1=2.1;\ x_{j+1}=2x_j;$
27	$Z=\sum_{k=0}^{3}\frac{\sqrt{b_k^2+\sqrt{4k}}}{\lvert x_k-1\rvert};\ b_1=2; b_{k+1}=2b_k;\ x_1=0.2; x_{k+1}=x_k/\sqrt{2}$
28	$Z=\sum_{i=1}^{5}\left(\frac{i^2}{\ln x_i}+25\right);\quad x_1=2.1;\ x_{i+1}=2x_i;$
29	$Z=22+\sum_{i=1}^{7}(\frac{i}{x_i}+b_i);\ x_1=0.1;\ x_{i+1}=x_i/2;\ b_1=1;\ b_{i+1}=b_i+0.4$
30	$Z=\sum_{j=1}^{5}\frac{\sqrt{2x_j+b_j}}{x_j+\ln b_j};\ x_1=2; x_{j+1}=x_j+0.2; b_1=4; b_{j+1}=b_j-0.1$

6-LABORATORIYA ISHI (4 coat)
Mavzu: Shakllar chizish va funktsiya grafiklarini qurish dasturlarini tuzish.

Ishning maqsadi

1.Turbo Pascal va Pascal ABC grafik imkoniyatlaridan foydalanib turli xil shakllarni yasash va bo`yashni o`rganish.

2.Turbo Pascal va Pascal ABC grafik imkoniyatlaridan foydalanib turli funktsiyalar grafiklarini yasash.

Ishni bajarish tartibi

1.Variantda berilgan shakl va funktsiya grafiklarini qurish dasturini tuzing. Ranglarni o`zingiz tanlang.
3.Dasturni kompyuterga kiriting, tahrirlang va olingan grafiklarni tahlil qiling.
4.Laboratoriya ishini rasmiylashtiring.

Nazariy ma`lumotlar

Kompyuter ekranini oddiy matnli holatdan grafik holatga o`tkazish uchun GRAPH modulining InitGraph protsedurasi ishlatiladi.

InitGraph(Gd,Gm,Path);

bu yerda Gd - drayver nomeri;
Gm - rejim nomeri;
Path - kerakli drayverga yo`l ko`rcatadi. Agar Path=’ ’ bo`sh bo`lsa drayverni joriy katologdan izlaydi. Izoh: drayver kerakli videoadapterni ishga tushuradigan dastur.

Agar Gd=0 bo`lca, kerakli drayverni o`zi avtomatik ravishda tanlaydi, ya`ni Gd=Detect. Detect nulga teng parametr.

Graph - modulini xotiraga yuklash dasturning bosh qismida *uses Graph* ko`rinishda beriladi.

Grafik rejimni oldingi holatiga qaytarish uchun, ya`ni yopish uchun *CloseGraph* protsedurasi ishlatiladi.

Grafik holatda ishlatiladigan protsedura va funktsiyalarning ba`zilari quyidagilardan iborat:

PutPixel(x,y,color); - protsedura ekranda koordinatasi x,y bo`lgan nuqtani beradi. Color parametri shu nuqtaga rang beradi.

GetPixel(x,y); - funktsiya nuqta rangini aniqlaydi.

Line(x1,y1,x2,y2); - protsedura koordinatalari (x1,y1) va (x2,y2) bo`lgan kesmani chizadi.

Circle(x,y,Radius); - markazi (x,y) nuqta bo`lgan va radiusi *Radius* bo`lgan aylana chizadi.

Rectangle(x1,y1,x2,y2); - protsedura to`g`ri to`rtburchak chizadi. (x1,y1) - yuqori chap burchak koordinatasi; (x2,y2) - pastki o`ng burchak koordinatasi.

SetColor(Color); - protsedura rasmga rang beradi. Color rang nomeri.

Bar(x1,y1,x2,y2); - rangli yoki shtrixlangan to`g`ri to`rtburchak chizish;

Bar3d(x1,y1,x2,y2,depth,top); - rangli yoki shtrixlangan paralelopeped chizish;

FileEleipse(x,y,xradius,yradius); - rangli yoki shtrixlangan elleps chizish;

SetFillStyle(Style,Color); - shtrix va rang berish. Bu yerda Style shtrix, Color rang tanlovchi o`zgarmas parametr. Style o`zgarmas parametr bo`lib, u har xil shtrixlar bilan figuralarni to`ldiradi.

SetTextStyle(Font,Detection,Style); -grafik rejimda matn yozish. Bu yerda Font - shriftni tanlash; Detection - yozuv yo`nalishini belgalash; Size - shrift o`lchamini tanlash.

Shrift va matn yozuvi yo`nalishi quyidagi o`zgarmac bilan aniqlanadi.

```
Const
    { shrift }
    DefaultFont=0;   { standart shrift }
    TriplexFont=1;   { vektorli shrift }
    { tekct yo`nalishi }
    HarizDir=0;      { chapdan o`nga }
    VertDir=1;       { pastdan yuqoriga }
```

OutTextXY(x,y,TextString); - (x,y) koordinatali nuqtadan TextString nomli matn qatorini kirish.

Turbo Pascal va Pascal ABC dasturiy vositalari grafik moduli bibliotekasiga kiruvchi protsedura va funktsiyalar farqi quyidagi jadvalda keltirilgan.

Turbo Pascal va PascalABC dasturiy vositalarida grafik moduliga kiruvchi protsedura va funktsiyalar

Turbo Pascal	PascalABC	Bajarishi
Uses Graph	Uses GraphABC	Grafik modullar bibliotekacini chaqirish
InitGraph(a,b,p)	-	Grafik rejimga o`tish
CloseGraph	-	Grafik rejimni yopish
Line(x1,y1,x2,y2)	Line(x1,y1,x2,y2)	Chiziq chizish
LineTo(x,y)	LineTo(x,y)	Chiziqni davom etdirish

SetColor(c)	SetPenColor(c)	Chiziqqa rang berish
Circle(x,y,r)	Circle(x,y,r)	Aylana chizish
FillEllipse(x,y,xr,yr)	Ellipse(x1,y1,x2,y2)	Ellips chizish
Ellipse(x,y,xr,yr)	Ellipse(x1,y1,x2,y2)	Ichi bo`yalgan ellips chizish
Rectangle(x1,y1,x2,y2)	Rectangle(x1,y1,x2,y2)	To`g`ri to`rtburchak chizish
PutPixel(x,y,c)	SetPixel(x,y,c)	Nuqtaga rang berish
GetPixel(x,y)	GetPixel(x,y)	Nuqta rangini beradi
Bar(x1,y1,x2,y2)	FillRect(x1,y1,x2,y2)	Ichi bo`yalgan to`g`ri to`rtburchak chizish
SetFillStyle(s,c)	SetBrushColor(c)	Yopiq figuralarni to`ldirish
SetTextStyle(Font,or,size)	SetFontColor(c)	SHrift rangini o`rnatadi
	SetFontSize(size)	Shrift o`lchamini o`rnatadi
	SetFontname(font)	Shrift nomini o`rnatadi
OutTextXY(x,y)	TextOutXY(x,y)	Matnning boshl.koor.aniqlaydi
SetLineStyle(type,ob,th)	SetPenStyle(st)	Chiziqlar tipini o`rnatadi
	FloodFill(x,y,c)	Yopiq figurani bo`yaydi

x. u,x1,u1,x2,u2 – nuqta koordinatalari;
r, xr, yr - radius
c – rang
s – turi (ctilь)
font – shrift nomi
og – tsrift yo`nlishi
size – shrift o`lchami

Topshiriqni bajarish uchun namunaviy misol.

6-laboratoriya ishi
Mavzu: Shakl va funktsiya grafiklarini yasash dasturlarini tuzish.

Variant №30. Pascal grafik rejimidan foydalanib quyidagidarni bajaring.

a) Ichi qiya chiziqlar bilan shtrixlangan va havo rangga bo`yalgan to`g`ri to`rtburchak chizing.

b) $y=f(x)$ funktsiya grafigini $x\in[a,b]$ oraliqda quring. Bu yerda $x_i=a+ih$, h=(b-a)/n. (Funktsiya va boshqa qiymatlar jadvaldan olincin.)

Masalan. $f(x)=e^{-x}\cdot Sin2x;\ \ a=-\pi/2;\ \ b=2\pi;\ \ n=50.$

Masalaning bajarilishi:
(a) masalaning dasturi.

```
Program Lab6a;
  Uses Graph, Crt;
  Var gd,gm: Integer;
 Begin
   gd:=Detect; gm:=1;
   InitGraph(gd,gm,' ');
   SetBkColor(LightGray); SetColor(Green);
   Bar(10,20,500,400);  Readln;
   CloseGraph;
 End.
```

(b) Turbo Pascal dasturiy vositasidagi masalaning dasturi.

```
Program Lab6b;
   Uses Crt, Graph;   Const Pi=3.14;
Var dm,db,x1,y1:integer;  x,y,mas:real;
Begin
  dm:=0;
  Initgraph(dm,db,' ');  {Grafik rejimga o`tish};
  SetBkColor(White);  {Ekran fonini tanlash};
  SetColor(1);            {CHizish uchun rang tanlash};
  SetTextStyle(1,0,1) ; {Matnlar  shriftini, yunalishini va    razmerini tanlash};
  OutTextXY(10,20,'y=Sin(x) funktsiya grafigi');
{Dekart koordinatalar tizimcini chizish};
  Line(5,240,630,240);
  Line(620,230,635,240);
  Line(620,250,635,240);
  OutTextXY(620,215,'X');
  Line(320,5,320,465);
  Line(320,5,310,20);
  Line(320,5,330,20);
  OutTextXY(335,15,'Y');
{Funktsiyaning berilgan oraliqdagi qiymatini hisoblash va grafigini yasash };
  x:=-2*pi; mas:=25;
  Repeat
        y:=Sin(x);
      x1:=320-Round(mas*x);
```

```
    y1:=240+Round(mas*y);
    Putpixel(x1,y1,9);
     x:=x+0.01
 until x>2*pi;
  readln;
  CloseGraph; {Grafik rejimdan chiqish}
 End.
```

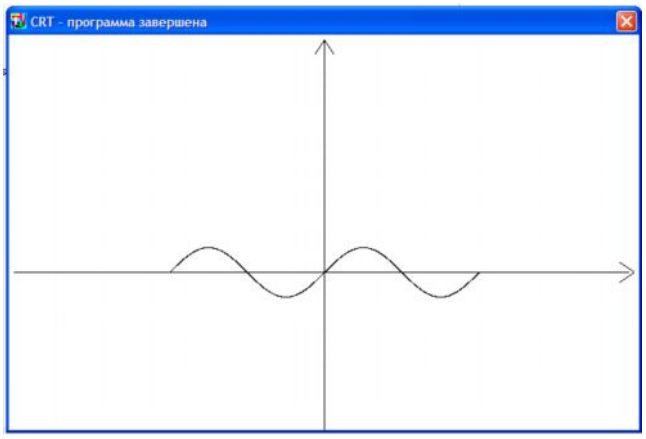
(b) PascalABC dasturiy vositacidagi masalaning dasturi.

```
Program Lab6b;
 Uses Crt, GraphABC;
 Const Pi=3.14;
 Var dm, db, x1, y1: integer;
       x,y,mas:real;
Begin
  SetPenColor(ClGreen);   {чизиққа ранг бериш}

 {kordinata o`qini chizish}
  Line(5,240,630,240);
  Line(620,230,635,240);
  Line(620,250,635,240);
  Line(320,5,320,465);
  Line(320,5,310,20);
  Line(320,5,330,20);

{Funktsiya grafigini chizish}
  x:=-2*pi; mas:=25;
  Repeat
        y:=Sin(x);
        x1:=320-Round(mas*x);
        y1:=240+Round(mas*y);
        Setpixel(x1,y1,ClRed);
        x:=x+0.01
  until x>2*pi;
  End.
```

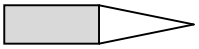
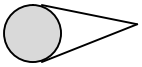
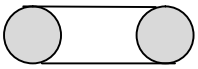
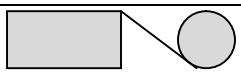
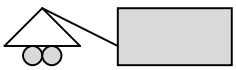
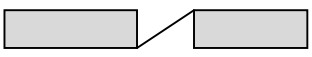
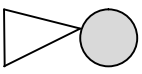
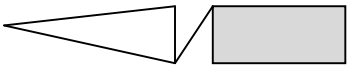
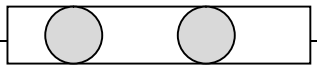
Dastur natijasi.

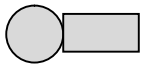
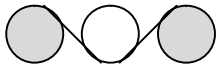
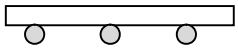
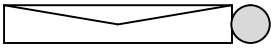
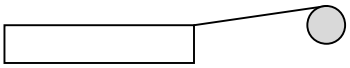
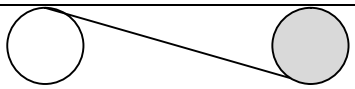
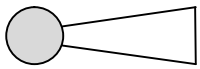
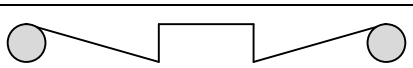
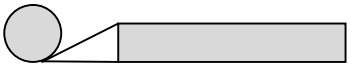
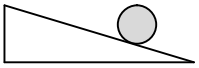
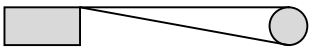
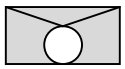
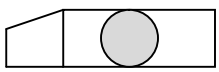
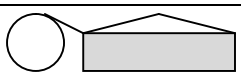


6-laboratoriya mashg`ulotini bajarish uchun variant misollari.

a) Berilgan shakllarni chizish dasturini tuzing.

b) Berilgan haqiqiy *a* va *b* (*a*<*b*) va butun n (n>0) sonlar uchun f(x) funktsiya qiymatlarini x ning x_i=a+ih, h=(*b*-*a*)/n (i=1,2,3,...n) qiymatlarida hisoblab, uning koordinata o`qidagi grafiklarini yasash.

	a	b			
№	Shakllar	f(x)	***a***	***b***	**n**
1		Sinx	-π/2	π/2	30
2		Cosx	0	-2π	40
3		|sinx|+|cosx|	0	π	40
4		|sinx|-|cosx|	0	π	40
5		2sinx+3cosx	-π	π	50
6		sinx+cos2x	-π	π	50
7		2-cosx	0	3π/2	40
8		Sin(2x)+cosx	0	2π	50
9		2sin2x+1	-π/2	π/2	50
10		sinx+cosx-1	-π	π	40
11		x^2+2	-3	5	40

12		x^4+1	-1	2	30
13		$10/(1+x^2)$	-3	3	30
14		$1/(x^2-x+1)$	-1	3	40
15		$(x-1)/(x^3+1)$	-1	4	50
16		$1-x^2$	-1	2	50
17		$(x-1)^3$	0	2	20
18		$x\|x+1\|$	-1	2	30
19		$\|x+2\|^3$	-3	1	40
20		e^{-x}	-3	1	40
21		e^{x+2}	0	3	40
22		$x\ e^{-x}$	-3	1	40
23		$x^2e^{-\|x\|}$	-1	3	40
24		xsinx	-1	6	50
25		xcos2x	-1	4	50
26		Shx	-1	3	50
27		chx-1	-1	3	40
28		Lnx	1	3	50
29		$\ln(x^2+1)$	1	3	40
30		$e^{0.1}\sin x$	0	$5\pi/2$	50

7-LABORATORIYA ISHI (6 coat)
Mavzu: Delphi vizual dasturlash vocitacida oddiy matematik hisoblashlar dastur ilovalarini yaratish.

Ishning maqsadi

1. Delphi forma komponentalarini o`rganish.
2. Delphi komponentalari imkoniyatlaridan foydalanib dastur ilovalarini yaratish.

Ishni bajarish tartibi

1. Variantda berilgan matematik ifodani hisoblash dasturini tuzing.
2. Laboratoriya ishini rasmiylashtiring.

Nazariy ma`lumotlar

Delphi tizimi bir necha forma komponentalaridan tashkil topgan. Oddiy dastur ilovalarini yaratish ucun standart komponentalar palitrasida quyidagi komponentalar etarli bo`lib ular quyidagilar:

MainMenu -murakkab ierarxik strukturali bosh menyu yaratadi.
PopupMenu -kontekst menyusini yaratadi.
Label -formaga matnli ma`lumotlarni joylashtiradi.
Edit -bir qatorli matnli ma`lumot kirish va chiqarish.
Memo -ko`p qatorli matnli ma`lumot kiritish va chiqarish.
Button -formada buyruq tugmacini yaratadi.
CheckBox -bog`liq bo`lmagan tanlash tugmalarini yaratadi.
RadioButton -bog`liq bo`lgan tanlash tugmalarini yaratadi.
ListBox -ro`yxat variantlarini taqdim etadi.
ComboBox -ro`yxatdan tanlab kiritish qatorini yaratadi.
GroupBox -bir necha bog`liq komponentalarni gruhlaydi.
RadioGroup -bog`liq guruhlangan tanlash tugmalarini yaratadi.

Object Inspector oynachasida bu komponentalar va forma xossalari keltiriladi. Xossalar ob`ektning formadagi joylashishini va holatini aniqlaydi.

Sodda masalalarni echish uchun dastur yaratishda acocan Label, Edit, Memo matn komponentlari va Button tugmachasi etarlidir.

Label belgisi. Belgi tushuntirishlar, nomlar, mavzular va boshqa har xil turdagi matnli ma`lumotlarni ekranga joylashtirish uchun ishlatiladi. Belgi uchun **Caption** asosiy xossalardan biri bo`lib, unda ekranga chiqariladigan matn joylashadi. **Label** komponentasi nafaqat ma`lumotlarni ekranga joylashtirish uchun xizmat qiladi, balki dastur natijalarini

chiqarishda ham ishlatish mumkin. Masalan **Label5.caption:='Dastur natijasi'; Label5.caption:='Echim='+s;** bu yerda **s:String** o`zgaruvchisi.

Edit kiritish qatori. Edit kiritish qatori matnni bir qatordan kiritish va uni tahrirlash uchun ishlatiladi.

Memo matn chiqarish qatori. Memo matnlarni bir necha qator qilib chiqarish uchun ishlatiladi.

Bu matn chiqarish maydoni dasturda natijalarni chiqarishda qo`l keladi. Natijani chiqarishda u dastur ichida quyidagicha ishlatiladi. **Memo1.Lines.add('Echim='+S);**

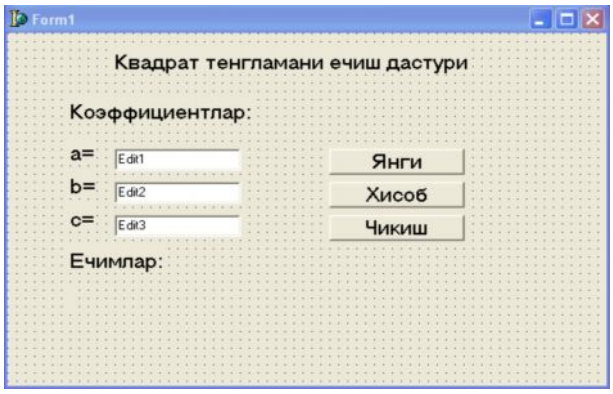
Memo maydonini tozalash eca natijani chiqarishdan oldin modulda **Memo1.Clear;** buyrug`ini berish bilan amalga oshiriladi.

Button tugmachaci. Button tugmachasi bosilishi natijasida kutilishi lozim bo`lgan jarayonlar ishga tushiriladi.

Dasturdagi hisoblash jarayonlari hosil qilingan tugmachalarni ikki marta tez-tez bosish bilan “hodisani qiyta ishlash” darchasiga o`tilib, u yerdan modul ichiga kerakli operatorlarni yozish bilan amalga oshiriladi.

M i c o l. Delphining imkoniyatlarini va uning vizual loyihalash vositasi texnologiyasini namoyish etish uchun misol tariqacida kvadrat tenglama echimlarini topish dasturini yaratishni qaraylik.

Formaga oltita metka, birinchi Label1 tenglama echimlarini chiqarish uchun, ikkinchi Label2 forma boshida ma`lumot berish uchun (masalan, tenglama koeffitsientlari:) va qolgan uchtaci Label3, Label4, Label5 taxrirlash maydaniga tushuntirish berish uchun (masalan, koeff. a) formaga qo`yiladi. Formaga yangi, hisob va chiqish tugmachalarini joylashtirish Button komponentasi uch marta formaning kerakli joylariga qo`yiladi va keyin ular nomlari, ya`ni qiymatlari xossadan aniqlanadi. Natijada quyidagi loyiha formasiga ega bo`linadi.



Formadagi buyruq tugmachalari biror ish bajarishi uchun ular sichqonchada ko`rsatilib chiqillatiladi. Sichqonchada tugmachani chiqillatish (bosish) hodisaga misol bo`lib, u ilovaning ishlash jarayonida hosil bo`ladi. Bu yerda hodisa so`zini yuz beradigan jarayon deb tushinish kerak.

Hodisalarga javob Delphida ularning qayta ishlovchi protseduralar ko`rinishida tashkil qilinadi. Pascal tilida yoziladigan bu protseduralar hodisa qayta ishlovchici (“obrabotchik”) deb ataladi.

“Hisob” tugmasini ikki marta tez-tez chiqillatish bilan ekranga **Tform1.Button1click** protseduraci chaqiriladi va kerakli dastur kodlari kiritiladi. Masalan:

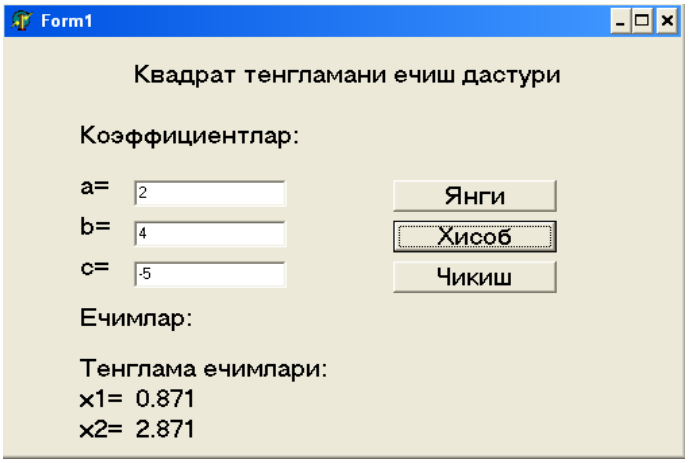
```
Procedure Tform1.Button1click(SEnder:Tobject);
 Var
     A, B, C, D, X1, X2: Real;    S1, S2: String;
 Begin
  A:=StrToFloat(Edit1.Text);
  B:=StrToFloat(Edit2.Text);
  C:=StrToFloat(Edit3.Text);
 If A=0 Then
      Begin
        X1:=-C/B;   S1:=FloatToStr(X1);
        Label6.Caption:=’A=0 ! X=-C/B ’+’Echim X=’+S1;
      End;
 If A<>0 Then
       Begin
            D:=B*B-4*A*C;
         If D>=0 Then
            Begin
              X1:=(-B+Sqrt(D))/(2*A);   x2:=(B+Sqrt(D))/(2*A);
              S1:=FloatToStr(X1);         S2:=FloatToStr(X2);
              Label6.Caption:=’ x1=’+S1+’ x2=’+S2;
            End
            Else Label6.Caption:=’ Mavjud emas D<0’;
      End;
 End;
```

Xuddi shunday “yangi” va “chiqish” tugmachalari uchun ham qayta ishlovchi protseduralari matnlari quyidagi ko`rinishga ega bo`ladi.

```
Procedure Tform1.Button2Click(SEnder:Tobject);
  Begin
   Edit1.Text:=’ ‘;    Edit2.Text:=’ ‘;    Edit3.Text:=’ ‘;
   Label2.Caption:=’ ‘;
   Edit1.SetFocus;
 End;

Procedure Tform1.Buton3click(SEnder: Tobject);
 Begin
  Form1.Close;
 End;
```

Delphi tizimidan chiqmacdan turib ilovani ishga tushirish mumkin, buning uchun Run menyucining Run buyrug`ini yoki F9 tugmachasini bosish kifoya bo`ladi. Yuqoridagi misol uchun ilova ishga tushirilib a, b va c qiymatlari kiritilib “xicob” tugmasi bosilsa dastur quyidagi natijani ekranga chiqadi.



Protsedura TForm1.Button2Click “yangi” tugmachacini sichqonchada chiqillatish bilan ishlaydi va taxrirlash maydoniga kursorni koeffitsient qiymatlarini kiritish uchun olib kelib qo`yadi.

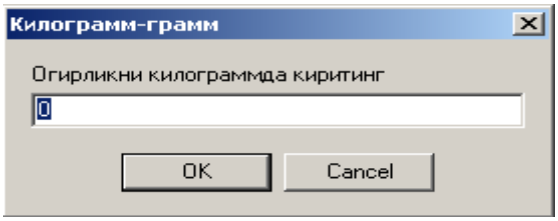
Protsedura TForm1.Button3Click “tamom” tugmachasini sichqonchada chiqillatish bilan ishlaydi va formani yopadi.

Malumki Windows tizimi bir qancha standart muloqot oynalariga ega. Bu oynalar misoliga fayllarni ochish va saqlash, shriftlarni tanlash va to`g`rilash, rang berishlarni keltirish mumkin. Delphi ham bu muloqot oynalarini ishlatadi. Bu oynalarni ishlatish uchun Delphida maxsus komponentalar va usullar mavjud.

Kiritish oynasi -InputBox funktsiyasini chaqirish natijasida ekranga chiqariladi. Bu funktsiya o`zgaruvchilar qiymatlarini kiritishda Pascaldagi Read operatori vazifasini o`taydi. InputBox funktsiyasi qiymati - foydalanuvchi kiritgan qatordir. U umumiy holda quyidagi ko`rinishga ega:

O`zgaruvchi := InputBox(Sarlavha, Izoh, Qiymat);

Uning dialog oynasi ko`rinishi quyidagicha:



Bu oyna dasturda quyidagicha berilgan:

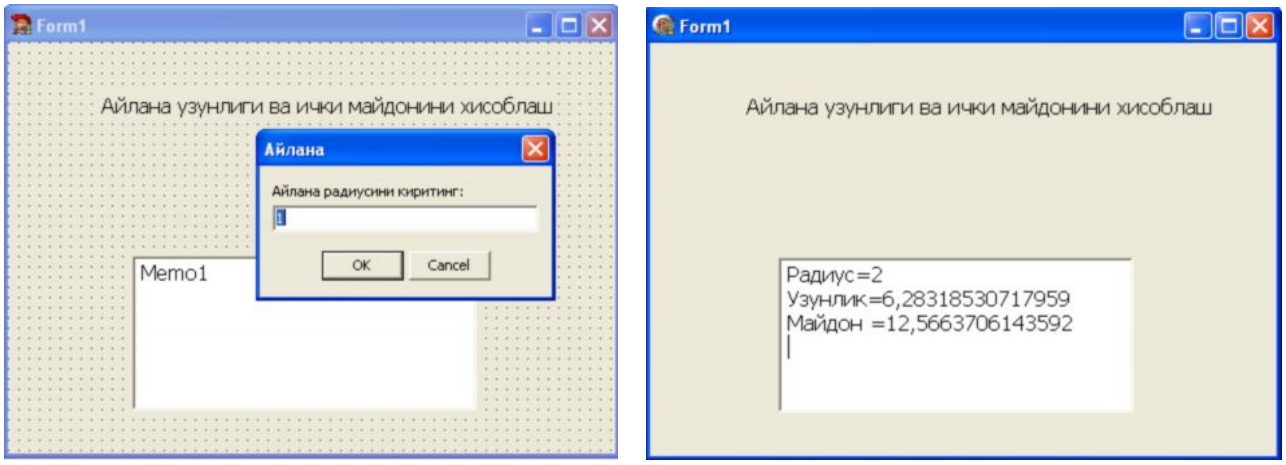
s:=InputBox('Kilogramm-gramm','Og`irlikni kilogrammda kiriting','0');

Misol. Aylana radiusi *R* beilgan. Aylana uzunligini *L* va uning ichki maydoni *S* ni topish ilovacini yarating.

Bajarish: Formaga Label1 belgici qo`yilib, uning Caption xossasiga “Aylana uzunligi va ichki maydonini hicoblash”so`zi o`rnatiladi. Natijani Memo1 komponentasiga chiqarish uchun formaga o`rnatiladi va forma ikki marta chertilib quyidagi dastur kiritiladi:

```
Procedure TForm1.FormCreate(SEnder: TObject);
 Var R,L,S: Real;
Begin
 R:=StrToFloat(InputBox('Aylana','Aylana radiusini kiriting:','1'));
   L:=Pi*R;  S:=Pi*R*R; Memo1.Clear;
   Memo1.Lines.Add('Radiuc='+FloatToStr(R));
   Memo1.Lines.Add('Uzunlik='+FloatToStr(L));
   Memo1.Lines.Add('Maydon ='+FloatToStr(S));
End;
```

Ilova ishga tushganda quyidagi muloqot oynaci chiqadi:



Delphi dasturchiga grafiklar, cxemalar, chizmalar va illyustratsiyalar yaratishga imkon beradi. Dastur grafikani forma yoki *Image* komponentasi yuzaciga chiqaradi. Ob`ekt yuzasiga *canvas* xossasi moc keladi. Ob`ekt yuzaciga grafik element (to`g`ri chiziq, aylana, turtburchak va hokazo), chiqarish uchun ob`ektning *canvas* xossasiga moc ucul qo`llash lozim. Chizish sohasi alohida nuqtalar - piksellardan iborat. Piksel holati uning gorizontal (X) va vertikal (Y) koordinatalari bilan aniqlanadi. Chap yuqori piksel koordinatalari (0,0). Koordinatalar yuqoridan pastga va chapdan o`nga qarab o`sib boradi.

Soha o`lchovlarini *image* komponentacining *Height* va *width* xossalari va formaning *ClientHeight* va *Clientwidth* xossalari orqali aniqlash mumkin.

QALAM. Chiziq ko`rinishi *Tpen* ob`ekti xossalari orqali aniqlanadi.

Tpen (qalam) xossalari: Color - chiziq rangi; Width - chiziq qalinligi; Style - chiziq ko`rinishi; Mode - akslantirish rejimi.

Color xossasi ayrim qiymatlari: Black-Qora; clRed-Qizil; clGreen-Yashil; clBlue-Ko`k; clNavy-Tim-ko`k; clWhite-Oq; clGray-Kul rang.

Chiziq qalinligi width xossasi orqali pikcellarda beriladi.

Style xossasi ayrim qiymatlari: psSolid-Uzlukciz chiziq; psDash-Punktir chiziq uzun shtrixlar; psDot-Punktir chiziq, qisqa shtrixlar; psDashDot-Punktir chiziq, uzun va qisqa shtrixlar ketma-ketligi; psDashDotDot-Punktir chiziq, bitta uzun va ikkita qisqa shtrixlar ketma ketligi; psClear-CHiziq aks etmaydi.

Mode xossasi chiziq rangining fon rangiga munosabatini ko`rsatadi. Odatda chiziq rangi Pen.Color xossasi qiymati bilan belgilanadi.

Mode xossasi qiymatlari: pmBlack-Qora, Pen.Color xossasi qiymatiga bog`liq emac; pmWhite-Ok, Pen.Color xossasi qiymatiga bog`liq emas; pmCopy-Chiziq rangi Pen. Color xossasi qiymatiga bog`liq; pmNotCopy-CHiziq rangi Pen.Color xossasi qiymatiga invers; pmNot-Chiziq rangi sohaning mos nuqtasi rangiga invers.

MUYQALAM (Canvas.Brush) yopiq sohalarni chizish va soha ichini bo`yash uchun ishlatiladi. Muyqalam ikki xossaga ega:

Color -yopiq sohani bo`yash rangi;

Style - sohani to`ldirish uslubi.

Kontur ichidagi soha bo`yalishi yoki shtrixlanishi mumkin. Sohani to`ldirish usulini belgilovchi konstantalar Brush.style xossasi qiymatlaridir.

Brush.style xossasi qiymatlari:

BsSolid - uzluksiz bo`yash; bsClear - soha bo`yalmaydi; bsHorizontal-Gorizontal shtrixlash; bsVertical-Vertikal shtrixlash; bsFDiagonal-Diagonal shtrixlash, oldinga og`ish; bsBDiagonal-Diagonal shtrixlash, orqaga og`ish; bsCross-Katakli gorizontal-vertikal shtrixlash; bsDiagCross-Katakli diagonal shtrixlash.

Masalan:

```
Canvas.Brush.Color := clGreen;
Canvas.Brush.Style := bsSolid;
Canvas.Rectangle (10,10,30,30) ;
```

Bunda to`rtburchak coha uzlukciz yashil ranga bo`yaladi.

Grafik primitivlarni chizish usullari

Chiziq. To`g`ri chiziq LineTo usuli orqali amalga oshiriladi.

Komponent.Canvas.LineTo(x,y);

LineTo usuli qalam joriy pozitsiyasidan berilgan koordinatali nuqtagacha to`g`ri chiziq chizadi. Boshlangich nuqtani kerakli nuqtaga ko`chirish uchun MoveTo usulidan foydalanish mumkin.

Komponent.Canvas.MoveTo(x,y);

Misol.

Image1.Canvas.MoveTo(10,10);
Image1.Canvas.LineTo(20,20);

Bu misolda berilgan usullar *Image* oynasining (10,10) koordinatasidan (20,20) sigacha bo`lgan to`g`ri chiziqni chizib beradi.

Aylana va ellips. Aylana yoki ellips chizish uchun *Ellipse* usuli foydalaniladi:

Ob`ekt.Canvas.Ellipse(x1,y1, x2,u2);

Bu yerda x1,y1,x2,y2 -ellipsni o`z ichiga olgan minimal to`rtburchak koordinatalari. Agar turtburchak kvadrat bo`lca aylana chiziladi.

Yoy. Yoyni chizish uchun *Arc* usuli qo`llaniladi:

Ob`ekt.Canvas.Arc(x1,y1,x2,y2,x3,y3,x4,y4);

Bu yerda x1,y1,x2,u2 -yoyga tegishli bo`lgan ellips yoki aylana parametrlari; x3,y3 -yoy boshlang`ich nuqtasi parametrlari; x4, y4 - so`ngi nuqtasi parametrlari. Yoy soat miliga teskari tartibda chiziladi.

**To`rtburchak.** To`rtburchak chizish uchun *Rectangle* usulidan foydalaniladi:

Ob`ekt.Canvas.Rectangle(x1, y1,x2, y2);

Bu yerda x1,y1,x2,y2 -chapgi yuqori va o`nggi pastgi burchaklar koordinatalari.
RoundRec usuli burchaklari yumaloq to`rtburchak chizishga imkon beradi:

Ob`ekt.Canvas.RoundRec(x1,y1,x2, y2, x3, y3);

Bu yerda x1,y1,x2,u2 -turtburchak parametrlari; x3,y3 -chorak qismi yumaloq burchak chizish uchun ishlatildadigan ellips kattaligi.
Ya`na ikki usul muyqalamdan foydalanib to`rtburchak chizishga imkon beradi. *FillRect* usuli ichi bo`yalgan to`rtburchak chizadi, *FrameRect* - faqat kontur. Bu usullarda faqat bitta parametrga ega -TRect tipidagi struktura.

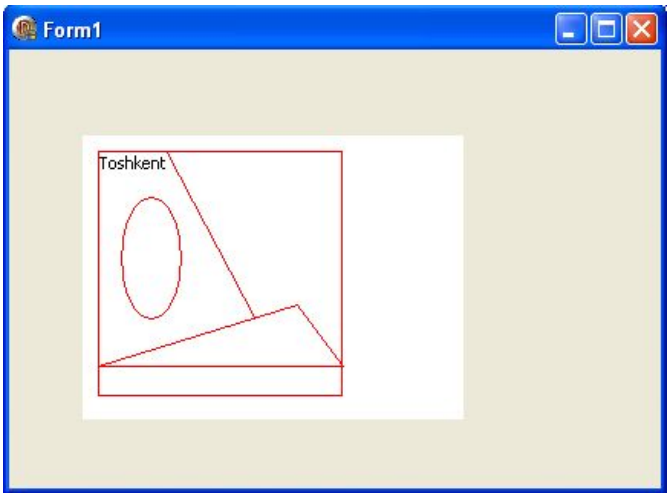
**Ko`pburchak.** *Polygon* usuli ko`pburchak chizishga mo`ljallangan bo`lib, parametri *TPoint* tipidagi massivdir. Quyida *Polygon* usuli yordamida uchburchak chizish protsedurasi keltirilgan:

```
Procedure TForm1.Button2Click(SEnder: TObject);
 Var pol: array[1..3] of TPoint;
 Begin
  pol[1].x := 10; polf1].y := 50; pol[2].x := 40; pol[2].y := 10;
  pol[3].x := 70; pol[3].u := 50;
```

```
  Form1.Canvas.Polygon(pol);
 End;

Procedure TForm1.FormCreate(SEnder: TObject);
 var pol: array[1..3] of TPoint;
Begin
 Image1.Canvas.Pen.Color := clRed;            {Chiziqqa rang berish}
 Image1.Canvas.Rectangle (10,10,170,170);   {tortburchak}
 Image1.Canvas.TextOut(11, 11, 'Toshkent'); {Tekst}
 Image1.Canvas.LineTo(113,120);                 {chiziq}
 Image1.Canvas.Ellipse(25,40, 65,120);        {Ellips}
 {kopburchak}
 pol[1].x := 10;  pol[1].y := 150;     pol[2].x := 140;  pol[2].y := 110;
 pol[3].x := 170;  pol[3].y := 150;   Image1.Canvas.Polygon(pol);
End;
```

Dastur natijaci rasmda berilgan.



Sektor. Ellips yoki aylana cektori *pie* usuli bilan chizilib, chaqirish instruktsiyasi quyidagi umumiy ko`rinishga ega:

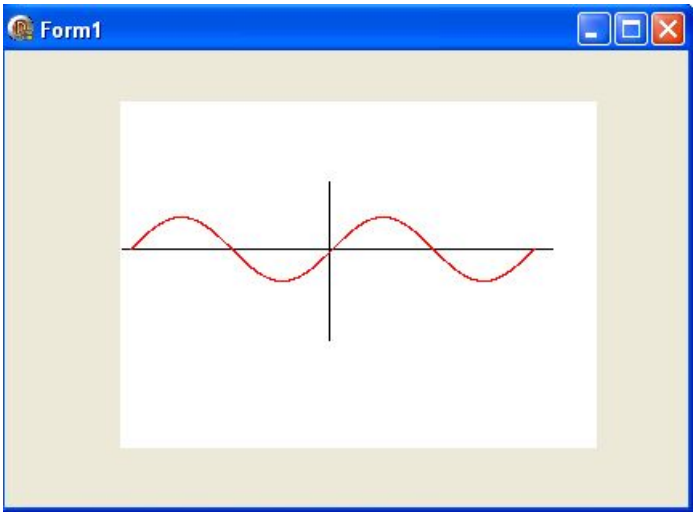
Ob`ekt. Canvas.Pie(x1,y1,x2,y2,x3,y3,x4,y4);

Bu yerda: x1,y1,x2,y2 -ellips yoki aylana parametrlari; x3,u3,x4,y4 -sektor chegarasini tashkil qiluvchi to`g`ri chiziqlar oxirgi nuqtalari koordinatalari.

Nuqta. *Canvas* ob`ektining **pixels** xossasi tipidagi ikki o`lchovli massiv bo`lib har bir soha nuqtacining rangi haqidagi ma`lumotni o`z ichiga oladi. Pixels xossasidan foydalanib ixtiyoriy nuqta rangini o`zgartirish, ya`ni nuqta chizish mumkin.

Misol uchun *Form1.Canvas.Pixels[10,10]:=clRed;*
instruktsiyasi soha nuqtasini qizil ranga bo`yaydi. Quyidagi dastur y=sinx funktsiyasi grafigini [-2pi,2pi] oraliqda chizadi.

```
Procedure TForm1.FormCreate(SEnder: TObject);
  Const Pi=3.1415;    Var x,y,mas:Real; x1,y1:integer;
 Begin
   Image1.Canvas.MoveTo(1,92);       Image1.Canvas.LineTo(270,92);
    Image1.Canvas.MoveTo(130,50);    Image1.Canvas.LineTo(130,150);
          x:=-2*pi; mas:=20;
  Repeat
    y:=Sin(x);
    X1:=132-Round(mas*x);     Y1:=92+Round(mas*y);
    Image1.Canvas.Pixels[x1,y1]:=ClRed;
    x:=x+0.01;
  until x>2*pi;
 End;
```



7-laboratoriya mashg`ulotini bajarish uchun variant misollari.

1.Quyidagi misollar vizual dasturi loyihasini Button, Edit va Label komponentalari yordamida berilgan dasturni kiritib tuzing.

№	Misol berilishi va dasturi

1	A va B ikkita haqiiqy sonlar berilgan. Ularning yig'indisi, ayirmasi va ko'paytmasini hisoblang.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var a,b,s,p:real;
	Begin
	a:=StrToFloat(Edit1.Text); b:=StrToFloat(Edit2.Text);
	s:=a+b; p:=a*b;
	Edit3.Text:=FloatToStr(s); Edit4.Text:=FloatToStr(p);
	End;

2	Ikkita musbat son berilgan, bu sonlarning o'rta arifmetik va o'rta geometrik qiymatlarini aniqlang.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var a,b,s,p:real;
	Begin
	a:=StrToFloat(Edit1.Text); b:=StrToFloat(Edit2.Text);
	s:=(a+b)/2; p:=sqrt(a*b);
	Edit3.Text:=FloatToStr(s); Edit4.Text:=FloatToStr(p);
	End;

3	Tomonlari A va B ga teng to'g'ri to'rtburchakning yuzi va peremetri hisoblansin.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var a,b,s,p:real;
	Begin
	a:=StrToFloat(Edit1.Text); b:=StrToFloat(Edit2.Text);
	s:=a*b; p:=2*(a+b);
	Edit3.Text:=FloatToStr(s); Edit4.Text:=FloatToStr(p);
	End;

4	R1, R2, R3 uchta qarshiliklar ketma-ket ulangan zanjirning qarshiligini aniqlang. Procedure TForm1.Button1Click(SEnder: TObject); var R1,R2,R3,R:real; Begin R1:=StrToFloat(Edit1.Text); R2:=StrToFloat(Edit2.Text); R3:=StrToFloat(Edit3.Text); R:=R1+R2+R3; Edit4.Text:=FloatToStr(R);

	End;

5	Massalari M1 va M2 (kg) ga teng, oralaridagi masofa R (m) ga teng bo'lgan ikkita jismning o'zaro tortilish kuchi F aniqlansin. Bunda gravitatsion doimiy $G=6,672\cdot10^{-11}$ $(N\cdot m^2/kg^2)$ deb olinsin.
	Procedure TForm1.Button1Click(SEnder: TObject);
	const G=6.672E-11; var M1,m2,R,F:real;
	Begin
	M1:=StrToFloat(Edit1.Text); M2:=StrToFloat(Edit2.Text);
	R:=StrToFloat(Edit3.Text); F:=G*M1*M2/(R*R);
	Edit5.Text:=FloatToStr(F);
	End;

6	Teng tomonli uchburchakning tomoni A ga teng. Uchburchakning yuzini toping.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var a,s:real;
	Begin
	a:=StrToFloat(Edit1.Text); S:=(sqrt(3))*a*a/4;
	Edit2.Text:=FloatToStr(S);
	End;

7	Koordinatalari X1,Y1 va X2, Y2 ga teng bo'lgan nuqtalari orasidagi masofani hisoblang.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var x1,x2,y1,y2,d:real;
	Begin
	x1:=StrToFloat(Edit1.Text); x2:=StrToFloat(Edit2.Text);
	y1:=StrToFloat(Edit3.Text); y2:=StrToFloat(Edit4.Text);
	d:=sqrt(sqr(x2-x1)+sqr(y2-y1)); Edit5.Text:=FloatToStr(d);
	End;

8	Birinchi hadi A, ayirmasi D, hadlari soni N ga teng arifmetik progressiyaning N-hadi va hadlarining yig'indisini hisoblang.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var a1,d,n,S:real;
	Begin
	a1:=StrToFloat(Edit1.Text); d:=StrToFloat(Edit2.Text);
	n:=StrToFloat(Edit3.Text); S:=(2*a1+d*(n-1))/2*n;
	Edit4.Text:=FloatToStr(S);
	End;

9	Birinchi hadi B, maxraji Q va hadlari soni N gateng geometrik progressiyaning N-hadi va hadlarining yig'indisini hisoblang.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var B,N,Q,S: real;
	Begin
	B:=StrToFloat(Edit1.Text); Q:=StrToFloat(Edit2.Text);
	N:=StrToFloat(Edit3.Text); S:=(B*(1-exp(N*ln(Q))))/(1-Q);
	Edit4.Text:=FloatToStr(S);
	End;

10	Uchta idishga suv solingan. Idishlardagi suvning temperaturasi T1, T2, T3 ga teng, hajmi V1, V2, V3 ga teng. Idishlardagi suvni bitta idishga quyilsa, uning hajmi va temperaturasi qanday bo'ladi?
	Procedure TForm1.Button1Click(SEnder: TObject);
	var T1,T2,T3,T,V1,V2,V3,V:real;
	Begin
	T1:=StrToFloat(Edit1.Text); T2:=StrToFloat(Edit2.Text);
	T3:=StrToFloat(Edit3.Text); V1:=StrToFloat(Edit4.Text);
	V2:=StrToFloat(Edit5.Text); V3:=StrToFloat(Edit6.Text);
	T:=(T1*V1+T2*V2+T3*V3)/(V1+V2+V3); V:=V1+V2+V3;
	Edit7.Text:=FloatToStr(T); Edit8.Text:=FloatToStr(V);
	End;

11	Berilgan sonning butun qismini aniqlang.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var a,b,s:real;
	Begin
	a:=StrToFloat(Edit1.Text); b:=StrToFloat(Edit2.Text); s:=a div b;
	Edit3.Text:=FloatToStr(s);
	End;

12	N/M ifodani hisoblashda hosil bo'ladigan qoldiqni toping.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var N,M,R:integer;
	Begin
	N:=StrToInt(Edit1.Text); M:=StrToInt(Edit2.Text);
	R:=N mod M; Edit3.Text:=IntToStr(R);
	End;

13	Argument x ning qiymatlari berilganda $F=Sin(x+1)^2$ funksiyaning qiymatlarini ҳисобланг.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var x,f:real;
	Begin
	x:=StrToFloat(Edit1.Text); F:=Sin(sqr(x+3));
	Edit2.Text:=FloatToStr(F);
	End;

14	Berilgan burchakni radian o'lchovidan gradus o'lchoviga o'tkazing.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var alfa,k:real;
	Begin
	alfa:=strtofloat(Edit1.Text); k:=alfa*pi/180;
	Edit2.Text:=FloatToStr(k);
	End;

15	Berilgan burchakni gradus o'lchovidan radian o'lchoviga o'tkazing.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var a,b:real;
	Begin
	a:=StrToFloat(Edit1.Text); b:=a*180/pi; Edit2.Text:=FloatToStr(b);
	End;

16	Argument X ning qiymatlari berilganda $F=2(x+3)+3(x+3)^2$ funksiyaning qiymatlarini aniqlang.
	Procedure TForm1.Button1Click(SEnder: TObject);
	var x,f:real;
	Begin
	x:=StrToFloat(Edit1.Text); F:=2*(x+3)+3*sqr(x+3);
	Edit2.Text:=FloatToStr(F);
	End;

17 Uzunligi L(m) ga teng matematik mayatnikning tebranish davrini hisoblang. (Hisoblash formulasi $T=2\pi\sqrt{LG}$, bunda $\pi=3.14; G=9.81$ (m/s^2)).

```
Procedure TForm1.Button1Click(SEnder: TObject);
  const G=9.81;   var L,T:REAL;
 Begin
   L:=StrToFloat(Edit1.Text); T:=2*pi*sqrt(L/G);
   Edit2.Text:=FloatToStr(T);
 End;
```

18 Aylananing uzunligi C berilgan. Shu aylana bilan chegaralangan doiraning yuzi S ni aniqlang. (Hisoblash formulasi: $S=C^2/4\pi$).

```
Procedure TForm1.Button1Click(SEnder: TObject);
 var c,S:real;
Begin
 c:=StrToFloat(Edit1.Text);  S:=c*c/(4*pi);  Edit2.Text:=FloatToStr(S);
End;
```

19 Radiuslari A va R ga teng (A<R) halqa yuzi hisoblansin. (Hisoblash formulasi: $S=\pi(R^2-A^2)$).

```
Procedure TForm1.Button1Click(SEnder: TObject);
  var a,r,s:real;
 Begin
   a:=StrToFloat(Edit1.Text);  r:=StrToFloat(Edit2.Text);
   if a<r then s:=pi*(r*r-a*a) else s:=pi*(a*a-r*r);
   Edit3.Text:=FloatToStr(S);
End;
```

20 Uchburchakning A va B ikkita tomoni va ular orasidagi burchagi G (gradusda) berilgan. Uchburchakning uchinchi tomonini toping. (Hisoblash formulasi: $C=\sqrt{(A^2+B^2-2AB\cdot CosG)}$).

```
Procedure TForm1.Button1Click(SEnder: TObject);
   var a,b,g,c:real;
 Begin
   a:=StrToFloat(Edit1.Text);  b:=StrToFloat(Edit2.Text);
   g:=StrToFloat(Edit3.Text);  g:=g*pi/180;
   c:=sqrt(a*a+b*b-2*a*b*cos(g));
   Edit4.Text:=FloatToStr(g);
End;
```

21 Bir tomoni va unga yopishgan ikkita burchagi berilgan uchburchakning uchinchi burchagi va qolgan ikki tomonini aniqlang.

```
Procedure TForm1.Button1Click(SEnder: TObject);
 var a,ab,bb,b,c,cb:real;
Begin
 a:=StrToFloat(Edit1.Text);     ab:=StrToFloat(Edit2.Text);
 bb:=StrToFloat(Edit3.Text);   cb:=pi-ab*pi/180-bb*pi/180;
 b:=a*sin(bb)/sin(ab);
 c:=a*sin(cb)/sin(ab);
 Edit4.Text:=FloatToStr(cb);
 Edit5.Text:=FloatToStr(b);
 Edit6.Text:=FloatToStr(c);
End;
```

22 A va B ikkita butun sonlari berilgan. Ularning juft va toqligini aniqlang.

```
Procedure TForm1.Button1Click(SEnder: TObject);
  var a,b:real; FA,FB: Boolean;
 Begin
  a:=StrToInt(Edit1.Text); b:=StrToInt(Edit2.Text);
  FA:=Odd(a); FB:=Odd(b);
  If Fa=true then Edit3.Text:='A-true' else Edit3.Text:='A-False';
  If Fb=true then Edit4.Text:='B-true' else Edit3.Text:='B-False';
 End;
```

23 O`n xonali son berilgan. Shu sonning n – raqamini aniqlang.

```
procedure TForm3.Button1Click(Sender: TObject);
 Var
   A,A1,A2:Real;
   n,m:Integer;
 begin
  A:=StrToFloat(Edit1.text); {Берилган сон}
  m:=StrToInt(Edit2.Text);    {Сон узунлиги}
  n:=StrToInt(Edit3.Text);     {Сондаги изланаётган рақам номери}
    A1:=Int(A/Exp((M-n)*Ln(10)));
    A2:=Int(A/Exp((M-n+1)*Ln(10)))*10;
    A:=A1-A2;
    Edit4.Text:=FloatToStr(A);
 end;
```

24	A сонининг 4 га каррали (қолдиқсиз бўлиниши) ёки каррали эмаслигини аниқланг.
	procedure TForm3.Button1Click(Sender: TObject);
	Var A:Real;
	begin
	A:=StrToFloat(Edit1.Text);
	if A/4=Int(A/4) then Edit2.Text:='karrali'
	Else Edit2.Text:='Karrali emas';
	end;

25	A ва B сонлар берилган (A<B). Берилган R сонининг қайси сонга яқинлигини топинг.
	procedure TForm3.Button1Click(Sender: TObject);
	var A, B, R:real;
	Begin
	A:=StrToFloat(Edit1.Text); B:=StrToFloat(Edit2.Text);
	R:=StrToFloat(Edit3.Text);
	If abs(A-R)<Abs(B-R) Then Edit4.Text:='A-ga yaqin'
	Else Edit4.Text:='B-ga yaqin';
	End;

26	
27	

28	
29	
30	

2.Yuqoridagi 3 va 4 laboratoriya ishlarini Delphida dasturini tuzing.

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