O‘ZBEKISTON RESPUBLIKASI XALQ TA’LIMI VAZIRLIGI

NAVOIY DAVLAT PEDAGOGIKA INSTITUTI

Delphi dasturlash tilida massivlar bilan ishlash

(Uslubiy qo‘llanma)

Navoiy-2013

Ushbu uslubiy qo‘llanma akademik litsey, kasb-hunar kollejlari, oliy o‘quv yurtlari talabalari hamda mustaqil foydalanuvchilar uchun mo‘ljallangan.

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Uslubiy qo`llanma Navoiy davlat pedagogika institutining 2013 yil __ noyabrdagi 2 -sonli Ilmiy kengashida ko‘rib chiqilgan va chop etishga tavsiya etilgan.

M U N D A R I J A

KIRISH

Ko‘p hollarda jadval yoki matritsalar ko‘rinishidagi ma’lumotlar bilan ish yuritish kerak bo‘ladi. Jadvalda ma’lumotlar juda ko‘p bo‘lgani sabab, ularning har bir yacheykasidagi sonni mos ravishda bitta o‘zgaruvchiga qiymat qilib berilsa ular ustida ish bajarish ancha noqulayliklarga olib keladi. Shu sabab dasturlashda bunday muammolar massivlarni ishlatish yordamida hal qilinadi.

Uslubiy qo`llanma Delphi dasturlash tilida massivlar bilan ishlashga mo`ljallangan bo`lib, unda bir o`lchovli va ikki o`lchovli massivlarga doir bir qancha masalalar keltirilgan va ularni hal qilish uchun delphi muhitida amaliy dasturlar tuzib ko`rsatilgan, natijalar olinib ularning tahlili keltirilgan. Shu bilan birgalikda foydalanuvchilarga mustaqil yechish uchun misollar berilgan.

Ushbu uslubiy qo`llanma akademik litsey, kasb-hunar kollejlari, oliy o`quv yurti talabalari hamda mustaqil foydalanuvchilar uchun mo`ljallangan.

Mualliflar

1-§. BIR O`LCHOVLI MASSIVLAR

Massiv - bu bir nom bilan belgilangan qiymatlar guruhi yoki jadvaldir. Massivning har bir elementi massiv nomidan so‘ng kvadrat 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.

Ma’lumki, Delphi dasturlash tilida ishlatiladigan ma’lumotlar ikki turga oid: oddiy(**Real, Integer, Boolean, Char**, qayd qilingan va chegaralangan) va murakkab turdagi ma’lumotlarga muntazam turdagi ma’lumotlar (yozuvlar, fayl turlari, to’plamlar va ko’rsatkichlar) ga bo’linadi. Oddiy turdagi ma’lumotlarning boshqa turdagi ma’lumotlardan asosiy farqlanuvchi belgisi ularning tartiblanganligi va yaxlitlanganligidir, ya’ni masalan, INTEGER turiga mansub ixtiyoriy kattalik alohida raqamlarga bo’linmaydigan yaxlit kattalikdir(**Integer** toifasidagi kattalik sifatida bitta butun son tushuniladi). Lekin sonli o’qning ixtiyoriy bo’lagini butun sonlar ketma-ketligida qarasak, u holda shu ketma-ketlik **i** raqami to’g’riisida gapirish, bu elementlar(butun sonlar) to’plamiga “butun sonlar” degan umumlashtiruvchi nom berish mumkin.

Delphi dasturlash tilida bunday kattaliklarni ma’lumotlarning muntazam turi ko’rinishida ifodalash mumkin. Umumiy nomga ega, tartiblangan kattaliklar ketma-ketligi *muntazam toifadagi ma’lumotlar yoki massivlar* deb yuritiladi. Ularning tashkil etuvchilari massiv elementlari va elementlari toifasi bazaviy toifa deb nomlanadi. Masalan, quyidagi tartiblangan haqiqiy sonlar ketma-ketligi 1.5,18.7, -5, 4.9, 0.88.

Haqiqiy sonlar massivi, bu massivning bazaviy turi esa haqiqiy(**Real**) toifadir.

Massiv tushunchasi A-umumiy nomga ega bo’lgan va bir toifadagi qo’zg’almas kattaliklar ketma-ketligidan iborat bo’lgan sonli vektor.

A(4)=(a1,a2,a3,a4)

misolida tushuntirish mumkin. Bu yerda a1, a2…massiv elementlaridir. Ularni ifodalashda ko’rsatkichli (indeks) o’zgaruvchilardan foydalaniladi.

Matematika kursidan ma’lumki, ko’rsatkichli o’zgaruvchilarning tartiblangan ketma-ketlikdagi o’rnini bildirib, qavslar ichiga olinib yoki massiv nomidan birmuncha past ko’rsatilar edi. Masalan, A(1) yoki A1, umumiy holda esa A1, bu yerda i=1,2,3,...n.

Delphi dasturlash tilidagi o’zgaruvchining ko’rsatkichi to’rtburchak qavslar ichiga olib yoziladi, ya’ni A[1]=1.6, A[2]=23.7, A[3]=-7, A[4]=9.5.

Agar dasturda massiv ishlatilayotgan bo’lsa, u holda uni o’zgaruvchilar bo’limi VAR yoki toifalar bo’limi TYPE da tasvirlash zarur, masalan, **Var** bo’limida massiv quyidagi ko’rinishda tasvirlanadi:

Var <massiv nomi>:

Array [<ko’rsatkich toifasi>] of <element toifasi>;

Bu yerda <massiv nomi> - ixtiyoriy idetfikator, Array(massiv) va of(dan)-xizmatchi so’zlar,<ko’rsatkich toifasi>-ko’rsatgichli ifoda, bu toifa qiymatlari massiv elementlarining sonni belgilaydi va ko’rsatkichlarni yozish uchun ishlatiladigan belgilar to’plamini ko’rsatadi, shunung uchun bu toifa sifatida **Real** va **Integer** toifasidan tashqari barcha oddiy toifalarni ishlatish mumkin, <element toifasi>-massiv elementlari toifasi bo’lib, bu toifa sifatida fayl va to’plam toifasidan tashqari barcha toifalarni ishlatish mumkin.

Yuqorida ko’rib o’tilgan A vektorini massiv ko’rinishida dasturda quyidagicha tasvirlash mumkin:

Var a:array[1..5] of real;

Indeks sifatida faqat aniq son emas, qiymati massiv elementlarining tartib raqamini belgilovchi ifoda ham ishlatilishi mumkin, masalan

A[i+5],B[I div(j+6)], C[n1 or n2],YEAR[1988] va hokazo.

Ko’rsatkichli ifoda qiymatining toifasi massiv elementi ko’rsatkichining toifasi deyiladi va ularning tartiblanganligini aniqlovchi to’plam bo’lishi kerak. Quyida ko’rsatgich toifasi sifatida paskalda ishlatilishi mumkin bo’lgan toifalar bilan tanishamiz. Ma’lumki, paskal tilida **Integer** va **Real** toifasidagi ma’lumotlar to’plami

cheklanmagan, **Real** toifa esa, shuningdek, tartiblanmagandir ham. Shu sababli massiv ko'rsatgichi toifasi sifatida **Integer** va **Real** toifasiga mansub ma'lumotlardan foydalanish mumkin emas;

Var a:Array[1..4] of real;
c:array[1..4] of integer;
b:array[1..20,1..45] of integer;

Ushbu hollarda massiv ko'rsatkichi toifasi sifatida chegaralangan toifa, ko'pincha chegaralangan butun toifa ma'lumotlari ishlatiladi. Masalan, 100 ta haqiqiy elementlardan iborat massiv quyidagi ko'rinishda tavsiflanishi mumkin:

var a:array[1..10] of real;

Bu yerda 1 dan 10 gacha chegaralangan butun toifa **a** massiv elementlari soni 10 ta ekanligi va ularning tartiblanganligini bildiradi.

To'g'ri tavsiflangan massivlarga misollar:

var massiv:array[-745..-1] of real;
das:array[1477..1988] of char;
l:array[boolean]of char;
a,b,c:array[1..50] of rael;

Massiv indeksi chegarasini butun tipdagi o'zgarmas bilan ham ifodalash mumkin, masalan, **const nmax=50;**
var a:array[1..nmax] of real;

Ma'lumki, qayd qilingan toifa qiymatlarining to'plami ham cheklangan va tartiblangan to'plamni tashkil qiladi, bu esa o'z navbatida, qayd qilingan toifa qiymatlarini ham ko'rsatgich toifasi sifatida qo'llash imkoniyatini beradi. Masalan,

var mon:array[mart,apr, may] of char;
color:array[red,blue,yellow, black] of integer;

Ko'rsatkich(indeks) va ko'rsatgich toifasi tushunchalari o'rtasida farq mavjud bo'lib, ko'rsatkich toifasi massiv elementlari soni va ularning tartiblanganligini bildiradi va u massivni tavsiflash bo'limida ishlatiladi, indeks esa massiv elementining tartib raqamini belgilaydi va operatorlar bo'limidagina ishlatiladi. Agar biror-bir massivga murojat qilish uchun ham to'liq nomi, ya'ni muntazam toifaga mansub o'zgaruvchining nomi ishlatilsa, massivning alohida elementiga murojat qilish uchun ko'rsatgichli o'zgaruvchi ishlatiladi. Masalan,

A(1) massiv uchun **A** o'zgaruvchi to'liq o'zgaruvchi (massiv nomi), **A[1]**- ko'rsatgichli o'zgaruvchi bo'lib, u **A** massivning 1-elementini ifodalaydi.

Massiv elementlarining operatorlar bo’limida ishlatilishiga doir misollar:

B[5]:=B[3]+1;
sum:=sum-round(c[k]);
p1:=sqrt(a[2*i+1]);

Delphi dasturlash tilida massivlarni o’zgaruvchilar bo’limida tavsiflashdan tashqari, **TYPE** toifalar bo’limida ham tavsiflash mumkin. Buning uchun **TYPE** bo’limida massiv toifasi nomi va massiv toifasi beriladi, **Var** bo’limida shu toifaga mansub o’zgaruvchilar sanab o’tiladi.

TYPE bo’limida toifalarni tavsiflash dasturlashda yaxshi uslub sanaladi va dasturning mantiqiy mukammalligini oshirish imkonini beradi. Massivni **TYPE** bo’limida tavsiflash quyidagi ko’rinishga ega bo’ladi:

TYPE <toifa nomi>=**array** [<ko’rsatkich toifasi>] **of** <element toifasi>;
var <o’zgaruvchi yoki massiv nomi>:<toifa nomi>;

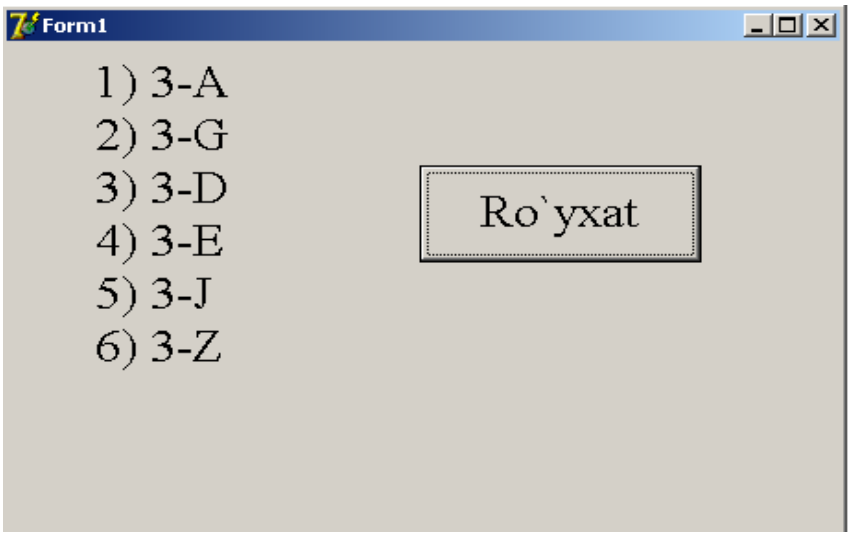
Yuqorida aytib o`tilgan ma`lumotlarga doir bir nechta misollar ko`rib o`tamiz.

1-misol. Guruhlar ro‘yxatini chiqaruvchi dastur tuzamiz.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit unit1;
interface
uses
Windows, Messages, SysUtils, Variants, Classes, Graphics,
Controls, Forms,Dialogs, StdCtrls;
type
TForm1 = class(Tform)
Button1: Tbutton;
Label1: Tlabel;
procedure Button1Click(Sender: Tobject);
private
{ Private declarations } public
{ Public declarations } end;
```

```
var
Form1: Tform1;
implementation
{$R *.dfm}
const
NT = 6;
var
Massiv: array[1..NT] of string[10] =
('3-A','3-G','3-D','3-E','3-J','3-Z');
procedure Tform1.Button1Click(Sender: Tobject);
var
st:string; // massiv ro'yxati
i:integer; // indeks, massiv elementlarining nomeri
begin
// formallashgan ro'yxat formada joylashish bo'yicha
for i:=1 to NT do
st:= st + IntToStr(i)+ ') '+ Massiv[i] + #13;
Label1.Caption:= st;  // ro'yxatni chiqarish
end;
end.
```



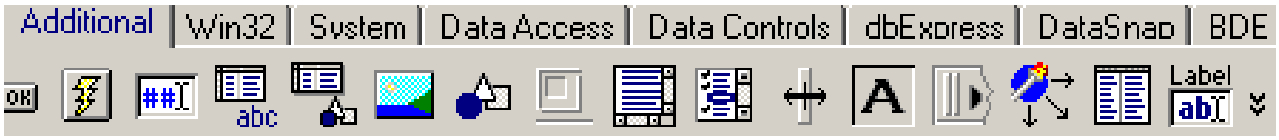
1-rasm.

2-misol. $A(5)$ massiv elementlari yig‘indisi va o‘rta arfimetigini toppish.

Dasturni tuzishning 1-usul.

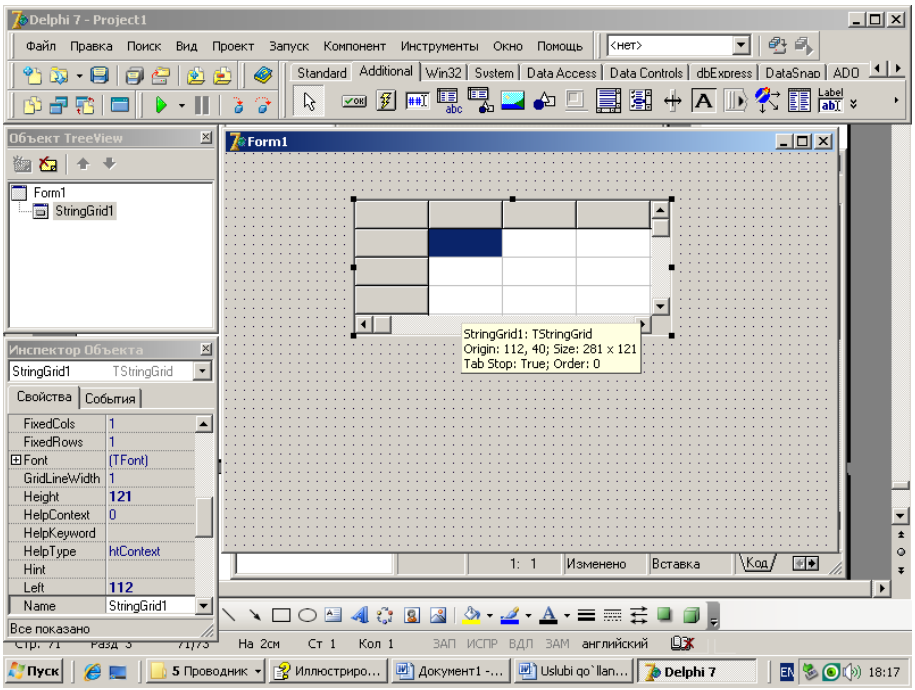
1-bosqich.

1. Komponentalar ro‘yxatini Additional bandidan StringGrid1(abc) tugmani tanlaymiz ko‘rsatilgan.



2-rasm.

Tugma tanlangandan so‘ng, oynaning ko‘rinish holati quyidagicha bo‘ladi:



3-rasm.

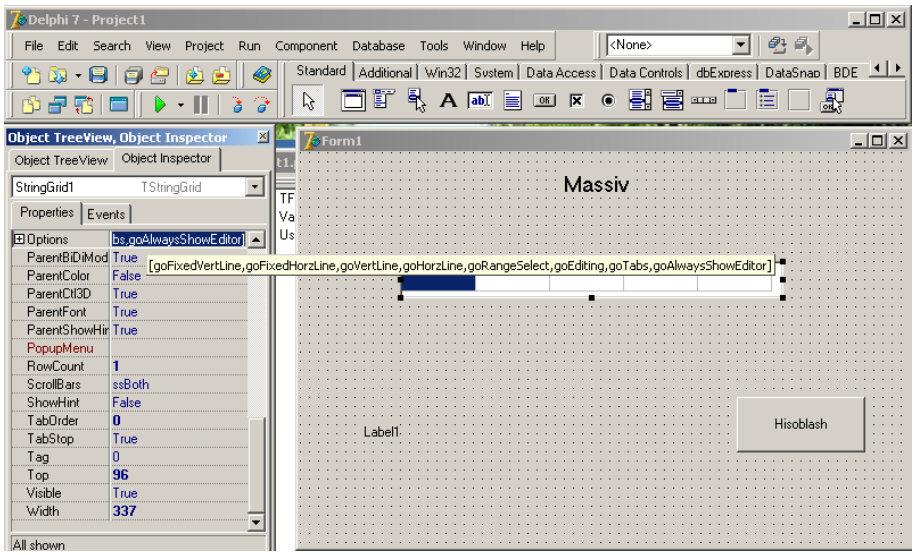
Hosil bo‘lgan jadvaldan 5 ta ustun, 1 ta satr yarating. Bu jadvalni yaratish uchun parametrlar va xossalar bo‘limidan **ColCount** hodisalar bandiga 5 raqamini kiritamiz. Satr bo‘yicha o‘zgartirish kiritish uchun, **RowCount** bandiga 1 raqamini kiritamiz.

Umumiy holda oynani ishga tayyorlashimiz uchun parametrlar va xossalar bo‘limidan jadvalda ko‘rsatilgan buyruqlarning tarkibi quyidagicha:

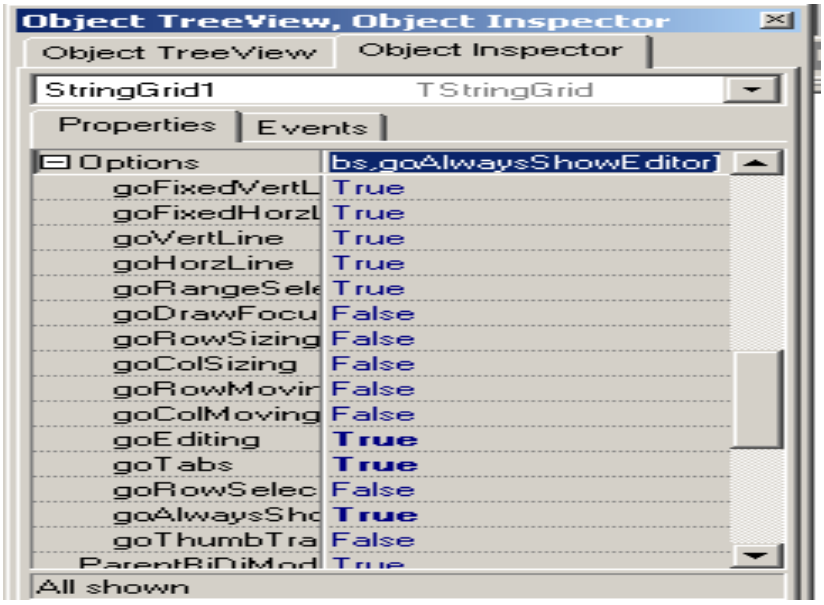
1-jadval

Parametrlar va xossalar bo‘limi	Hodisalar bo‘limi
ColCount	5
FixedCols	0
RowCount	1
DefaultRowHeight	24
Height	24
DefaultColWidth	64
Width	328
Options . goEditing	True
Options . AlwaysShowEditing	True
Options .goTabs	True

Jadvalda ko‘rsatilgan 3 ta **Options.goEditing**, **Options.AlwaysShowEditing**, **Options.goTabs** buyruqlarni hosil qilishimiz uchun parametrlar va xossalar bo‘limidan “Options” parametrining “+” ishorasini “-” ishoraga o‘tkazamiz (jadval ustiga sichqoncha tugmasini bir marta bosganimizdan so‘ng, aytilgan topshiriqni bajarishimiz mumkin).



4-rasm.



5-rasm.

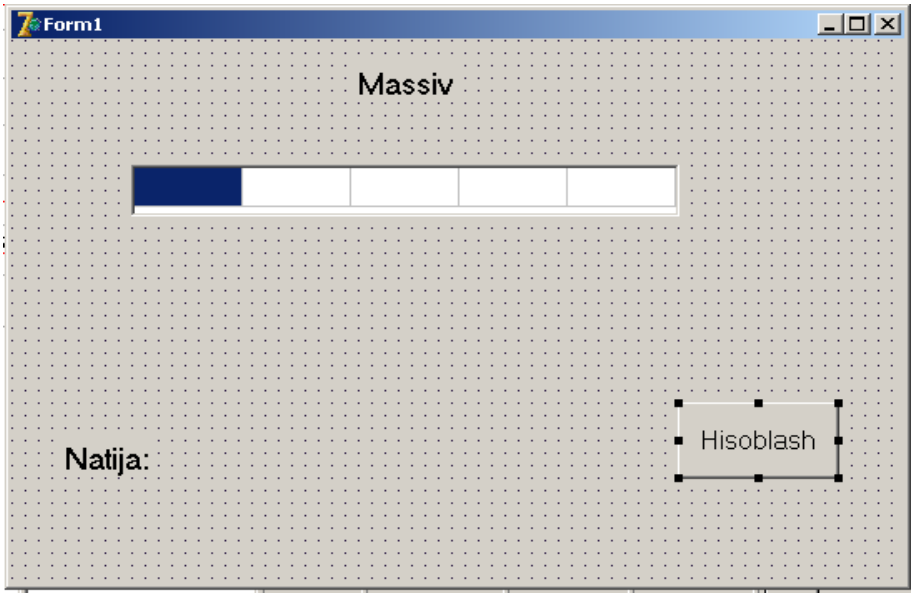
Hodisalar bo‘limining **goEditing** bandida 2 ta **False** va **True** buyrug‘i mavjud. **True** buyrug‘ini tanlasangiz katakchaga ma’lumot kiritgandan so‘ng dastur bilan bog‘lanish hosil qiladi aks holda ya’ni **False** buyrug‘i tanlasangiz kiritilgan ma’lumot dastur bilan bog‘lashga ruxsat etmaydi.

Parametrlar va xossalar bo‘limidan “Options” parametirini “+” ishorasini “-ishoraga o‘tkazganimizdan so‘ng oynani ko‘rinishi quyidagicha bo‘ladi:

2. “Label1” tugmasidan foydalanib “Massiv” so‘zini kiritamiz.

3. “Label2” tugmasiga “Natija” so‘zini kiritamiz.

Natijada oynaning umumiy ko‘rinishi quyidagicha bo‘ladi:



6-rasm.

2-bosqich.

1. Dasturlash maydoniga quyidagi dasturni kiritamiz:

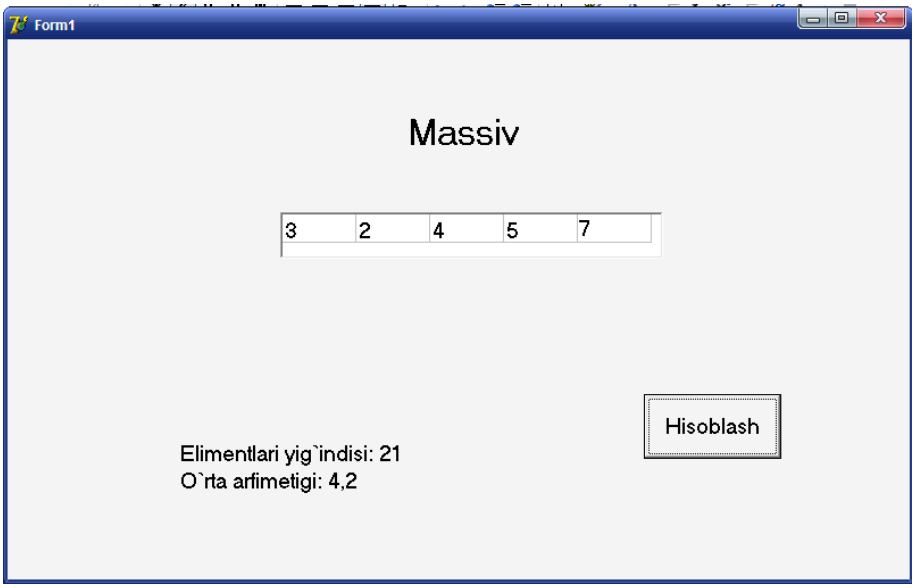
```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
Type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    Label1: TLabel;
    Button1: TButton;
    Label2: TLabel;
    procedure Button1Click(Sender: TObject);
    procedure StringGrid1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
var
a : array[1..5] of integer;
summ: integer;
sr: real;
```

```
i: integer;
 begin
for i:= 1 to 5 do
 if Length(StringGrid1.Cells[i-1, 0]) <>0
 then a[i] := StrToInt(StringGrid1.Cells[i-1,0])
 else a[i] := 0;
summ := 0;
 for i :=1 to 5 do
summ := summ + a[i]; sr := summ / 5;
Label1.Caption :=
 'Elimentlari yig‘indisi: ' + IntToStr(summ)
 + #13+ 'O‘rta arfimetigi: ' + FloatToStr(sr);
end;
  procedure TForm1.StringGrid1Click(Sender: TObject);
var Key: Char;
begin
 case Key of
#8,'0'..'9' : ;
#13:
if StringGrid1.Col < StringGrid1.ColCount-1
then StringGrid1.Col := StringGrid1.Col + 1;
else key := Chr(0);
end;
end;
end.
```

2.Dastur kiritilganidan so‘ng, biron bir nom bilan saqlaymiz.

3.Dastur ishini yakunlab ma’lum bir qiymatlarini yachyekalarga kiritamiz

Oynani umumiy ko‘rinishi keltiramiz:



7-rasm.

2-usul.

1-masalani ikkinchi usul bilan hisoblaymiz.

1. **Standar**t komponentalar palitrasidan 2 ta **button**, 1 ta **memo** va 1 ta **ComboBox** tugmalarini hosil qilamiz,

2. sichqoncha tumachasini forma oynasiga tez-tez ikki marata bosamiz va dasturni yuqori qismidagi

var

Form1: TForm1;

Yozuvning pastiga

a:Array[1..5] of integer;

i:integer;

s,s1,s2:real;

yozuvlarni kiritamiz.

3. "**F12**" tugmasini bosgan holda forma oynasiga o'tamiz.

4. Sichqoncha tumachasini forma oynasiga tez-tez ikki marata bosamiz va quyidagi:

procedure TForm1.FormCreate(Sender: TObject);

begin

i:=0;

```
  ComboBox1.Clear;
end;
```

dasturni kiritamiz.

2. **“Button1”** tez-tez ikki marta bosamiz va dasturlash maydoniga

```
begin
ComboBox1.Items.Add(ComboBox1.text);
   i:=i+1;
  a[i]:=StrToInt(ComboBox1.text);
  ComboBox1.SetFocus;
end;
```

dasturni kiritamiz.

3. **“Button2”** tez-tez ikki marta bosamiz va dasturlash maydoniga

```
begin
      S:=0;
     For i:=1 to 5 do
       s:=s+a[i];
       Memo1.Clear;
       Memo1.Lines.add('Yig‘indi ='+floattostr(s));
        for i:=1 to 5 do
       s1:=s/5;
      Memo1.Lines.add('O‘rtacha='+floattostr(s1));
end;
end.
```

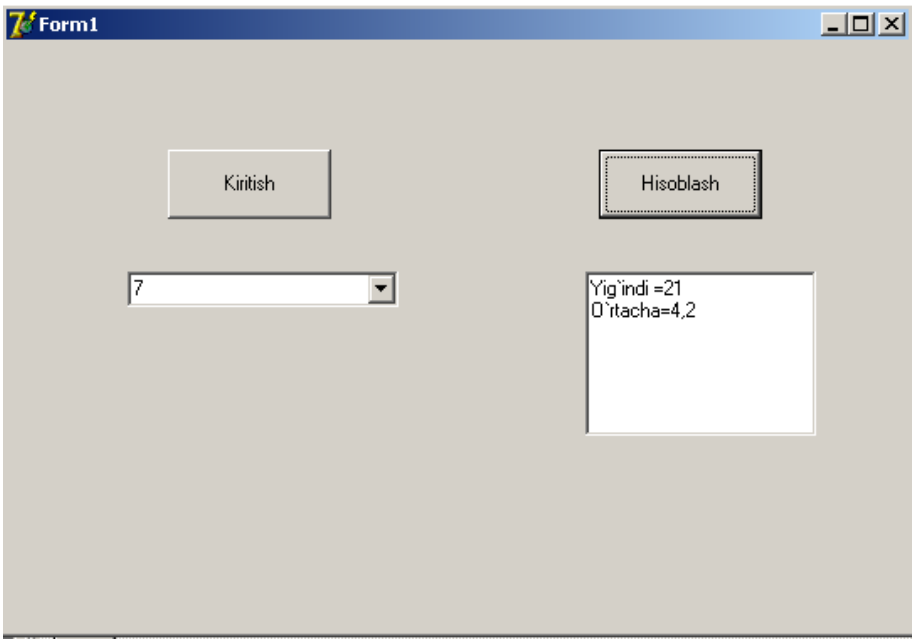
dasturni kiritamiz.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
```

```
  Dialogs, StdCtrls;
type
  TForm1 = class(TForm)
    ComboBox1: TComboBox;
    Button1: TButton;
    Button2: TButton;
    Memo1: TMemo;
    procedure FormCreate(Sender: TObject);
    procedure Button1Click(Sender: TObject);
    procedure Button2Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
     a:Array[1..5] of integer;
  k,i,maxx,minn:integer;
  s,s1,s2:real;
implementation
{$R *.dfm}
procedure TForm1.FormCreate(Sender: TObject);
begin
  i:=0;
  ComboBox1.Clear;
end;
procedure TForm1.Button1Click(Sender: TObject);
begin
```

```
ComboBox1.Items.Add(ComboBox1.text);
   i:=i+1;
  a[i]:=StrToInt(ComboBox1.text);
  ComboBox1.SetFocus;
end;
procedure TForm1.Button2Click(Sender: TObject);
begin
      S:=0;
     For i:=1 to 5 do
      s:=s+a[i];
      Memo1.Clear;
      Memo1.Lines.add('Yig‘indi ='+floattostr(s));
       for i:=1 to 5 do
      s1:=s/5;
           Memo1.Lines.add('O‘rtacha='+floattostr(s1));
end;
end.
```



8-rasm.

3-usul.

1-masalani uchunchi usul bilan hisoblaymiz.

1. **Standart** komponentalar palitrasidan 2 ta **button**, 1 ta **mem**o, 1 ta **edit**, va 1 ta **ListBox** tugmalarini hosil qilamiz,

2. sichqoncha tumachasini forma oynasiga tez-tez ikki marata bosamiz va dasturni yuqori qismidagi

Var Form1: TForm1;

Yozuvning pastiga

a:Array[1..5] of integer;

i:integer;

key,s,s1:real;

yozuvlarni kiritamiz.

3. "**F12**" tugmasini bosgan holda forma oynasiga o'tamiz.

4. Sichqoncha tumachasini forma oynasiga tez-tez ikki marata bosamiz va quyidagi:

```
procedure TForm1.FormCreate(Sender: TObject);
begin
i:=0;
ListBox1.Clear;
 end;
```

dasturni kiritamiz.

4. **"Button1"** tez-tez ikki marta bosamiz va dasturlash maydoniga

```
begin
ListBox1.Items.Add(Edit1.text);
        i:=i+1;
        a[i]:=StrToInt(Edit1.text);
        Edit1.SetFocus;
end;
```

dasturni kiritamiz.

5. **“Button2”** tez-tez ikki marta bosamiz va dasturlash maydoniga

```
begin
    S:=0;
   For i:=1 to 5 do
    s:=s+a[i];
    Memo1.Clear;
    Memo1.Lines.add('Yig‘indi ='+floattostr(s));
     for i:=1 to 5 do
    s1:=s/5;
   Memo1.Lines.add('O‘rtacha='+floattostr(s1));
end;
end.
```

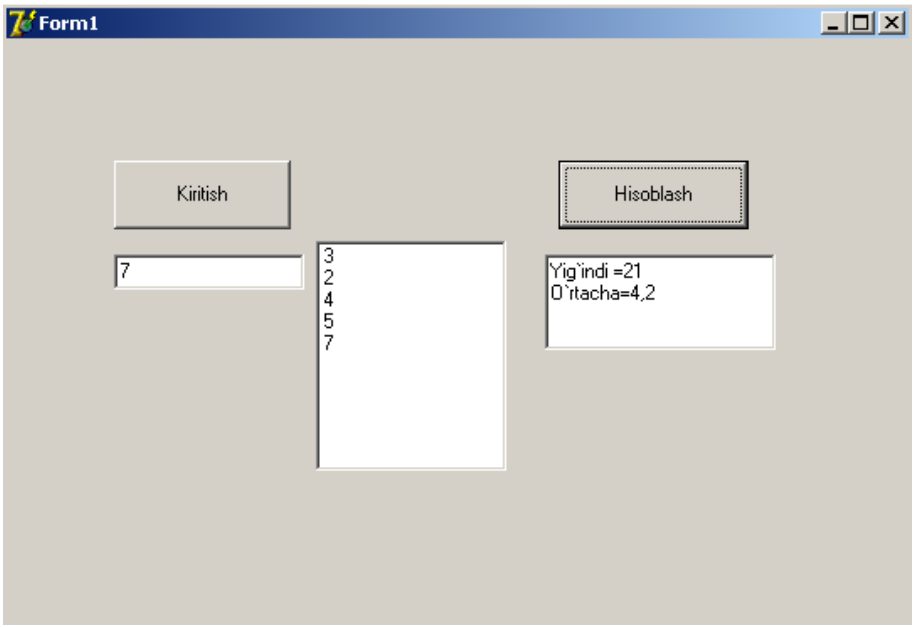
dasturni kiritamiz.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls;
type
  TForm1 = class(TForm)
    Edit1: TEdit;
    ListBox1: TListBox;
    Button1: TButton;
    Button2: TButton;
    Memo1: TMemo;
    procedure FormCreate(Sender: TObject);
    procedure Button1Click(Sender: TObject);
    procedure Button2Click(Sender: TObject);
```

```
   procedure Edit1Change(Sender: TObject);
  private
   { Private declarations }
  public
   { Public declarations }
  end;
var
  Form1: TForm1;
  a:Array[1..5] of integer;
  k,i,maxx,minn:integer;
  key,s,s1,s2:real;
implementation
{$R *.dfm}
procedure TForm1.FormCreate(Sender: TObject);
begin
i:=0;
ListBox1.Clear;
 end;
procedure TForm1.Button1Click(Sender: TObject);
  begin
ListBox1.Items.Add(Edit1.text);
          i:=i+1;
          a[i]:=StrToInt(Edit1.text);
          Edit1.SetFocus;
end;
procedure TForm1.Button2Click(Sender: TObject);
   begin
      S:=0;
     For i:=1 to 5 do
```

```
    s:=s+a[i];
    Memo1.Clear;
    Memo1.Lines.add('Yig‘indi ='+floattostr(s));
     for i:=1 to 5 do
    s1:=s/5;
        Memo1.Lines.add('O‘rtacha='+floattostr(s1));
end;
procedure TForm1.Edit1Change(Sender: TObject);
  begin
If key=13 Then Button1.SetFocus;
end;
end.
```



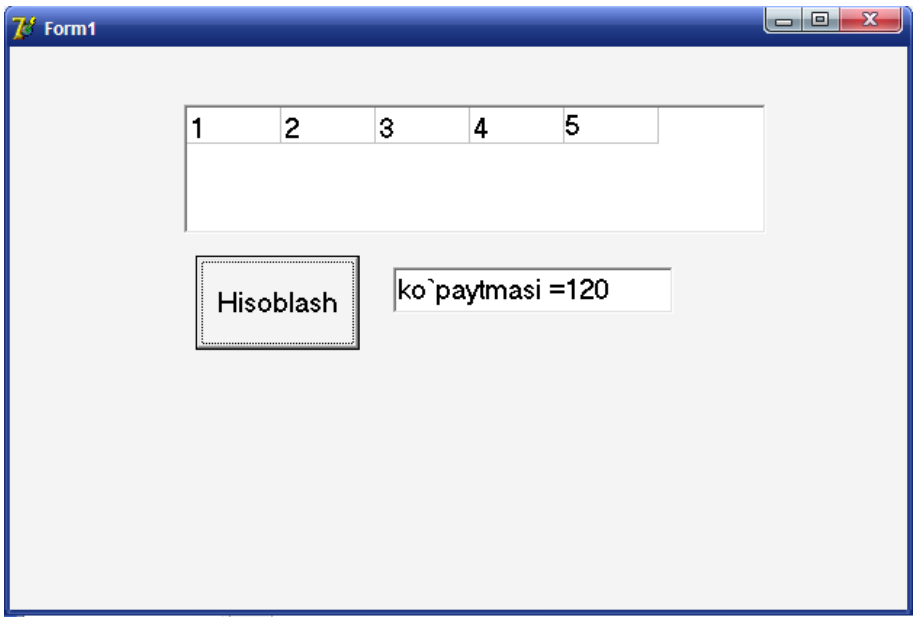
9-rasm.

3-misol. A**(**N) vektor elementlari ko`paytmasini hisoblash dasturi.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
```

```
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    Button1: TButton;
    StringGrid1: TStringGrid;
    Edit1: TEdit;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
const N=5;
var a,b:array[1..N] of integer;
p,i:integer;
begin
for i:=1 to n do
a[i]:=StrToInt(StringGrid1.Cells[i-1,0]);
p:=1;
for i:=1 to n do
p:=p*a[i];
 edit1.Text:='ko`paytmasi ='+   FloatToStr(p);
end;
end.
```



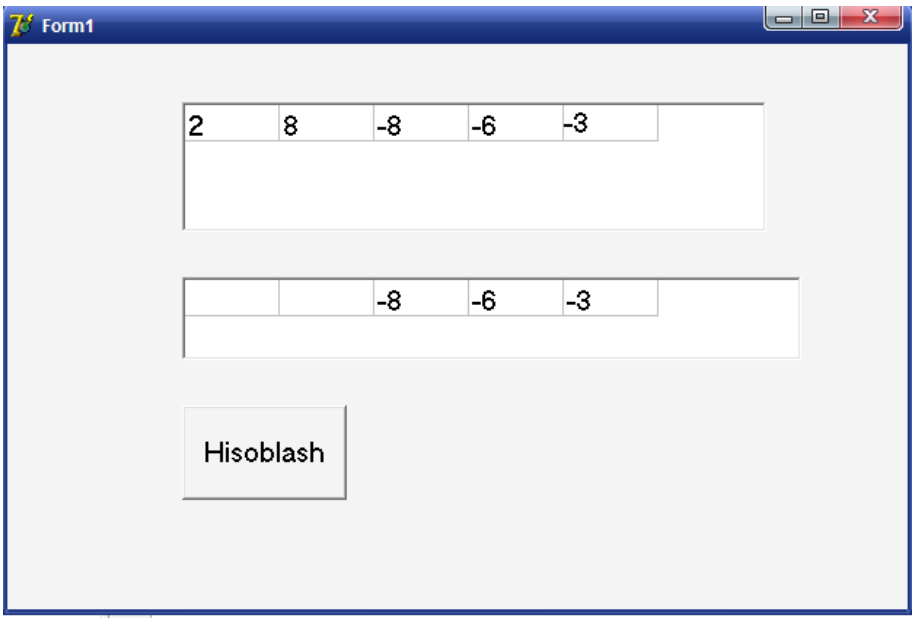
10-rasm.

4-misol. A(N) vektorni manfiy elementlarni topish dasturi.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    Button1: TButton;
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
```

```
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
const N=5;
var a,b:array[1..N] of integer;
min,p,i:integer;
begin
for i:=1 to n do
  begin a[i]:=StrToInt(StringGrid1.Cells[i-1,0]); end;
 for i:=1 to n do
  begin
if a[i]<0 then begin b[i]:=a[i];
 stringgrid2.Cells[i-1,0]:=IntToStr(b[i]);  end;
            end;
        end; end.
```



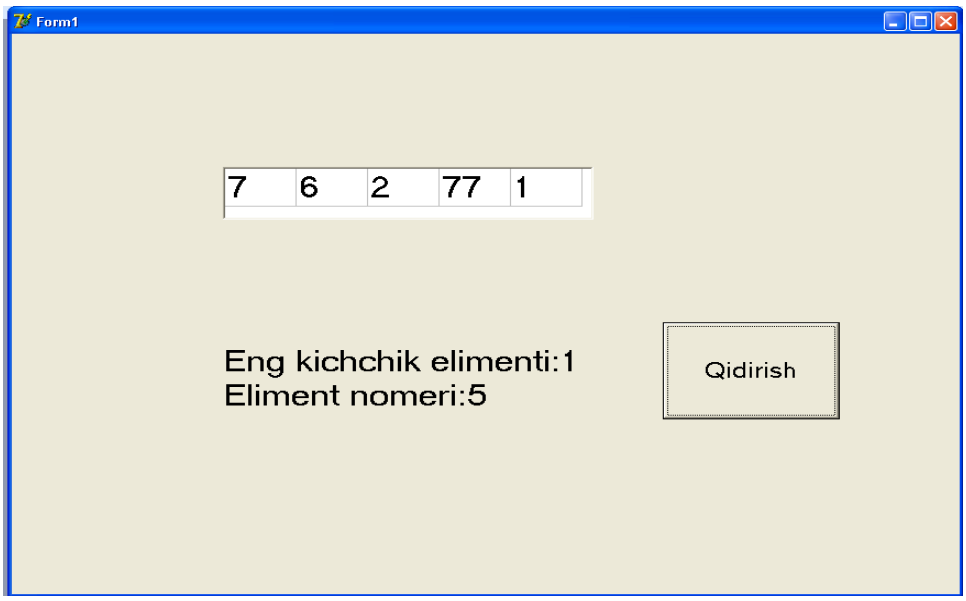
11-rasm.

5-misol. $A(5)$ vektornining eng kichigini va eliment nomerini topish dasturi.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    Label1: TLabel;
    Label2: TLabel;
    Button1: TButton;
    procedure Button1Click(Sender: TObject);
    procedure StringGrid1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
const
k=5;
var
```

```
a:array[1..k]of integer;
min:integer;
i:integer;
begin
 for i:=1 to k do
a[i]:=StrToInt(StringGrid1.Cells[i-1,0]);
min:=1;
for i:=2 to k do
if a[i]< a[min]then min:=i;
label2.caption:='Eng kichchik elimenti:'
+IntToStr(a[min])+#13+'Eliment nomeri:'+ IntToStr(min);
end;
 procedure TForm1.StringGrid1Click(Sender: TObject);
var Key: Char;
begin
 case Key of
#8,'0'..'9': ;
#13:
if StringGrid1.Col < StringGrid1.ColCount-1
then StringGrid1.Col:= StringGrid1.Col + 1;
else key := Chr(0);
end;
end;
 end.
```



12-rasm.

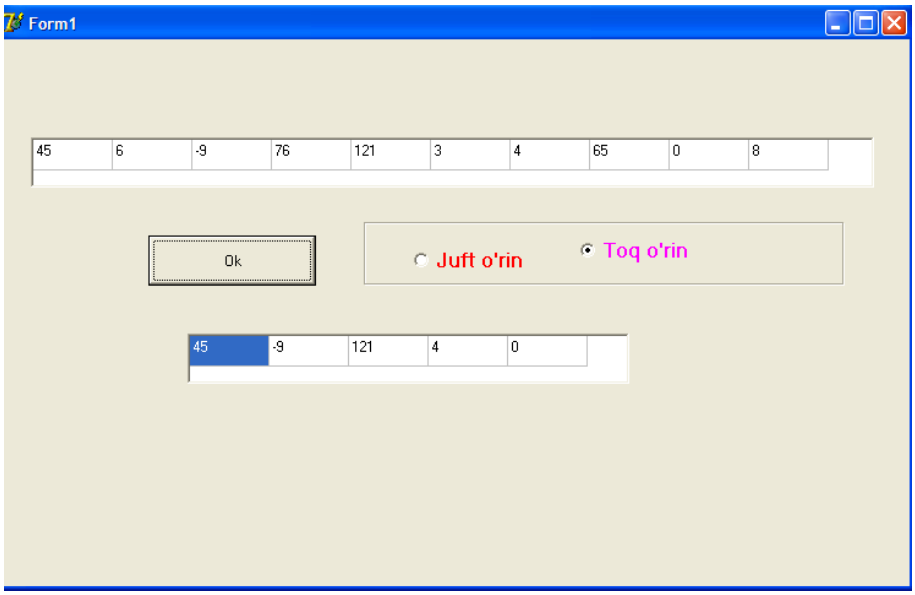
6-misol. A(10) vektorning toq va juft o`rinlarida joylashgan elementlarini B(K) vektorga ketma-ket yozish dasturi.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Buttons, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    BitBtn1: TBitBtn;
    StringGrid2: TStringGrid;
    GroupBox1: TGroupBox;
    RadioButton1: TRadioButton;
    RadioButton2: TRadioButton;
    procedure BitBtn1Click(Sender: TObject);
  private
```

```
  { Private declarations }
 public
  { Public declarations }
 end;
var
 Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.BitBtn1Click(Sender: TObject);
var i,k:integer;
begin
k:=0;
if RadioButton1.Checked  then
 begin
  for i:=0 to 9 do
    begin
      if odd(i) then
        begin
          StringGrid2.Cells[k,0]:=StringGrid1.Cells[i,0];
         k:=k+1;
        end;
    end;
    end
    else
      begin
  for i:=0 to 9 do
    begin
      if not odd(i) then
        begin
          StringGrid2.Cells[k,0]:=StringGrid1.Cells[i,0];
```

```
            k:=k+1;
          end;
        end;
      end;
    end;
end.
```



13-rasm.

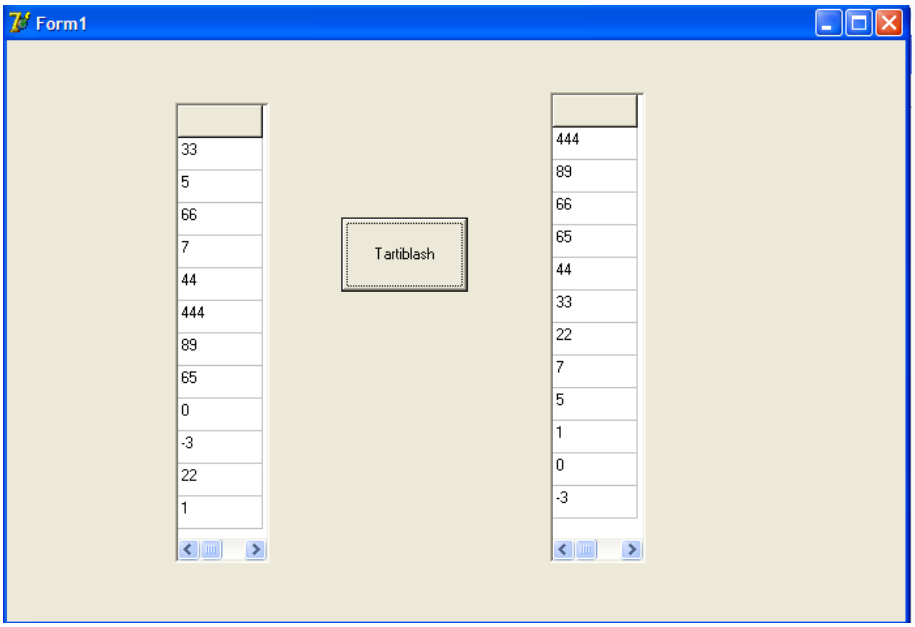
7-misol. X(12) vektor elementlarini kamayib borish tartibda joylashtirish dasturi.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    Button1: TButton;
    procedure Button1Click(Sender: TObject);
```

```
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
var i,k:integer;
  x:array[1..13] of integer;
  min:integer;
begin
   for i:=1 to 12 do
    begin
      for k:=1 to 12 do
        begin
          x[i]:=StrToInt(StringGrid1.Cells[0,i]);
        end;
    end;
    min:=x[1];
     for i:=1 to 11 do
    begin
      for k:=i+1 to 12 do
        begin
          if x[i]<x[k] then
            begin
              min:=x[i];
              x[i]:=x[k];
```

```
            x[k]:=min;
          end;
        end;
    end;
    for i:=1 to 12 do StringGrid2.Cells[0,i]:=IntToStr(x[i]);
end;
end.
```



14-rasm.

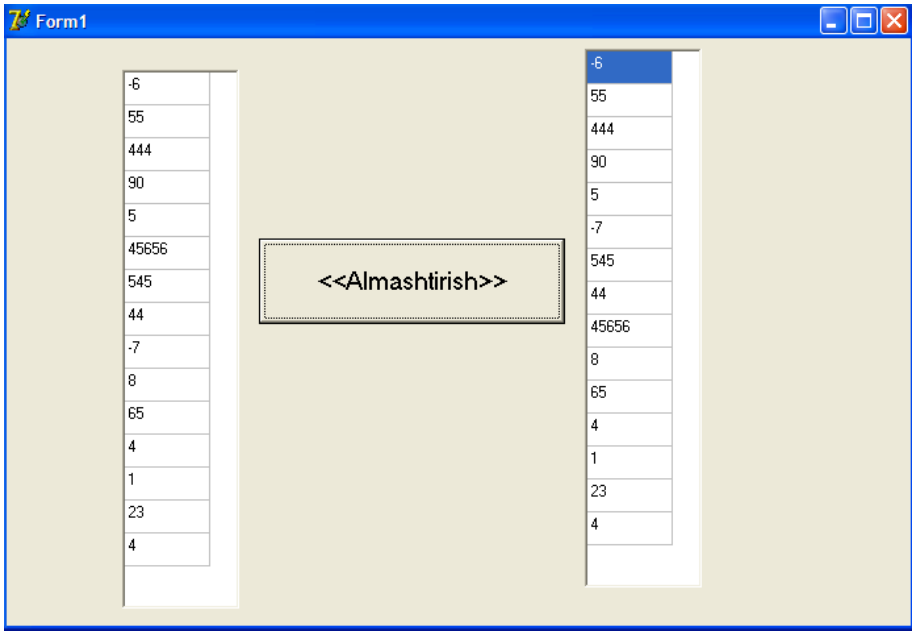
8-misol. A(15) vektorning eng katta elementi o`rnini eng kichik elementi o`rniga almashtirish dasturi.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
```

```
    Button1: TButton;
    StringGrid2: TStringGrid;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
Var i:integer;
  a:array[0..14] of integer;
  alm,max,min,maxid,minid:integer;
begin
    for i:=0 to 14 do
      begin
        a[i]:=strtoint(StringGrid1.Cells[0,i]);
      end;
    min:=a[0]; max:=a[0];
    for i:=0 to 14 do
      begin
        if min>a[i] then
          begin
          min:=a[i];
          minid:=i;
          end;
        if max<a[i] then
```

```
        begin
        max:=a[i];
        maxid:=i;
        end;
      end;
    alm:=a[maxid];
    a[maxid]:=a[minid];
    a[minid]:=alm;
    for i:=0 to 14 do
      begin
        StringGrid2.Cells[0,i]:=IntToStr(a[i]);
      end;
end;
end.
```



16-rasm.

2-§. IKKI O`LCHOVLI MASSIVLAR

Shu vaqtgacha biz elementlarni faqat bitta ko’rsatkichli massivlarni ya’ni bir o’lchovli massivlarni ko’rib chiqayotgan edik. Delphi dasturlash tilining massiv elementlari turiga ularning hammasi bir toifaga mansub bo’lishi kerakligidan boshqa hech qanday cheklanishlar qo’yilmasligi, massiv elementlari sifatida massivlar ham ishtirok etishi imkoniyatini berdi. Bunday massivlar ko’p o’lchovli massivlarni tashkil qiladi. Agar massiv elementlari o’z navbatida massivdan iborat bo’lsa, u holda ikki o’lchovli massiv(matritsa), agar matritsa elementlari massiv bo’lsa, u holda biz uch o’lchovli massivni olamiz va hokazo.

Massivlarning o’lchami ularni EHM da qayta ishlashga hech qanday to’sqinlik ko’rsatmaydi, chunki massiv elementlari ularning o’lchamidan qatiy nazar, EHM xotirasida chiziqli ketma-ketlik sifatida saqlanadi.

Ikki o’lchovli massivlar dasturda quyidagicha tavfsiflanadi:

Array[<ko’rsatkich toifasi>] of array[<ko’rsatkich toifasi>] of <elementlar toifasi>;

yoki

Array[<ko’rsatkich toifasi, ko’rsatkich toifasi>] of <elementlar toifasi>;

Ikki o’lchovli massivlarga misol qilib matritsalarni keltirish mumkin. Ikki o’lchovli massivni e’lon qilishning bir necha usullari mavjud, masalan, massivni elementlari ham massivdan iborat massiv sifatida e’lon qilish mumkin,

```
type
mas=array[1..5] of real;
matr=array[1..3] of mas;
var a:mas; b:matr;
```

Bu yerda **a** o’zgaruvchi 5 ta haqiqiy toifaga mansub elementdan iborat bir o’lchovli massiv, **b** o’zgaruvchi 3 ta satr va 5 ta ustundan iborat (3*5) ikki o’lchovli massiv sifatida tasvirlangan.

B massivni tasvirlashni MAS toifasini ko’rsatmasdan birmuncha soddalashtirish mumkun:

type

mas=array[1..3] of array[1..3] of real;

var b:matr;

Ikkinchi xil tasvirlashda birinchi indeks(1..3) satr bo'yicha o'zgarishni, ikkinchi indeks(1..5) ustun bo'yicha o'zgarishni ko'rsatadi. Ikki o'lchovli massivlarni **Var** bo'limida to'g'ridan to'g'ri quyidagicha e'lon qilish mumkin:

var a:array[1..n,1..m] of real;

Bunda albatta N va M qiymatlari oldindan aniqlangan bo'lishi kerak.

Ikki o'lchovli massiv bilan ishlashda indekslar vergul bilan ajratiladi. Masalan, A[i,j], B[k+i,l].

Demak, indekslar o'rnida ifodalar ham ishlatilishi mumkin. Faqat ifoda tipi tasvirlashdagi tip bilan mos bo'lishi kerak.

Agar ko'rsatilgan toifa dasturda bitta massivni aniqlash uchun ishlatilayotgan bo'lsa, massivni o'zgaruvchilar bo'limida e'lon qilish maqsadga muvofiq bo'ladi:

Var

b:array[1..3,1..5] of real;

B matritsaning i satr va j ustuni kesishmasida turgan elementiga murojat B[i,j] ko'rinishga ega bo'ladi. Dasturda ishlatilganda faqat bir xil ko'rinishdagi yozilishdan foydalanish tavsiya qilinadi. Ko'pincha bir xil yozilish, ya'ni B[i,j] kabi yozilish ko'rinishi ko'p ishlatiladi. Dasturda massivning ixtiyoriy elementiga uning indeksini ko'rsatgan holda to'g'ridan to'g'ri murojat qilish mumkin.

Yuqoridagi tavfsiflarga asosan quyidagi operatorlarni ishlatish mumkin:A[i]:=2.5;

B[i,j=1]:=A[k]*B[k,j]; Readln(B[i,j]);

dasturda massivlardan foydalanish uchun massiv elementlari qiymatlari xotiraga kiritilgan bo'lishi zarur. Massiv elementlariga qiymat berishda ma'lumotlarni kiritish yoki o'zgartirish operatoridan foydalanish mumkin. Quyida keltirilgan dastur lavhalarida ikki o'lchovli massivlar elementlarini kiritish va chiqarish amalga oshirilgan.

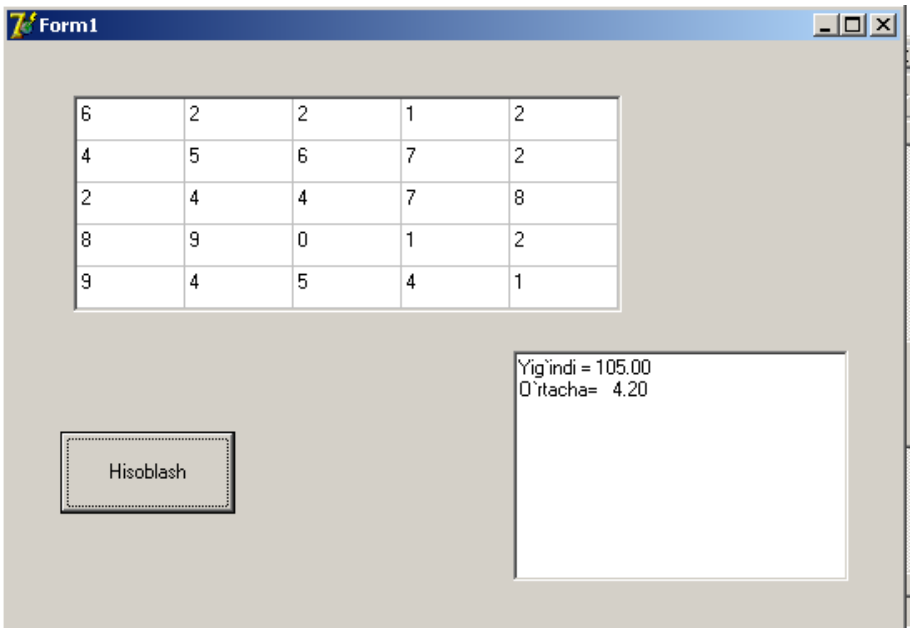
1-misol. $A(5,5)$ matritsa elementlarining yig‘indisi va o‘rta arfimetigini hisoblovchi dastur tuzing.

Yechish:Ikki o‘lchovli massiv elimentalri yig‘indisi va o‘rta arfimetigini hisoblash uchun, **button**, **memo** va **StringGrid** tugmalaridan foydalanamiz.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    Button1: TButton;
    Memo1: TMemo;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
  Var i,j,cod:integer;
     A:array[1..5,1..5] of Real;
```

```
    S:real; s1:String;
  begin
   For i:=1 to 5 do
    For j:=1 to 5 do
     Val(StringGrid1.cells[i-1,j-1],a[i,j],cod);
      S:=0;
     For i:=1 to 5 do
      For j:=1 to 5 do
       s:=s+a[i,j];
       Str(s:7:2,s1);
       Memo1.Clear;
       Memo1.Lines.add('Yig‘indi ='+s1);
       s:=s/25;
       Str(s:7:2,s1);
       Memo1.Lines.add('O‘rtacha='+s1);
end;
end.
```



17-rasm.

2-misol. A(N,N) kvadrat matritsani musbat va manfiy elimentlarini mos ravishda 1 va 0 sonlari bilan almashtirish dasturi.

Yechish: Standart kompanentalar palitrasidan 2 ta " Button1", " Button2", "Edit1" va Additional komponentalar palitrasida "StringGrid1" tugmalarni hosil qilamiz.

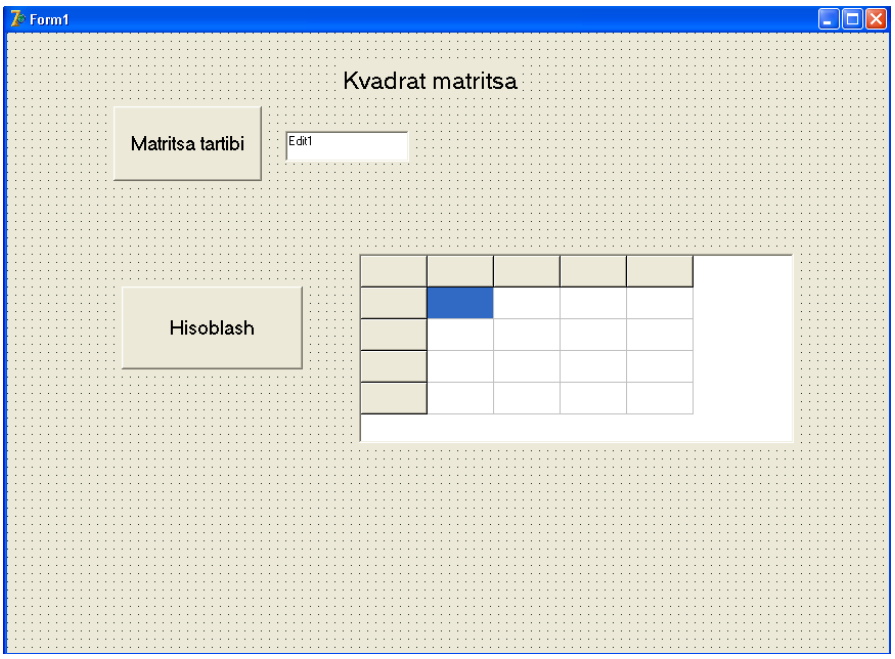
1. " Button1" tugmachasining dasturlash maydonchasiga quyidagi dasturni kiritamiz:

```
var col:integer;
begin
  col:=strtoint(Edit1.Text);
  StringGrid1.ColCount:=col+1;
  StringGrid1.RowCount:=col+1;
end;
```

Yuqorida dastur yordamida kvadrat matritsaning o`lchamlarini o`zgartirish mumkin.

2. " Button2" tugmachasining dasturlash maydonchasiga quyidagi dasturni kiritamiz:

```
var i,k:integer;
begin
 for i:=1 to strtoint(edit1.Text) do
 for k:=1 to strtoint(edit1.Text) do
  begin
   if strtoint(StringGrid1.Cells[i,k])<=0 then StringGrid1.Cells[i,k]:='0'
   else StringGrid1.Cells[i,k]:='1'
  end;
```

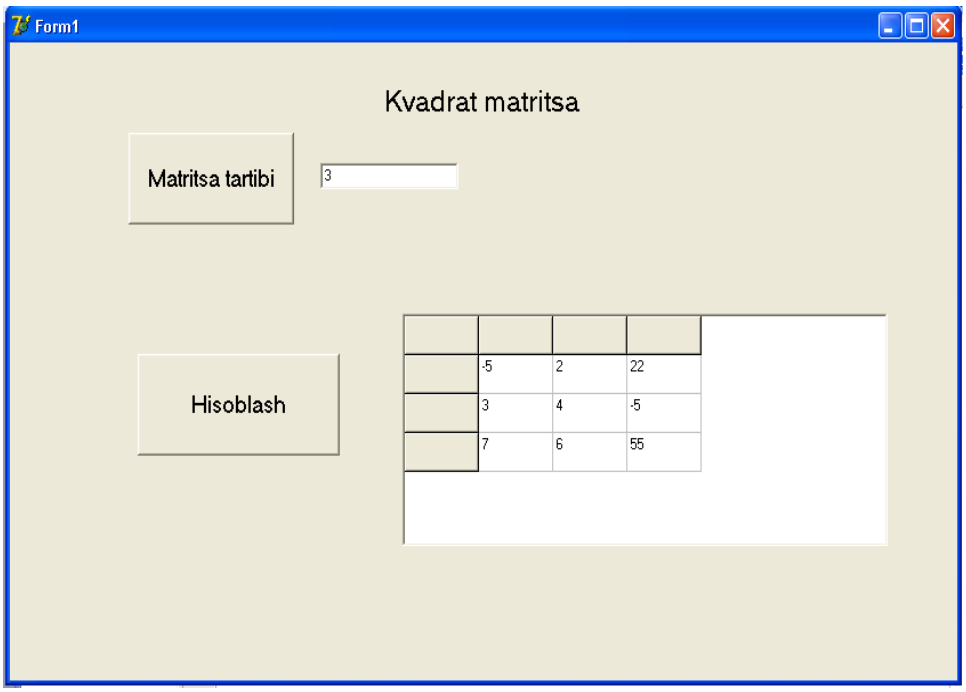


18-rasm.

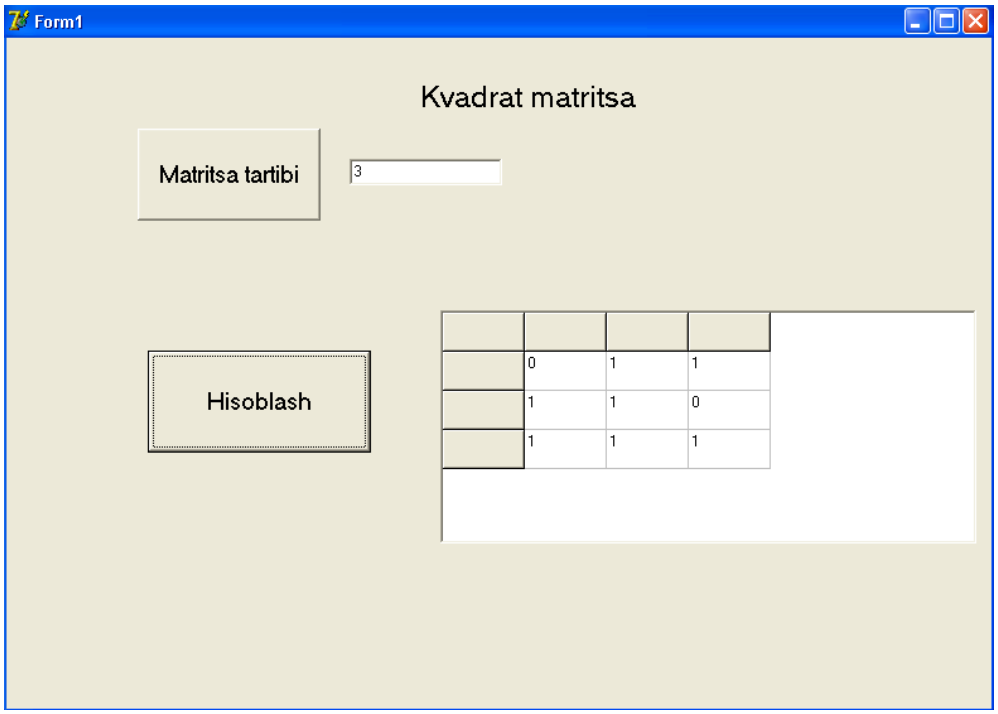
Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    Label1: TLabel;
    Edit1: TEdit;
    Button1: TButton;
    Button2: TButton;
    procedure Button1Click(Sender: TObject);
    procedure Button2Click(Sender: TObject);
  private
    { Private declarations }
  public
```

```
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
var col:integer;
begin
   col:=strtoint(Edit1.Text);
   StringGrid1.ColCount:=col+1;
   StringGrid1.RowCount:=col+1;
end;
procedure TForm1.Button2Click(Sender: TObject);
var i,k:integer;
begin
  for i:=1 to strtoint(edit1.Text) do
  for k:=1 to strtoint(edit1.Text) do
   begin
     if strtoint(StringGrid1.Cells[i,k])<=0 then StringGrid1.Cells[i,k]:='0'
     else StringGrid1.Cells[i,k]:='1'
   end;
end;
end.
```



19-rasm.



20-rasm.

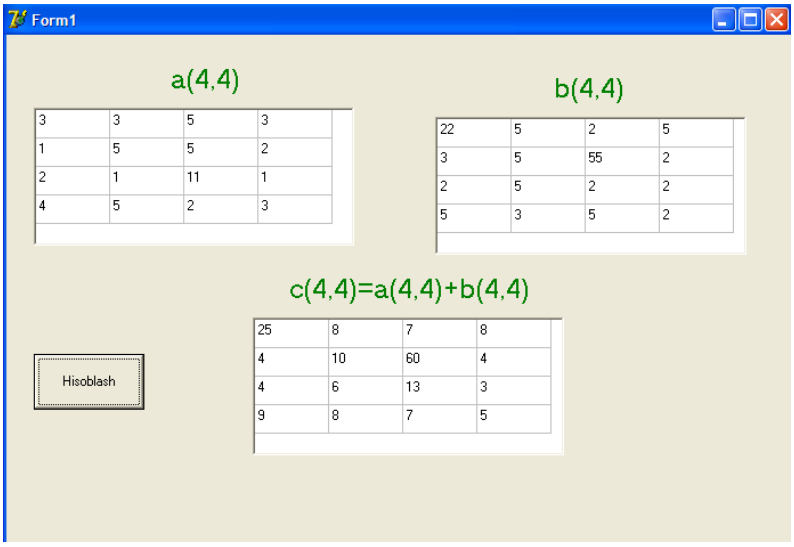
3-misol. $c_{ij} = a_{ij} + b_{ij}$ matritsani hisoblash dasturi. Bunda $i = \overline{1,4}$, $j = \overline{1,4}$

Yechish: Standart komponentalar palitrasidan bitta “Button” uchta ”StringGrid” tugmachalarini hosil qilamiz

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    Button1: TButton;
    Label1: TLabel;
    Label2: TLabel;
    StringGrid3: TStringGrid;
    Label3: TLabel;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
var
```

```
i,k:integer;
begin
for i:=1 to 4 do
begin
for k:=1 to 4 do
begin
stringgrid3.Cells[i-1,k-1]:=floattostr(strtoint(stringgrid1.cells[i-1,k-
1])+strtoint(stringgrid2.cells[i-1,k-1]));
end;
end;
end;
end.
```



21-rasm.

4-misol. A(5,5) matritsaning bosh dioganal elimentlarini yig`indisini hisoblash dasturi.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”** va **“Edit1”** tugmalarini hamda **Additional** kompanentalar palitrasidan **“ StringGrid1”** tugmasini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

unit Unit1;

```
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    Edit1: TEdit;
    StringGrid1: TStringGrid;
    Button1: TButton;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
const n=5;
   var
i,j:integer;
s,s1,p:real;
begin
s:=0; s1:=0;
for i:=1 to 5 do
begin
for j:=1 to 5 do
begin
```

if i=j then s:=s+strtoint(stringgrid1.Cells[i-1,j-1]);

if i=n+1-j then s1:=s1+strtoint(stringgrid1.Cells[i-1,j-1]);

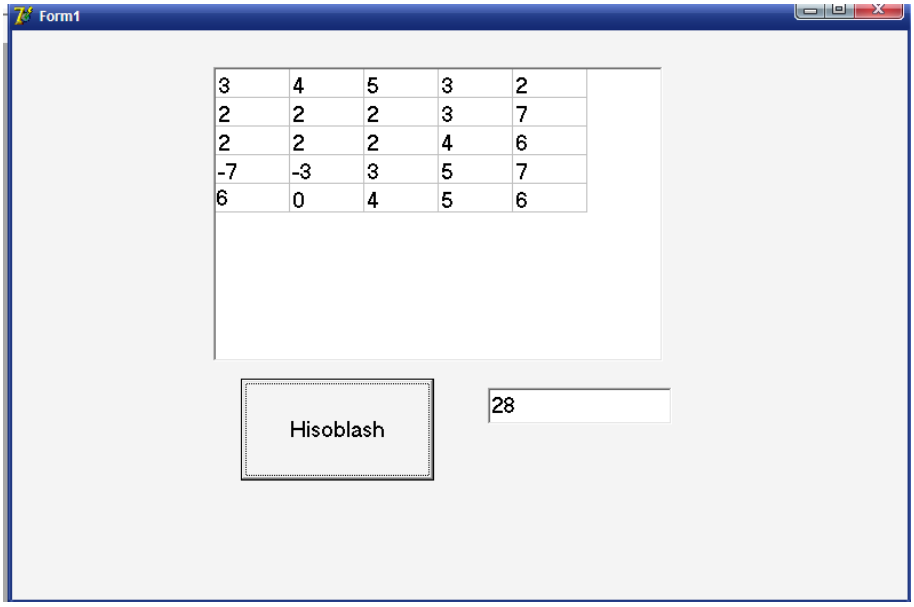
p:=s+s1;

edit1.Text:=floattostr(p); end;

end;

end;

end.



22-rasm.

5- misol. A(5,5) matritsani (transponinlash) satr elemetlarini ustun shaklda chiqarish dasturi.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”** tugmasini hamda **Additional** kompanentalar palitrasidan **“ StringGrid1”** va **“ StringGrid2”** tugmachalarini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

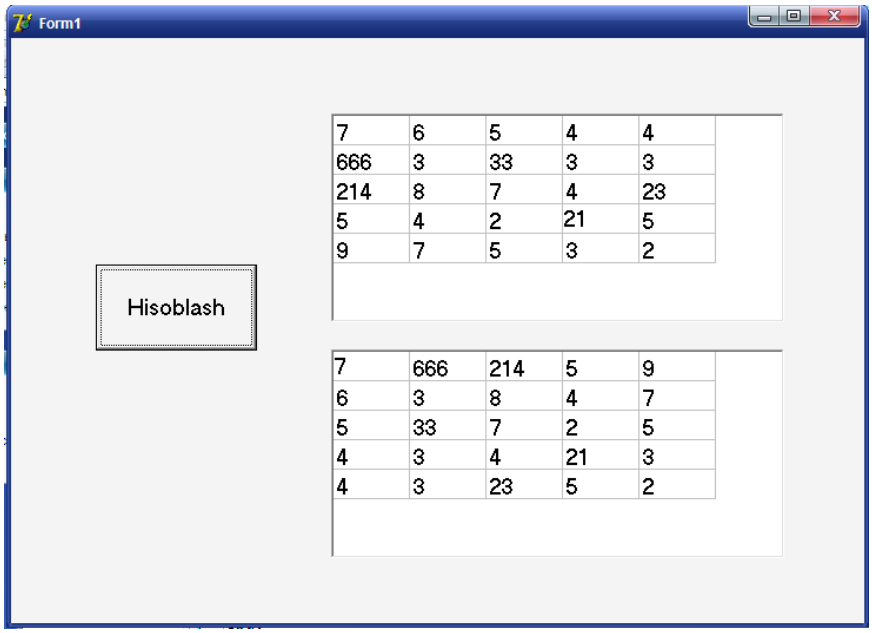
unit Unit1;

interface

uses

Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms, Dialogs, StdCtrls, Grids;

```
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    Button1: TButton;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
var
i,k:integer;
begin
for i:=1 to 5 do
begin
for k:=1 to 5 do
begin
stringgrid2.Cells[i-1,k-1]:=floattostr(strtoint(stringgrid1.cells[k-1,i-1]));
end; end; end; end.
```



23-rasm.

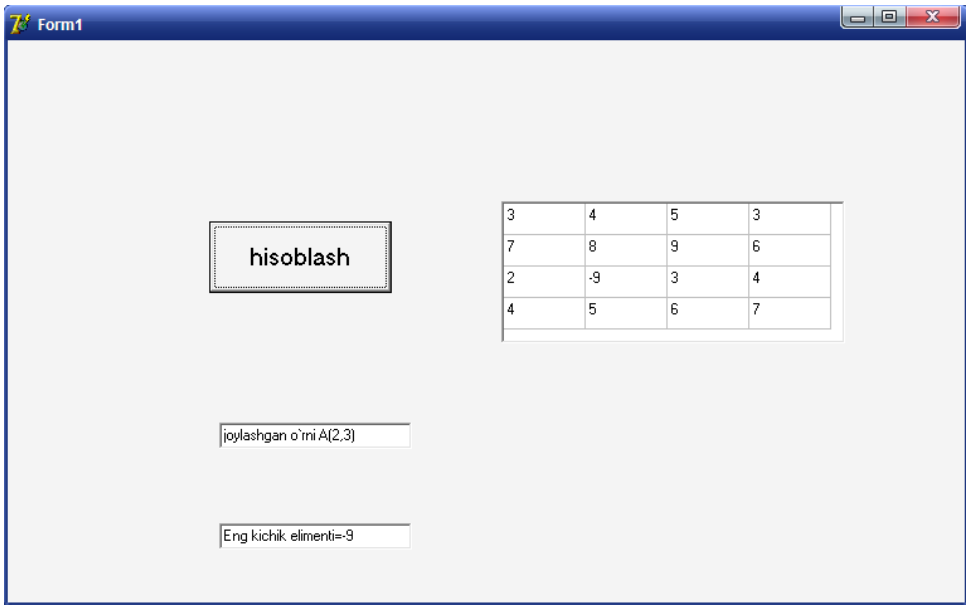
6-misol. A(4,4) matritsaning eng kichik elementi va uning turgan o`rnini aniqlash dasturi.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”** va **“Edit1”, “Edit2”** tugmalarini hamda **Additional** kompanentalar palitrasidan **“ StringGrid1”** tugmasini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    Edit1: TEdit;
    Edit2: TEdit;
    StringGrid1: TStringGrid;
    Button1: TButton;
    procedure Button1Click(Sender: TObject);
```

```
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
var a,b,i,j,min:integer;
begin
 min:=strtoint(StringGrid1.Cells[1,1]);
  for i:=1 to 4 do
    begin
      for j:=1 to 4 do
        begin
          if strtoint(StringGrid1.Cells[i-1,j-1])<min then
          begin
            min:=strtoint(StringGrid1.Cells[i-1,j-1]);
            a:=i;
            b:=j;
     edit1.Text:='A('+inttostr(a)+','+inttostr(b)+')';
   edit2.Text:=inttostr(min);
end;
   end;
   end;
   end;
end.
```



24-rasm.

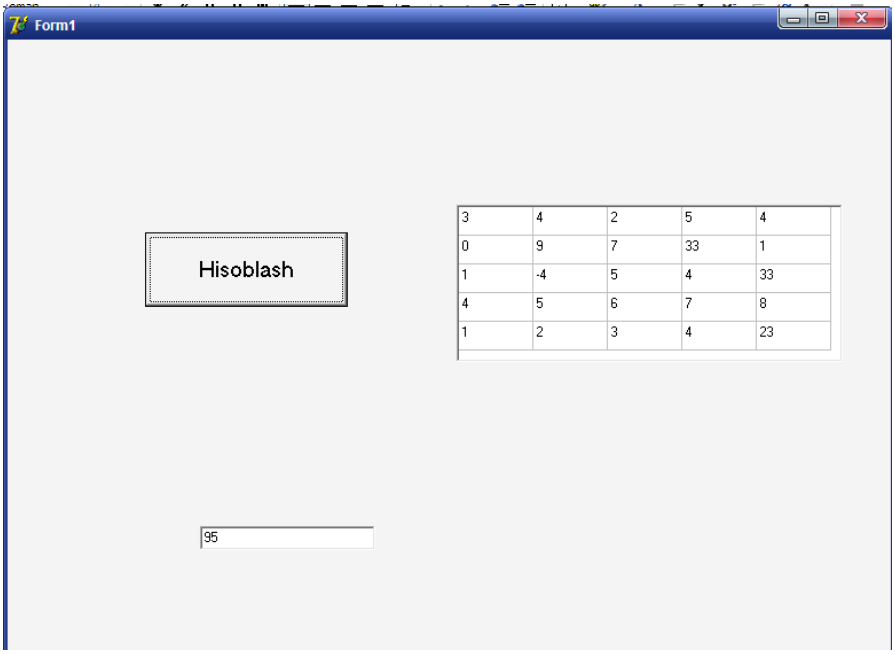
7-misol. A(5,5) matritsaning diogonal elementalri yig`indisini hisoblash dasturi.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”** va **“Edit1”,** tugmalarini hamda **Additional** kompanentalar palitrasidan **“ StringGrid1”** tugmasini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    Button1: TButton;
    StringGrid1: TStringGrid;
    Edit1: TEdit;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
```

```
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
const n=5;
   var
i,j:integer;
s,s1,p:real;
begin
s:=0; s1:=0;
for i:=1 to 5 do
begin
for j:=1 to 5 do
begin
if i=j then s:=s+strtoint(stringgrid1.Cells[i-1,j-1]);
if i=n+1-j  then  s1:=s1+strtoint(stringgrid1.Cells[i-1,j-1]);
p:=s+s1;
edit1.Text:=floattostr(p); end;
end;
end;
end.
```



25-rasm.

8-misol. A(4,4) matritsaning satr va ustun elimentlari yig`indisini kattasini topish dasturi.

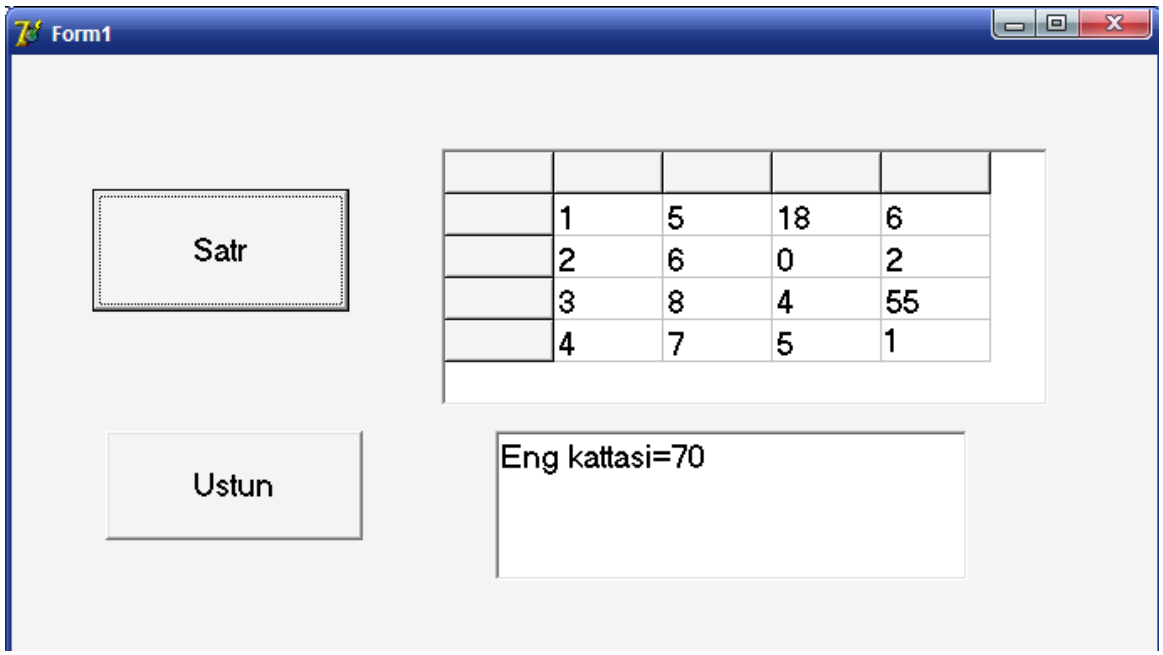
Yechish: **Standart** kompanentalar palitrasidan **“Button1”, “Button2”** va **“Memo1”** tugmalarini hamda **Additional** kompanentalar palitrasidan **“ StringGrid1”** tugmasini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    Button1: TButton;
    Button2: TButton;
    Memo1: TMemo;
    procedure Button1Click(Sender: TObject);
```

```
    procedure Button2Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
var
i,j:integer;
s,max:real;
A:array[1..4,1..4] of extended;
begin
for i:=1 to 4 do
for j:=1 to 4 do
A[i,j]:=strtofloat(stringgrid1.Cells[i,j]);
max:=a[1,1];
for j:=1 to 4 do
begin
s:=0;
for i:=1 to 4 do
  begin
    s:=s+a[i,j];
  end;
if max<s then max:=s;
end;
Memo1.Clear;
```

```
memo1.lines.add('Eng kattasi='+floatToStr(max));
end;
procedure TForm1.Button2Click(Sender: TObject);
var
i,j:integer;
s,max:real;
A:array[1..4,1..4] of extended;
begin
for i:=1 to 4 do
for j:=1 to 4 do
A[i,j]:=strtofloat(stringgrid1.Cells[i,j]);
max:=a[1,1];
for i:=1 to 4 do
begin
s:=0;
for j:=1 to 4 do
  begin
    s:=s+a[i,j];
  end;
if max<s then max:=s;
end;
memo1.Clear;
memo1.lines.add('Eng kattasi='+floatToStr(max));
end;
end.
```



26-rasm.

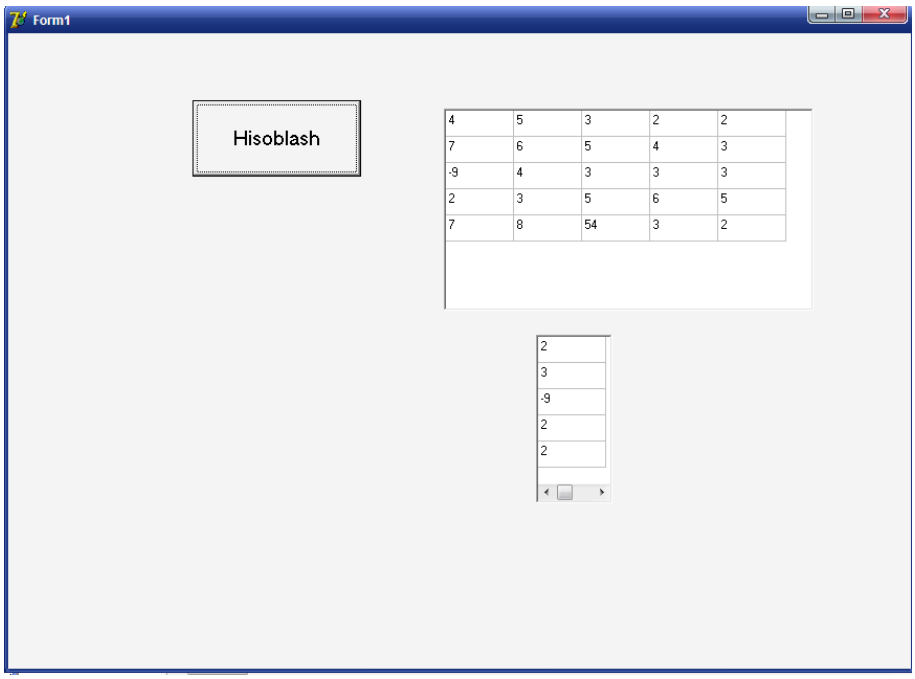
9-misol. A(5,5) matritsaning satr elementlarini eng kichigini chiqarish dasturi.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”** tugmasini hamda **Additional** kompanentalar palitrasidan**“ StringGrid1”** va **“ StringGrid2”** tugmalarini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, Grids, StdCtrls;
type
  TForm1 = class(TForm)
    Button1: TButton;
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    procedure Button1Click(Sender: TObject);
  private
```

```
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
var i,k:integer;
  min:real;
begin
  for i:=1 to 5 do
    begin
    k:=1;
    min:=strtofloat(StringGrid1.Cells[i-1,k-1]);
      for k:=1 to 5 do
        begin
if                    strtofloat(StringGrid1.Cells[k-1,i-1])<min                    then
min:=strtofloat(StringGrid1.Cells[k-1,i-1]);
        end;
     StringGrid2.Cells[0,i-1]:=floattostr(min);
    end;
end;
end.
```



27-rasm.

10-misol. **A**(4,4) matritsaning satr elementlarini o`rta geometrigini ustun bo`yicha B(4) ga chiqarish dasturi.

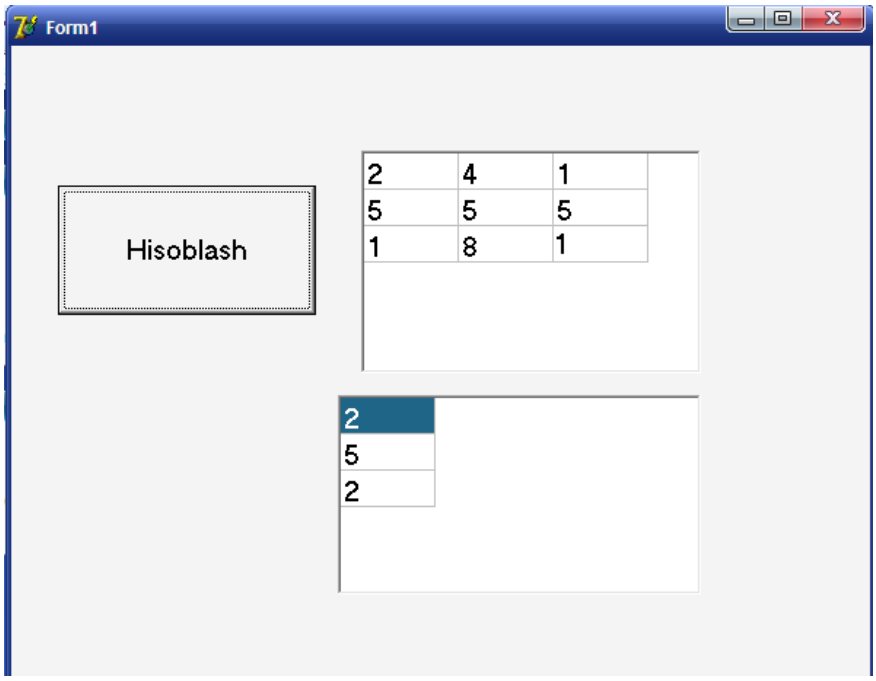
Yechish: **Standart** kompanentalar palitrasidan **“Button1”** tugmasini hamda **Additional** kompanentalar palitrasidan**“ StringGrid1”** va **“ StringGrid2”** tugmalarini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, Grids, StdCtrls;
type
  TForm1 = class(TForm)
    Button1: TButton;
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    procedure FormCreate(Sender: TObject);
```

```
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.FormCreate(Sender: TObject);
begin
StringGrid1.Cells[0,0]:='A jadv';
StringGrid2.Cells[0,0]:='B jadv';
end;
procedure TForm1.Button1Click(Sender: TObject);
var i,k:integer;
  a:array[1..3,1..3] of integer;
  s:real;
begin
  for i:=1 to 3 do
    begin
      for k:=1 to 3 do
         begin
          a[i,k]:=StrToInt(StringGrid1.Cells[k-1,i-1]);
         end;
    end;
      for i:=1 to 3 do
    begin
    s:=1;
```

```
    for k:=1 to 3 do
      begin
       s:=s*a[i,k]
      end;
      StringGrid2.Cells[0,i-1]:=FloatToStr(exp((1/3)*ln(s)));
  end;
end; end.
```



28-rasm.

11-misol. A(3,3) matritsaning har bir satrida joylashgan elementlarining eng kichigini topib uni B(2) massivga chiqarish dasturi.

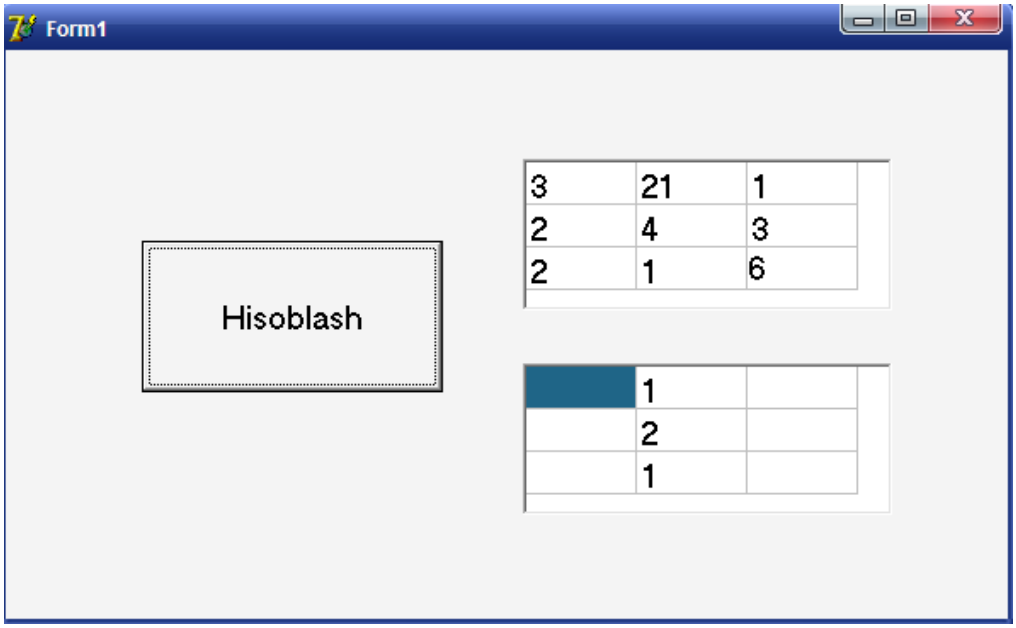
Yechish: **Standart** kompanentalar palitrasidan **“Button1”** tugmasini hamda **Additional** kompanentalar palitrasidan**“ StringGrid1”** va **“ StringGrid2”** tugmalarini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
```

```
  Dialogs, StdCtrls, Buttons, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    BitBtn1: TBitBtn;
    procedure BitBtn1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.BitBtn1Click(Sender: TObject);
var i,k:integer;
  a:array[1..3,1..3] of integer;
  min:integer;
begin
  for i:=1 to 3 do
    begin
      for k:=1 to 3 do
        begin
          a[i,k]:=StrToInt(StringGrid1.Cells[k-1,i-1]);
        end;
    end;
    for i:=1 to 3 do
      begin
```

```
    min:=a[i,1];
     for k:=2 to 3 do
       begin
        if min>a[i,k] then min:=a[i,k];
       end;
       StringGrid2.Cells[1,i-1]:=IntToStr(min);
    end;
end;
end.
```



29-rasm.

12-masala. A(4,4) matritsaning har bir ustun elementlarini o`rta geometrigini topib. Uni B(4) massivga chiqarib va B(4) massivdagi eng katta elementni topish dasturi.

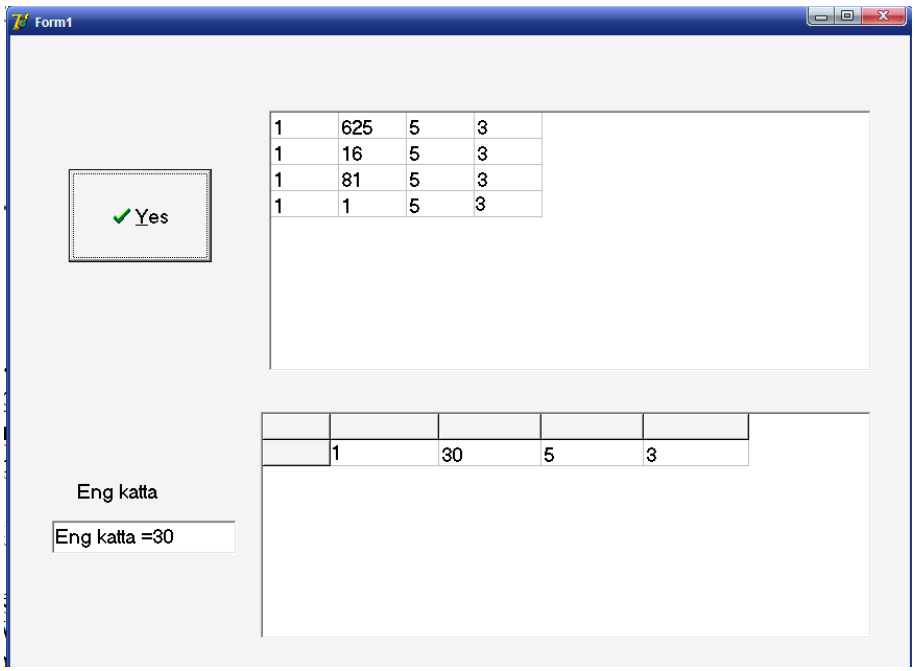
Yechish: **Standart** kompanentalar palitrasidan **“Edit1”,** tugmasini hamda **Additional** kompanentalar palitrasidan**“ StringGrid1”, “ StringGrid2”** , **“BitBtn1”** tugmalarini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
```

```
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Buttons, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    BitBtn1: TBitBtn;
    StringGrid2: TStringGrid;
    Edit1: TEdit;
    Label1: TLabel;
    procedure BitBtn1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.BitBtn1Click(Sender: TObject);
var i,k:integer;
  a:array[1..4,1..4] of real;
  max:real;
  lm:real;
begin
   for i:=1 to 4 do
    begin
      for k:=1 to 4 do
        begin
          a[i,k]:=StrTofloat(StringGrid1.Cells[k-1,i-1]);
```

```
        end;
     end;
    for i:=1 to 4 do
     begin
     lm:=1;
       for k:=1 to 4 do
         begin
           lm:=lm*a[k,i];
         end;
         lm:=exp((1/4)*ln(lm));
         StringGrid2.Cells[i,1]:=FloatToStr(lm);
     end;
     for i:=1 to 4 do
       begin
        a[i,1]:=StrToFloat(StringGrid2.Cells[i,1]);
       end;
       max:=a[1,1];
       for i:=2 to 4 do
       begin
        if max<a[i,1] then max:=a[i,1];
       end;
       edit1.Text:='Eng katta ='+   FloatToStr(max);
end;
end.
```



30-rasm.

13-misol. A(4,4) matritsaning satr elementlarini o`rta arfimetigini topib va B(4) massivga chiqarish dasturi.

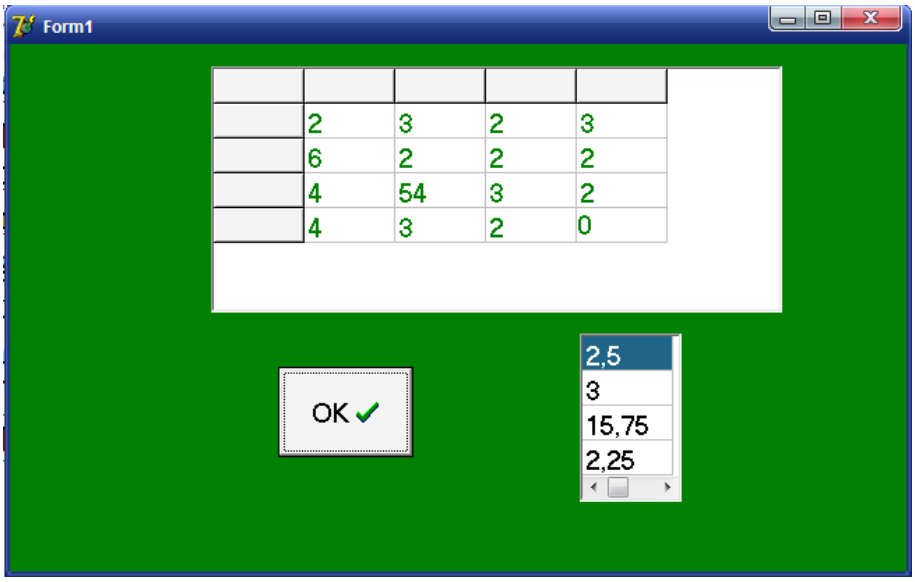
Yechish: **Additional** kompanentalar palitrasidan**“ StringGrid1”, “ StringGrid2”** , **“BitBtn1”** tugmalarini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, Grids, StdCtrls, Buttons;
type
  TForm1 = class(TForm)
    BitBtn1: TBitBtn;
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    procedure BitBtn1Click(Sender: TObject);
  private
```

```
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.BitBtn1Click(Sender: TObject);
 var i,k:integer;
    p:integer;
  a:array[1..4,1..4] of real;
  urtarif:real;
begin
   for i:=1 to 4 do
    begin
      for k:=1 to 4 do
        begin
          a[i,k]:=StrToFloat(StringGrid1.Cells[k,i]);
        end;
    end;
    for i:=1 to 4 do
    begin
    urtarif:=0;
      for k:=1 to 4 do
        begin
          urtarif:=urtarif+a[i,k];
            for p:=1 to 16000 do
        end;
        urtarif:=urtarif/4;
```

```
      StringGrid2.Cells[0,i-1]:=floatToStr(urtarif);
    end;
end;  end.
```



31-rasm.

14-misol. A(4,4) matritsaning manfiy elementlarini nisbatini hisoblash dasturi.

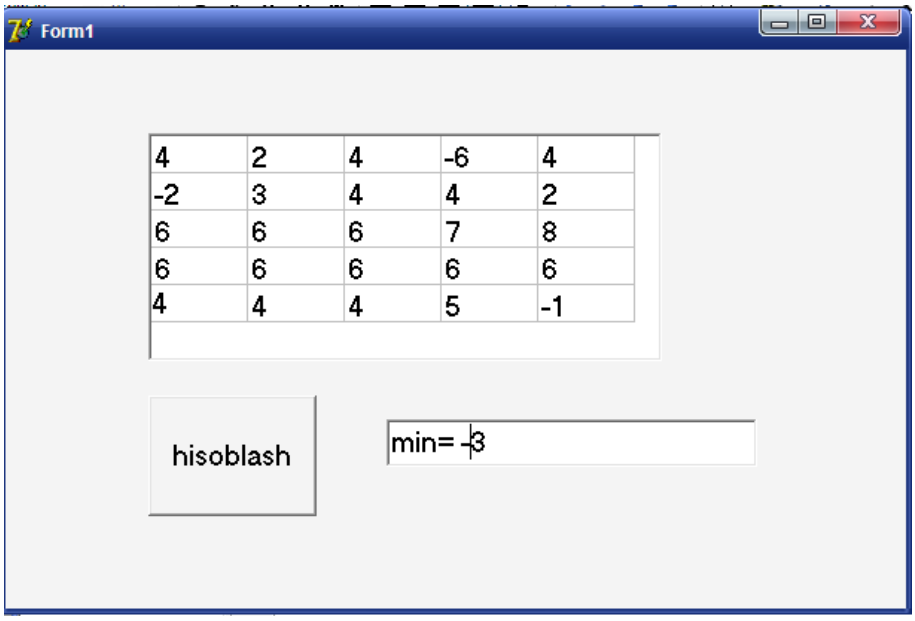
Yechish: **Standart** kompanentalar palitrasidan **“Button1”** va **“Edit1”** tugmasini hamda **Additional** kompanentalar palitrasidan**“ StringGrid1”** tugmasini hosil qilamiz.

Dastur kodi va oynani umumiy ko`rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    Edit1: TEdit;
    StringGrid1: TStringGrid;
    Button1: TButton;
    procedure Button1Click(Sender: TObject);
```

```
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
label tam;
const n=5;
var i,k,ii,kk:integer;
min:real;
a:array[1..n,1..n] of real;
begin
    for i:=1 to n do
      begin
        for k:=1 to n do
          begin
            a[i,k]:=StrToFloat(StringGrid1.Cells[k-1,i-1]);
          end;       end;
      for i:=1 to n do
      begin
        for k:=1 to n do
          begin
            if a[i,k]<0 then
              begin
                min:=a[i,k];
                goto tam;
```

```
            end;          end;
      end;
tam:
if k=n then k:=1 else k:=k+1;
  for i:=i to n do
    begin
      for k:=k to n do
        begin
          if a[i,k]<0 then
            begin
              min:=min/a[i,k];
            end;        end;
        k:=1;
    end;
    edit1.Text:='min='+ FloatToStr(min);
end; end.
```



32-rasm.

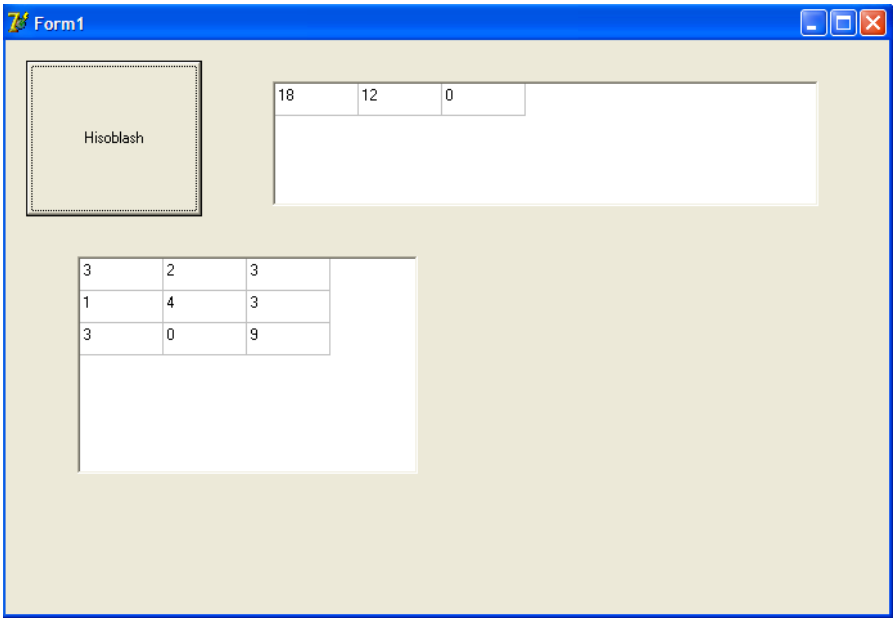
15-misol. A(3,3) matritsani satr elimentlarini ko`paytmasini B vektorga chiqarish dasturi.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”** tugmasini hamda **Additional** kompanentalar palitrasidan **“ StringGrid1”** va **“StringGrid12”** tugmalarini hosil qilamiz.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, Grids, StdCtrls;
type
  TForm1 = class(TForm)
    Button1: TButton;
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
var
a:array[1..3,1..3] of integer;
b:array[1..3] of integer;
```

```
i,cod,p,j:integer;
begin
for i:=1 to 3 do
 for j:=1 to 3 do
val(stringgrid1.Cells[i-1,j-1],a[i,j],cod);
 for i:=1 to 3 do
 begin
 p:=1;
 for j:=1 to 3 do
      begin
 p:=p*a[j,i];
 b[i]:=p;
      end;
stringgrid2.cells[i-1,0]:=inttostr(b[i]);
  end;
end;
end.
```



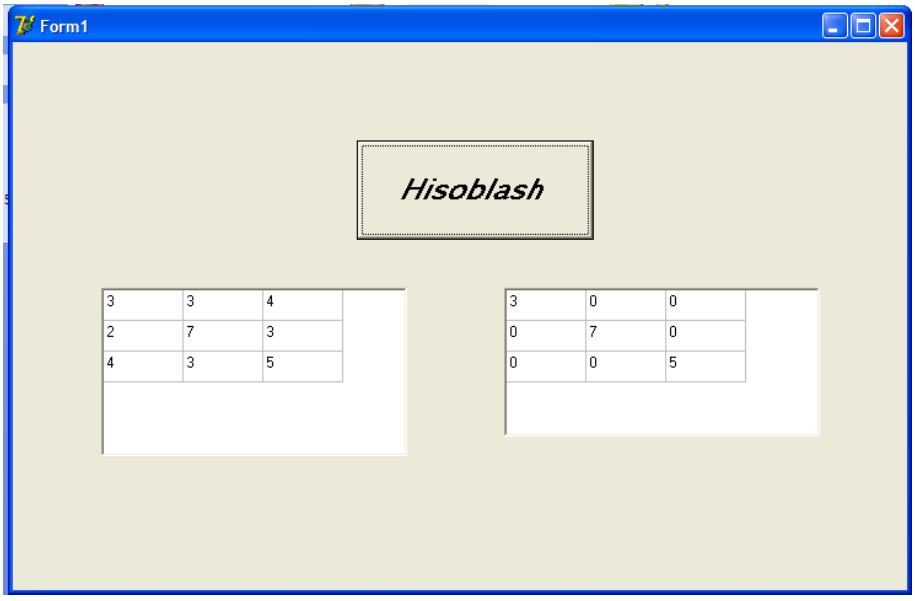
33-rasm.

16-misol. A(3,3) matritsani bosh diagonal elemintidan boshqasini nolga aylantiruvchi dastur.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”** tugmasini hamda **Additional** kompanentalar palitrasidan **“StringGrid1”** tugmalarini hosil qilamiz. Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, Grids, StdCtrls;
type
  TForm1 = class(TForm)
    Button1: TButton;
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
const n=3;
var
a:array[1..n,1..n] of integer;
b:array[1..n,1..n] of integer;
```

```
i,j,n1:integer;
begin
for i:=1 to n do
for j:=1 to n do
begin
a[i,j]:=strtoint(stringgrid1.Cells[i-1,j-1]);
end;
for i:=1 to n do
for j:=1 to n do
begin
if i=j then b[i,j]:=a[i,j] else begin a[i,j]:=0; b[i,j]:=a[i,j]; end;
stringgrid2.Cells[i-1,j-1]:=inttostr(b[i,j]);
end;
end;
end.
```



34-rasm.

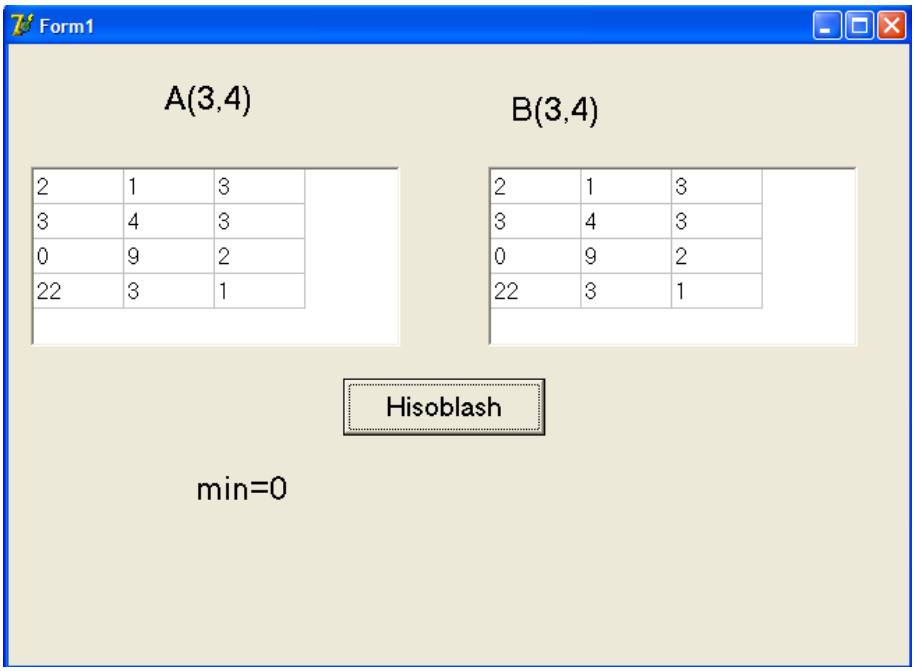
17-misol. A(3,4) matritsa elemintlarini B(3,4) matritsaga o`tkazib, eng kichchik elemintini toppish dasturi.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”** va **“Label1”, “Label2”, “Label3”** tugmalarini hamda **Additional** kompanentalar palitrasidan **“StringGrid1”** tugmasini hosil qilamiz.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, Grids, StdCtrls;
type
  TForm1 = class(TForm)
    Button1: TButton;
    StringGrid1: TStringGrid;
    StringGrid2: TStringGrid;
    Label1: TLabel;
    Label2: TLabel;
    Label3: TLabel;
    procedure Button1Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
```

```
const n=3; m=4;
var
a:array[1..n,1..m] of integer;
b:array[1..n,1..m] of integer;
alm,min,max,mini,minj,maxi,maxj,i,j:integer;
begin
for i:=1 to n do
for j:=1 to m do
begin
a[i,j]:=strtoint(stringgrid1.Cells[i-1,j-1]);
end;
min:=a[1,1];
for i:=1 to n do
begin
for j:=1 to m do
begin
if a[i,j]>max then max:=a[i,j];
if a[i,j]<min then min:=a[i,j];
label1.caption:=' min='+inttostr(min);
end; end;
for i:=1 to n do
begin
for j:=1 to m do
begin
stringgrid2.Cells[i-1,j-1]:=inttostr(a[i,j]); end;end;
end;
end.
```



35-rasm.

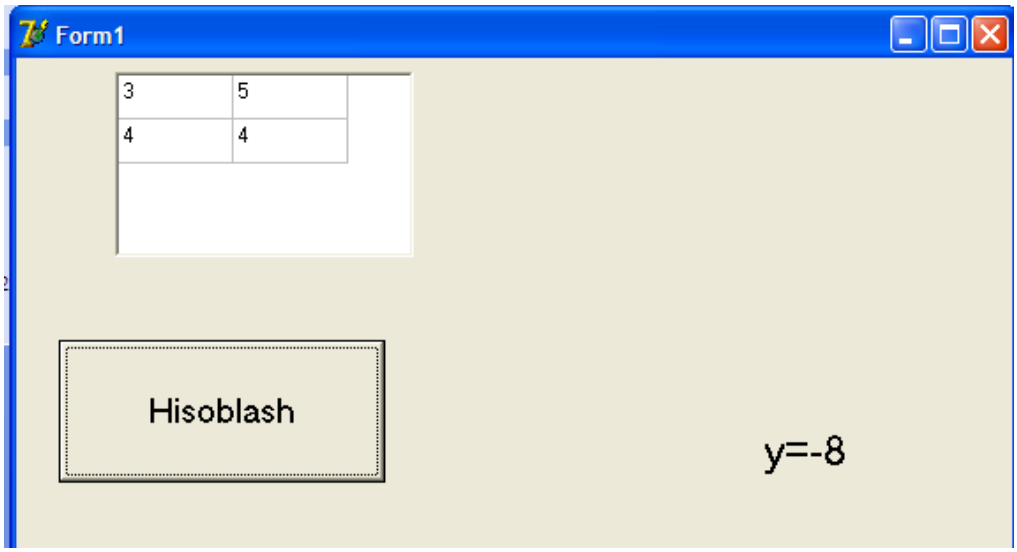
18-misol. Ikkinchi tartibli determinantni hisoblash.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”** tugmasini hamda **Additional** kompanentalar palitrasidan **“StringGrid1”** tugmasini hosil qilamiz.

Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, StdCtrls, Grids;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    Label1: TLabel;
    Button1: TButton;
    procedure Button1Click(Sender: TObject);
  private
```

```
    { Private declarations }
  public
    { Public declarations }
  end;
var
  Form1: TForm1;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
const n=2;
   var
a:array[1..2,1..2] of integer;
i,k:integer;
s,s1,y:real;
begin
s:=1; s1:=1;
for i:=1 to 2 do
for k:=1 to 2 do
a[i,k]:=strtoint(stringGrid1.cells[i-1,k-1]);
  for i:=1 to 2 do
for k:=1 to 2 do
begin
if i=k then s:=s*a[i,k];
if i=n+1-k  then  s1:=s1*a[i,k];
y:=s-s1;
end;
label1.caption:='y='+floattostr(y);
end;
end.
```



36-rasm.

19-misol. A(N,N) tartibli determinantni hisoblash dasturi. Bunda n=2,3,4 bo`lgan hol uchun.

Yechish: **Standart** kompanentalar palitrasidan **“Button1”, “Label1”, “Label2”, “Label3”** va **“Edit1”, “Edit2”** tugmalarini hamda **Additional** kompanentalar palitrasidan **“StringGrid1”** tugmalarini hosil qilamiz.

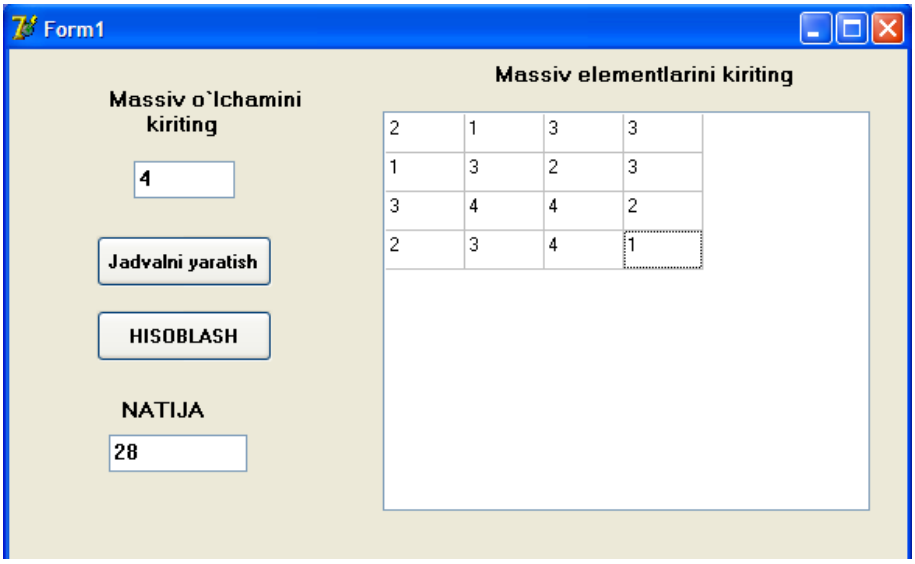
Dastur kodi va oynani umumiy ko‘rinishini keltiramiz:

```
unit Unit1;
interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,
  Dialogs, Grids, XPMan, StdCtrls;
type
  TForm1 = class(TForm)
    StringGrid1: TStringGrid;
    Label1: TLabel;
    Edit2: TEdit;
    Label2: TLabel;
    Button1: TButton;
    Label3: TLabel;
```

```
    Label4: TLabel;
    Edit1: TEdit;
    XPManifest1: TXPManifest;
    Button2: TButton;
    procedure Button1Click(Sender: TObject);
    procedure Button2Click(Sender: TObject);
  private
    { Private declarations }
  public
    { Public declarations }
  end;
type
  Tmass=array of Real;
  Tmatrix=array of Tmass;
var
  Form1: TForm1;
  n:integer;
implementation
{$R *.dfm}
procedure TForm1.Button1Click(Sender: TObject);
begin
n:=StrToInt(Edit1.Text);
StringGrid1.ColCount:=n;
StringGrid1.RowCount:=n;
end;
procedure TForm1.Button2Click(Sender: TObject);
procedure Per(k,n:integer;var a:Tmatrix; var p:integer);
var z:Real;j,i:integer;
begin
z:=abs(a[k,k]);i:=k;p:=0;
```

```
for j:=k+1 to n-1 do
   begin
     if abs(a[j,k])>z then
        begin
          z:=abs(a[j,k]);
          i:=j;
        end;
   end;
if i>k then
 begin
  p:=p+1;
  for j:=k to n-1 do
   begin
     z:=a[i,j];
     a[i,j]:=a[k,j];
     a[k,j]:=z;
   end;  end;
end;
function Znak(p:integer):integer;
begin
if p mod 2=0 then
result:=1 else result:=-1;
end;
procedure Opr(n:integer;var a:tmatrix;var det:real);
var k,i,j,p:integer;r:real;
begin
det:=1.0;
for k:=0 to n-1 do
  begin
    if a[k,k]=0 then Per(k,n,a,p);
```

```
    det:=znak(p)*det*a[k,k];
    for j:=k+1 to n-1 do
      begin
        r:=a[j,k]/a[k,k];
        for i:=k to n-1 do
        a[j,i]:=a[j,i]-r*a[k,i];
      end;   end;
end;
var k,j,i:integer;
    a:Tmatrix;
    det:real;
begin
n:=strtoint(edit1.Text);
SetLength(a,n,n);
  for k:=0 to n-1 do
  for j:=0 to n-1 do
  a[k,j]:=strtofloat(StringGrid1.Cells[j,k]);
Opr(n,a,det);
Edit2.Text:=FloatToStrF(det,ffFixed,5,0);
end; end.
```



36-rasm.

Mustaqil bajarish uchun topshiriqlar

1. $y = \dfrac{\sum_{j=1}^{6} \ln|x_i + 2{,}5|}{\prod_{i=1}^{6} x_i^2}$ ni hisoblash dasturini tuzing.

2. $y = \sum_{i=1}^{5} \dfrac{ilz_i}{2^i}$ ni hisoblash dasturini tuzing.

3. $A(10)$ vektor elementlarini eng kichigini topish dasturini tuzing.

4. $A(10)$ vektor elementlarini eng kattasini topish dasturini tuzing.

5. Uchunchi tartibli kvadrat matritsaning teskarisini topish dasturini tuzing.

6. $A(N,N)$ massivning p va q tartib raqamli satrlari o‘rnini almashtirovchi dasturini tuzing.

7. $X(K,L)$ mssivning eng katta va eng kichik elementlari o‘rnini almashtiruvchi dastur tuzing.

8. $A(3,4)$ massivning satr elementlari ko‘paytmasidan B massivni hosil qilish dasturini tuzing.

9. $Z(3,4)$ massivning har bir ustunidagi manfiy elementlar sonidan tashkil topgan M vektorni hosil qilish dasturini tuzing.

10. $A(M,N)$ massiv berilgan. Har bir satrdagi eng kichik elementlar orasidan eng kattasini va u joylashgan tartib raqamini aniqlash dasturini tuzing.

11. Diagonal elementlaridan tashqari barchga elementlari nolga teng bo‘lgan $C(M,M)$ massiv tashkil etuvchi dastur tuzing.

12. $K(3,4)$ massivning musbat elementlaridan tashkil topgan L vektorni hosil qiluvchi dastur tuzing.

13. $A(10,15)$ massivning har bir ustunindagi musbat elementlarining sonini va yig‘ingisini eslab qoluvchi va hisoblovchi dastur tuzing. Natija ikkita satr ko‘rinishida chop etilsin. $a_{ij} > 0$.

14. $N(8,6)$ massivning har bir satridagi manfiy elementlar sonini va ularning yig‘indisini aniqlovchi va bu yig‘indini massiv ko‘rinishda chop etuvchi dastur tuzing.

15. $S(10,20)$ massivning eng katta elementini toping va matritsaning har bir elementini o`nga bo‘lib, hosil bo‘lgan massivni chop etish dasturini tuzing.

16. A(4,3) massivning manfiy elementlarini nisbatini hisoblash dasturini tuzing.

17. **A**(3,3) massivning har bir satrida joylashgan elementlarining eng kattasini topib uni B(1) massivga chiqarish dasturini tuzing.

18. A(10,10) massivning satr elementlarini eng kattasini chiqarish dasturini tuzing.

19. A(4,4) massivning satr va ustun elimentlari yig`indisini kichigini topish dasturini tuzing.

20. A(4,4) massivning eng katta elementi va uning turgan o`rnini aniqlash dasturini tuzing.

21. A(5,5) massivning ustun elemetlarini satr shaklda chiqarish dasturini tuzing.

22. $c_{ij} = a_{ij} - b_{ij}$ hisoblash dasturini tuzing. Bunda $i = \overline{1,4}$, $j = \overline{1,4}$

23. $c_{ij} = a_{ij} * b_{ij}$ hisoblash dasturini tuzing. Bunda $i = \overline{1,4}$, $j = \overline{1,4}$

24. A(5,5) massivning har bir satr elementlarini o`rta arfimetigini topish dasturini tuzing.

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Delphi dasturlash tilida massivlar bilan ishlash

(Uslubiy qo‘llanma)

Terishga berildi: 14.11.2013 y.
Bosmaga ruxsat etildi: 25.11.2014 y.
Times garnirturasi. Hajmi 5 bosma taboq.
Bichimi 60x90. Adadi 100 nusxa. Buyurtma № ___
Bahosi kelishilgan narxda.
Navoiy davlat pedagogika instituti kichik bosmaxonasida chop etildi.