Mét sè thuật toán cơ bản

```pascal
{ Bµi 1  ThuËt to¸n tr¸o cèc }

Uses  Crt;
Var   A,B,C : Integer;
Begin
    Clrscr;
    Write('Nhap so A : ');
    Readln(A);
    Write('Nhap so B : ');
    Readln(B);
    C := A;
    A := B;
    B := C;
    Writeln('A = ',A:5,#13#10'B = ',B:5);
    Readln;
End.


{ Bµi  2  T×m phÇn tö nhá nhÊt trong d·y }

Uses  Crt;
Const  Max = 10;
Var   j : Integer;
    A : Array[1 .. Max] of Integer;
Begin
    Clrscr;
    For j:=1 to Max do
      Begin
        Write('A[',j:2,'] = ');
        Readln(A[j]);
      End;
    j := 2;
    Repeat
       If A[j] < A[1] then A[1] := A[j];
       Inc(j);
    Until j>Max;
    Writeln('So nho nhat la ',A[1]);
    Readln;
End.


{ Bµi  3  DuyÖt d·y theo thø tù , t×m phÇn tö X }

Uses  Crt;
Const  Max = 10;
Var   i,X : Integer;
    A  : Array[1..Max] of Integer;
Procedure Baoco;
    Begin
       Writeln(X,' co trong day ');
       Readln;
       Halt;
    End;
Procedure Khongco;
    Begin
```

```pascal
            Writeln(X,' khong co trong day ');
            Readln;
        End;
    Begin
        Clrscr;
        Write('Nhap X = '); Readln(X);
        Writeln('Nhap day A ');
        For i:=1 to Max do
            Begin
                Write('A[',i:2,'] = ');
                Readln(A[i]);
            End;
        i := 1;
        While i<= Max do
            Begin
                If A[i] = X then Baoco { Trong Baoco co lenh Halt }
                Else Inc(i);
            End;
        If i>max then Khongco;
    End.
```

{ Bµi 4 S¾p xÕp d·y b»ng ph-¬ng ph.p Næi bät - Ph-¬ng ph.p s¾p xÕp kÐm nhÊt }

```pascal
Uses  Crt;
Const  Max    = 10;
Var  N    : Integer;
     A    : Array[1..Max] of Integer;
Procedure Nhap;
    Var i : Integer;
    Begin
        Write('Nhap N = ');
        Readln(N);
        For i:=1 to N do
            Begin
                Write('A[',i:2,'] = ');
                Readln(A[i]);
            End;
    End;
Procedure Hien;
    Var i : Integer;
    Begin
        For i:=1 to N do
            Write(A[i]:5);
        Writeln;
    End;
Procedure Traococ( Var x,y : Integer);
    Var  c : Integer;
    Begin
        c    := x;
        x    := y;
        y    := c;
    End;

Procedure KieuFor;
    Var i,j : Integer;
```

```
            Begin
                For i:=1 to N-1 do
                    For j:=i+1 to N do
                        If A[i] > A[j] then Traococ(A[i],A[j]);
                Hien;
            End;
BEGIN
        Clrscr;
        Nhap;
        KieuFor;
        Readln;
END.
```

{ Bµi 5   Ph¬ng ph¸p Lïa bß vµo chuång !   }

```
Uses   Crt;
Const  Max   = 32000;
       M     = 10;
Var    x,N  : Integer;
       A    : Array[1..M] of Integer;
       B    : Array[1..Max] of Boolean;
Procedure Nhap;
       Var i  : Integer;
           Ok : Boolean;
       Begin
           Write('Nhap N = ');
           Repeat
               {$I-} Readln(N); {$I+}
           Until (IoResult=0) and (N<=10) and (N>0);
           Writeln('Nhap mang ',N,'  so nguyen duong : ');
           For i:=1 to N do
               Begin
                   Write('A[',i:2,'] = ');
                   Repeat
                       Readln(A[i]);
                       Ok := (IoResult=0) and (A[i]<=32000) and (A[i]>0);
                   Until Ok;
               End;
       End;
Procedure Thuchien;
       Var i,j : Integer;
       Begin
           FillChar(B,Sizeof(B),False);
           For i:=1 to Max do
               For j:= 1 to N do
                   If i=A[j] then B[i]:= true;
           For x:=1 to Max do
               If B[x]=False then
                   Begin
                       Write('So nguyen duong nho nhat khong thuoc mang: ');
                       Writeln(x);
                       Readln;
                       Halt;
                   End;
       End;
```

```pascal
BEGIN
    Clrscr;
    Nhap;
    Thuchien;
    Readln;
END.
```

{ Bµi 6 ThuËt to¸n t×m USCLN cña 2 sè }

```pascal
Uses   Crt;
Var    A,B,La,Lb : Integer;
Procedure Nhap(i : Char;Var x : Integer);
    Var Ok : Boolean;
    Begin
        Write('Nhap so nguyen ',i,' = ');
        Repeat
            {$I-} Readln(x); {$I+}
            Ok  := (IoResult=0);
        Until Ok;
    End;
Procedure Hien(x : Integer);
    Begin
        Write('UCLN(',LA:5,',',LB:5,') = ',x);
        Readln;
        Halt;
    End;
Procedure Hien2;
    Begin
        Writeln(' Moi so nguyen deu = UCLN(0, 0) ');
        Readln;
        Halt;
    End;
Procedure Tim;
    Var  D : Integer;
    Begin
        A  := Abs(A);
        B  := Abs(B);
        If (A=0) and (B<>0) then Hien(B);
        If (B=0) and (A<>0) then Hien(A);
        If (A=0) and (B=0) then Hien2;
        D  := A mod B;
        While D<>0 do { Chu y neu dung Repeat can tranh chia cho 0 }
          Begin
            A := B;
            B := D;
            D := A mod B;
          End;
        Hien(B);
    End;
BEGIN
    Clrscr;
    Nhap('A',A);
    Nhap('B',B);
    La := A;
    Lb := B;
```

```
        Tim;
        Readln;
END.
```

{ Bµi 7 T×m sè nguyªn tè - ThuËt to¸n tèt }

```
Uses   Crt,dos;
Const  Max = 400000; { 192/100 giay --> 50000 & 2269/100 giay --> 400000  }
Var    N , i  : LongInt;
       h,m,s,p : Word;
       T     : LongInt;
Begin
    Clrscr;
    Gettime(h,m,s,p);
    t   :=  6000*m + 100*s +p;
    Write(2:8);
    Write(3:8);
    For N := 5 to Max do
       If (N mod 2 <> 0) and (N mod 3 <> 0) then
         Begin
             i := -1;
             Repeat
                 Inc(i,6);
             Until (N mod i =0) or (N mod (i+2)=0) or (sqr(i)>N);
             If sqr(i)>N then Write(N:8);
         End;
    Gettime(h,m,s,p);
    t   := 6000*m + 100*s +p - t;
    Writeln;
    Writeln('Mat thoi gian la : ', T);
    Readln;

End.
```

{ Bµi 8 T×m c¨n bËc hai cña 1 sè }

```
Uses   Crt;
Var    A,E,X0  : Real;
Procedure Baoloi;
   Begin
       Writeln('Loi du lieu nhap : ');
       Readln;
       Halt;
   End;
Procedure Nhap;
   Var  Ok : Boolean;
      Begin
         Write('Nhap so trong can bac 2  : ');
         Repeat
             {$I-} Readln(A); {$I+}
             Ok  := (IoResult=0) and (A>=0);
             If not Ok then BaoLoi;
         Until Ok;
         Write('Nhap do chinh xac : ');
```

```
            Repeat
                {$I-} Readln(E); {$I+}
                Ok  := (IoResult=0) and (E>=0.000001) ;
                If not Ok then BaoLoi;
            Until Ok;
        End;
Procedure Lam;
    Var X : Real;
    Begin
        X0 := 1;
        Repeat
            X  := X0;
            X0 := (X + A/X)/2;
        Until Abs(X0-X) < E;
    End;
Procedure Hien;
    Begin
        Writeln('can bac 2 cua ',A:8:2,' la ',X0:8:2,' voi do chinh xac ',E:8:6);
    End;
BEGIN
    Clrscr;
    Nhap;
    Lam;
    Hien;
    Readln;
END.
```

{ Bµi 9   T×m nghiÖm ®a thøc b»ng thuËt to¸n chia ®«i cung }

```
Uses  Crt;
Const Max   = 10;
    e     = 0.0001;
Type  Mang  = Array[1..Max] of Real;
Var   A    : Mang;
    x1,x2 : Real;
    N     : Byte;
Procedure Nhap1;
    Var i : Byte;
    Begin
        Clrscr;
        Write('N = ');
        Repeat
            {$I-} Readln(N); {$I+}
        Until (IoResult=0) and (N>0) and (N<Max);
        For i:=N downto 0 do
            Repeat
                Write('A[',i:2,']=');
                {$I-} Readln(A[i]); {$I+}
            Until (IoResult=0);
    End;
Function F(x:Real):Real;
    Var i : Byte;
        p : Real;
    Begin
        p := A[n]*x+A[n-1];
```

```pascal
            For i:=2 to n do
                p := p*x+A[n-i];
            F := p;
      End;
Procedure Nhap2;
      Var  dem : Byte;
           Ok  : Boolean;
      Begin
           Writeln;
           dem := 0;
           Repeat
                Write('Nhap x1 : F(x1)<0   x1 = ');
                {$I-} Readln(x1); {$I+}
                Ok := (IoResult=0) and (F(x1)<0);
                If not Ok then
                     Begin
                         Inc(dem);
                         Writeln('Nhap sai yeu cau lan thu ',dem);
                     End;
           Until Ok or (dem =3);
           Writeln;
           dem := 0;
           Repeat
                Write('Nhap x2 : F(x2)>0   x2 = ');
                {$I-} Readln(x2); {$I+}
                Ok := (IoResult=0) and (F(x2)>0);
                If not Ok then
                     Begin
                         Inc(dem);
                         Writeln('Nhap sai yeu cau lan thu ',dem);
                     End;
           Until Ok or (dem =3);
      End;
Procedure Timnghiem;
      Var  x,p : Real;
      Begin
           x := (x1+x2)/2;
           p := F(x);
           While Abs(p) > e do
                Begin
                     If p>0 then x2 := x;
                     If p<0 then x1 := x;
                     If p = 0 then
                          Begin
                              Write('Nghiem dung la x= ',x:10:4);
                              Readln;
                              Halt;
                          End;
                     x := (x1+x2)/2;
                     p := F(x);
                End;
           Writeln('nghiem gan dung la ',x:10:4);
      End;
BEGIN
      Nhap1;
```

```
        Nhap2;
        Timnghiem;
        Readln
END.
1 -3 0 2
x1= 2 x2=4 --> x=2.732
```

{ Bµi 10 T« mµu b»ng ph-¬ng ph.p Greedy }

```
Uses  Crt;
Const  Max    = 14;
Var    A        : Array[1..Max,1..Max] of 0..1;
       Mau      : Array[1..Max] of Byte;
       N        : Integer;
       dato,chuato  : Set of Byte;
Procedure Nhap;
       Var i,j : Integer;
           F : Text;
       Begin
          FillChar(A,Sizeof(A),0);
          Assign(F,'Tomau.txt');
          Reset(F);
          Readln(F,N);
          While not Eof(F) do
            Begin
               Read(F,i);Readln(F,j);
               A[i,j] := 1;
               A[j,i] := 1;
            End;
       End;
Procedure Hien;
       Var i,j : Integer;
       Begin
          Writeln;
          For i:=1 to N do
             Begin
                For j:=1 to N do Write(A[i,j]:4);
                Writeln;
             End;
       End;
Procedure Thongbao;
       var i : Integer;
       Begin
          Write('Da   to mau  : ');
          For i:=1 to N do
             If i in dato then Write(i:4);
          Writeln;
          Write('Chua to mau   : ');
          For i:=1 to N do
             If i in chuato then Write(i:4);
          Writeln;
          Writeln;
          Write('Danh sach dinh : ');
          For i:=1 to N do
             Write(i:4);Writeln;
```

```pascal
              Write('Mau da to la   : ');
            For i:=1 to N do
                Write(Mau[i]:4);
       End;
Function Kt(x,m : Integer): Boolean;
      Var  i : Integer;
      Begin
          Kt := False;
          For i:=1 to N do
              If (A[x,i]=1) and (m=Mau[i]) then Exit;
          Kt := True;
      End;
Procedure  Greedy;
      Var i : Integer;
         Lienquan  : Array[1.. Max] of Byte;
         Mp,Maxm,j : Integer;
      Begin
          Dato := [];
          Chuato :=[];
          For i:=1 to N do chuato := chuato +[i];
          Mau[1]:=1;
          dato:= dato+[1];
          chuato := chuato-[1];
          Maxm   := 1;
          For i:=1 to N do
            Begin
                If i in chuato then
                    Begin
                        FillChar(Lienquan,Sizeof(Lienquan),0);
                        For j:=1 to N do
                          If (A[i,j]=1) and (Mau[j]>0) then
                          Lienquan[Mau[j]] := 1;
                        For j:=1 to N do
                          If Lienquan[j]=0 then
                              Begin
                                  mp := j;
                                  j := N;
                              End;
                        If mp<=N then
                              Begin
                                  Mau[i] := mp;
                                  dato   := dato + [i];
                                  Chuato := chuato -[i];
                              End
                        Else
                              Begin
                                  Inc(Maxm);
                                  Mau[i]:=Maxm ;
                                  dato   := dato + [i];
                                  Chuato := chuato -[i];
                              End;
                    End;
              End;
      End;
BEGIN
```

```pascal
        Clrscr;
        Nhap;
        Hien;
        Greedy;
        Thongbao;
        Readln;
END.
```

{Bµi 11 : T×m phÇn tö X trong d·y s¾p thø tù b»ng ph-¬ng ph¸p chia ®«i }

```pascal
Uses  Crt;
Const  Max  = 1000;
Var   A   : Array[1.. Max] of Integer;
      N,X  : Integer;
Procedure  Nhap;
     Var i : Integer;
     Begin
        Write('So phan tu cua mang : N = ');
        Readln(N);
        Randomize;
        For i:=1 to N do A[i] := Random(100);
     End;
Procedure Hien;
     Var i : Integer;
     Begin
        For i:=1 to N do
           Begin
              If i mod 480 =0 then Readln;
              Write(A[i]:4);
           End;
     End;
Procedure PPchiadoi;
     Procedure Sap;
        Var i,j,c : Integer;
        Begin
           For i:=1 to N-1 do
              For j:=i+1 to N do
                 If A[j]<A[i] then
                    Begin
                       c   := A[i];
                       A[i] := A[j];
                       A[j] := c;
                    End;
        End;
      Procedure NhapN;
        Begin
           Writeln;
           Write('Nhap so X can tim trong mang , X = ');
           Readln(X);
        End;
      Procedure Thuchien;
        Var g,d,c : Integer;
        Begin
           d := 1;
```

```
          c := N;
        While d<=c do
            Begin
               g := (d+c) div 2;
               If X > A[g] then d := g+1;
               If X < A[g] then c := g-1;
               If X = A[g] then c := -1
            End;
         If c = -1 then Writeln('Co ',x:4,' trong mang ') Else
         Writeln('Khong co ' ,x:4,' trong mang ');
      End;
   Begin
      Sap;
      Writeln;
      Hien;
      NhapN;
      Thuchien;
   End;
BEGIN
   Clrscr;
   Nhap;
   Hien;
   PPchiadoi;
   Readln;
END.
```

Bài 12: S¾p xÕp lµ mét c«ng viÖc tÝnh to¸n hay ph¶i lµm nhÊt . XÐt bµi to¸n s¾p xÕp cô thÓ sau ®©y : CÇn s¾p xÕp kh«ng gi¶m c¸c phÇn tö cña m¶ng , mµ c¸c gi¸ trÞ cña c¸c phÇn tö chØ lµ 1,2,3 .ViÖc s¾p xÕp ®îc thùc hiÖn b»ng mét d·y c¸c thao t¸c ®æi chç . Mét thao t¸c ®æi chç x¸c ®Þnh bëi 2 phÇn tö ë vÞ trÝ p , q cña m¶ng lµ ®æi vÞ trÝ cña chóng cho nhau .

   LËp ch¬ng tr×nh tÝnh sè Ýt nhÊt c¸c thao t¸c ®æi chç ®Ó s¾p xÕp d·y thµnh mét d·y kh«ng gi¶m .

   HiÖn tr¹n mµn h×nh sè Ýt nhÊt c¸c thao t¸c nµy vµ tÊt c¶ c¸c thao t¸c thùc hiÖn (mçi thao t¸c lµ 2 sè p vµ q t¬ng øng)

H¹n chÕ : Sè phÇn tö cña m¶ng lµ N <=1000 .

```
Uses   Crt;
Const  Max   = 1000;
Var    A            : Array[1..max] of Byte;
       Phai,Trai    : Array[1..Max] of Word;
       N,T2,T3,sp   : Word;
Procedure Nhap;
     { NhËp gi¸ trÞ cña N vµ c¸c phÇn tö cña M¶ng A(N) tõ bµn
phÝm hoÆc ngÉu nhiªn }
Procedure Khoitao;
  Var i : Word;
  Begin
       T2  := 1;
       For i:=1 to N do
          If A[i]=1 then Inc(T2) Else  If A[i]=2 then Inc(T3);
       T3  := T2+T3;
End;
Function Tim1_B2 : Word;    { Tim so 1 trong bang 2 }
  Var i,j : Word;
```

```pascal
        Begin
            For i:=T2 to T3-1 do
                If A[i]=1 then      Begin    Tim1_B2:=i;   Exit;      End;
            Tim1_B2:=0;
        End;
Function Tim1_B3 : Word;     { Tim so 1 trong bang 3 }
    Var i,j : Word;
    Begin
        For i:=T3 to N do
            If A[i]=1 then      Begin    Tim1_B3:=i;   Exit;      End;
        Tim1_B3:=0;
    End;
Procedure Doi(i,j,gt : Word);
    Begin
            A[j]  := A[i];    A[i]  := gt;
            Inc(sp);
            Phai[sp]:= i;    Trai[sp]:= j;
    End;
Procedure Lam1;
    Var i,x,y : Word;
    Begin
        For i:=1 to T2-1 do
            Begin
                x  := Tim1_B2;
                y  := Tim1_B3;
                If A[i]=2 then
                    Begin
                        If (x>0) then Doi(i,x,1);
                        If ((y>0) and (x=0)) then Doi(i,y,1);
                    End Else
                If A[i]=3 then
                    Begin
                        If (y>0) then Doi(i,y,1);
                        If ((y=0) and (x>0)) then Doi(i,x,1);
                    End;
            End;
    End;
Function Tim3_B2 : Word;{ Tim so 2 trong bang 3 }
    Var i : Word;
    Begin
        For i:=T3 to N do
            If A[i]=2 then
                Begin
                    Tim3_B2:=i;
                    Exit;
                End;
        Tim3_B2:=0;
    End;
Procedure Lam2;    { Chuyen so 3 tu bang 2 ve bang 3 }
    Var x,i : Word;
    Begin
        For i:=T2 to T3-1 do
            If A[i] = 3 then
                Begin
                    x:=Tim3_B2;
```

```pascal
            If x>0 then Doi(i,x,3);
        End;
  End;
Procedure Hien;
  Var   i        : Word;
Begin
        For i:=1 to sp Do Writeln(Phai[i],' ',Trai[i]);
End;
BEGIN
    Clrscr;
    Nhap;    Khoitao;
    Lam1;
    Lam2;
    Hien;
    Readln
END.
```