

! 2-D Numerical Wave Basin Program by BEM  
! (Warning !! only for PC Cluster with 2 CPUs)  
! 2005/7/4

```
=====
! 宣告本程式載掛平行程式資料庫
include 'mpif.h'
! 宣告平行程式所需的係數
integer stat(mpi_status_size),rank,cpu_num,c(2)
! 路徑
character(len=*) path
parameter(path="//shop01\chou\2dwave\')
! 此段宣告的變數為宣告到全部的 cpu

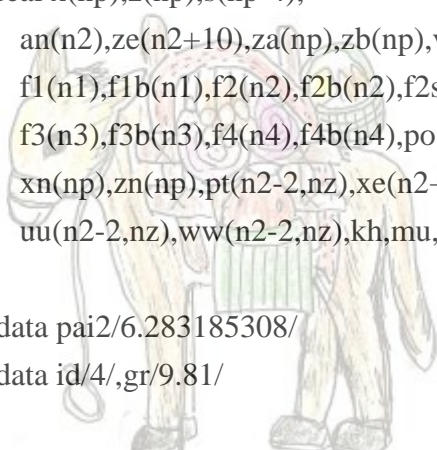
parameter(n1=41,n2x11=101,n2x12=395,n2x1=n2x11+n2x12,
/          n2x2=5,n2=n2x1+n2x2,n3=401,n4=101,
/          nz=4,np=n1+n2+n3+n4,nfr1=20,nfr2=3,nfr=nfr1+nfr2,nout=2)
parameter(nt1=n1+n2,nt2=n3+n4)
parameter(nt0=max(nt1,nt2))11 埃及尼羅河之旅
CHARACTER num1*2,num2*2,num3*2,num4*2
real h(nt0,nt0),g(nt0,nt0)
real x(np),z(np),s(np-4),
/ an(n2),ze(n2+10),za(np),zb(np),vabs(n2-2,nz),vang(n2-2,nz),
/ f1(n1),f1b(n1),f2(n2),f2b(n2),f2s(n2),f2x(n2),f2z(n2),
/ f3(n3),f3b(n3),f4(n4),f4b(n4),posx(n2-2,nz),posz(n2-2,nz),
/ xn(np),zn(np),pt(n2-2,nz),xe(n2+10),pxe(n2-2,nz),tmp(n2),
/ uu(n2-2,nz),ww(n2-2,nz),kh,mu,b(nfr),xline(nout),zline(nout)

data pai2/6.283185308/
data id/4/,gr/9.81/

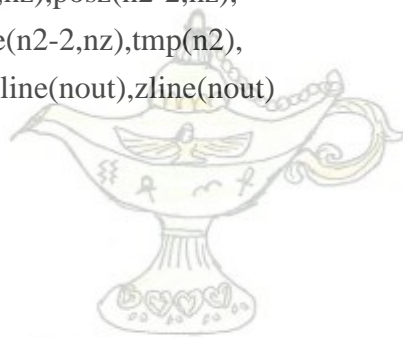
n11=n1-1
n21=n2-1 載滿貨品的驢子
n31=n3-1
n41=n4-1
ns=n11+n21+n31+n41
np2=n1+n2
np3=np2+n3
```



載滿貨品的駱駝



載滿貨品的驢子



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```

ns2=n11+n21
ns3=ns2+n31
n1x=n11-1
n2x=n21-1
n3x=n31-1
n4x=n41-1
ds=0.00001
ho=1
pai=3.1415927
gr=gr*ho
igdex=0

```

```

!=====
! 平行開始
! call mpi_init(ierr)
! 確認參與工作之 cpu
! call mpi_comm_size(mpi_comm_world,cpu_num,ierr)
! call mpi_comm_rank(mpi_comm_world,rank,ierr)

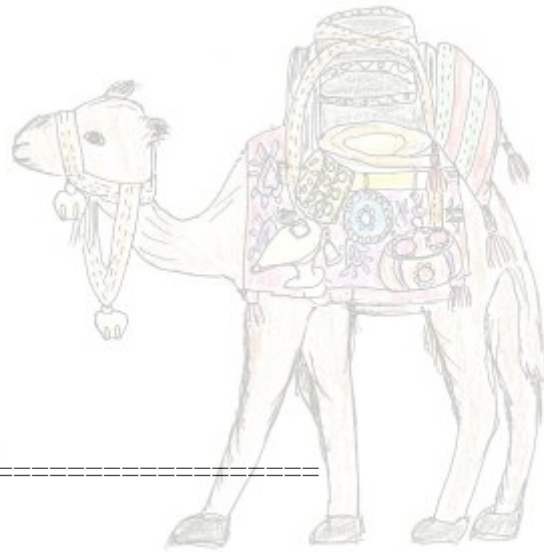
```

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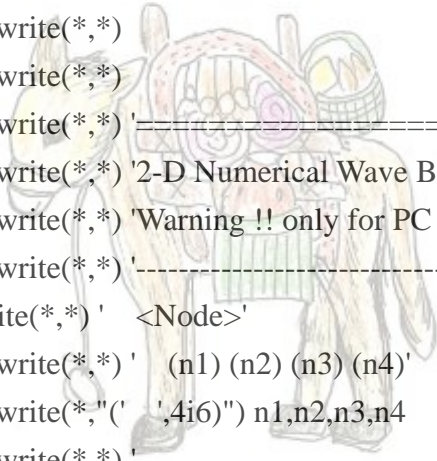
```

!=====
! rank0 執行的部分
! if(rank.eq.0)then
!   write(*,*)
!   write(*,*)
!   write(*,*) '=====
!   write(*,*) '2-D Numerical Wave Basin Program by BEM'
!   write(*,*) 'Warning !! only for PC Cluster with 2 CPUs'
!   write(*,*) '-----'
!   write(*,*) ' <Node>'
!   write(*,*) ' (n1) (n2) (n3) (n4)'
!   write(*,*) '(' ,4i6)" n1,n2,n3,n4
!   write(*,*) '-----'
!   write(*,*) 'Plase Check Dimension !!'
!   write(*,*) ("The maximum dimension is nt0=',i4)") nt0
!   write(*,*) '=====
!   if(cpu_num.ne.2)then
!     write(*,*) 'Error !! Not have enough CPUs !'
!     pause

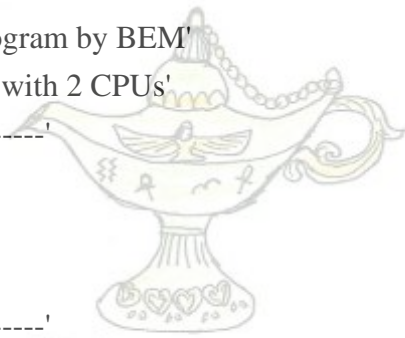
```



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第一項寶品的神燈



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end if

write(\*,\*)

!=====

```
open( 2,file=path/'out.dat' ,form='formatted',status='replace')
open( 4,file=path/'fin.in' ,form='formatted',status='old' )
open( 7,file=path/'xyz.dat' ,form='formatted',status='replace')
open(15,file=path/'vol.dat' ,form='formatted',status='replace')
open(16,file=path/'ang.dat' ,form='formatted',status='replace')
open(17,file=path/'pt.dat' ,form='formatted',status='replace')
open(18,file=path/'xy.dat' ,form='formatted',status='replace')
open(19,file=path/'u.dat' ,form='formatted',status='replace')
open(20,file=path/'w.dat' ,form='formatted',status='replace')
open(21,file=path/'check.dat',form='formatted',status='replace')
open(22,file=path/'h1.dat' ,form='formatted',status='replace')
open(23,file=path/'h2.dat' ,form='formatted',status='replace')
open(24,file=path/'h3.dat' ,form='formatted',status='replace')
open(25,file=path/'h4.dat' ,form='formatted',status='replace')
open(26,file=path/'h5.dat' ,form='formatted',status='replace')
open(27,file=path/'h6.dat' ,form='formatted',status='replace')
open(28,file=path/'h7.dat' ,form='formatted',status='replace')
open(29,file=path/'h8.dat' ,form='formatted',status='replace')
open(30,file=path/'h9.dat' ,form='formatted',status='replace')
open(31,file=path/'h10.dat' ,form='formatted',status='replace')
open(32,file=path/'h11.dat' ,form='formatted',status='replace')
open(33,file=path/'h12.dat' ,form='formatted',status='replace')
open(34,file=path/'h13.dat' ,form='formatted',status='replace')
open(35,file=path/'h14.dat' ,form='formatted',status='replace')
```

read(4,\*) xslope

read(4,\*) xxls

read(4,\*) icase

read(4,\*) ham

read(4,\*) shg

read(4,\*) start

read(4,\*) end

read(4,\*) hreal

read(4,\*) hmodel

```

read(4,*) dstep
read(4,*) mu
read(4,*) ismooth

```

```

call hk(shg,kh)
write(*,*) 'shg=',shg,' kh=',kh

```

```

scale=hreal/hmodel
scale2=sqrt(scale)

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itt=dstep/50
itt=1

```

```

sigma=sqrt(shg*gr/hmodel)
ddt=2*pai/sigma/dstep
xl=2*pai/kh

```

```

aka=kh*ham
hmodel=hmodel*ho
xls=xxls*ho
xslope=xslope*ho

```

```

ds1=0.25*ho
ds2=0.25*ho
ds3=0.25*ho

```

```

if(icase.eq.1) then
do i=1,n1
x(i)=xls
z(i)=-hmodel+hmodel/n11*(i-1)
end do

```

```

! do i=1,n2
! ii=n1+i
! x(ii)=xls-xls/n21*(i-1)
! z(ii)=0
! end do

```

```

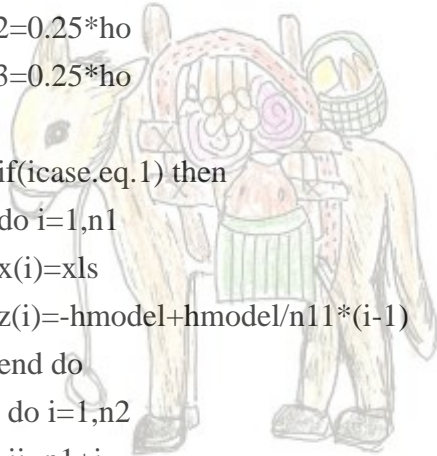
do i=1,n2x11
ii=n1+i
x(ii)=xls-ds1*(i-1)

```



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z(ii)=0

end do

do i=1,n2x12

ii=i+n1+n2x11

x(ii)=x(n1+n2x11)-ds2\*i

z(ii)=0

end do

! do i=1,n2x12

! ii=i+n1+n2x11

! x(ii)=x(ii-1)-(ds1-dd1\*(i-1))

! z(ii)=0

! end do

do i=1,n2x2

ii=n1+i+n2x1

x(ii)=x(ii-1)-ds3

z(ii)=0

end do



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! do i=1,n2x31

! ii=n1+i+n2x1+n2x2

! x(ii)=x(ii-1)-(ds2+dd2\*i)

! z(ii)=0

! end do

! do i=1,n2x32

! ii=n1+n2x1+n2x2+n2x31+i

! x(ii)=x(ii-1)-ds4

! z(ii)=0

! end do

do i=1,n3

ii=i+np2

x(ii)=xslope/n31\*(i-1)

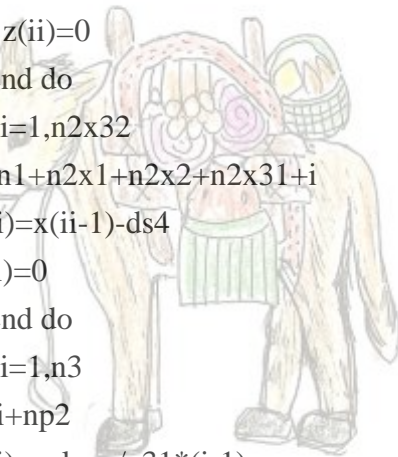
z(ii)=-hmodel/n31\*(i-1)

end do

do i=1,n4

ii=i+np3

x(ii)=xslope+(xls-xslope)/n41\*(i-1)

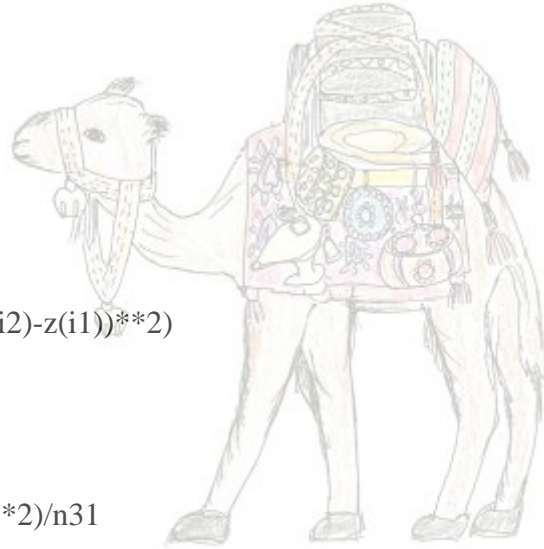
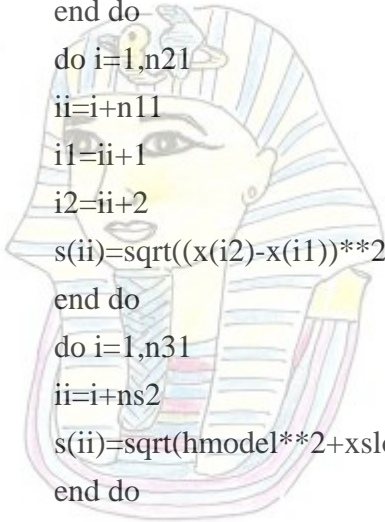


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```

z(ii)=-hmodel
end do
do i=1,n11
s(i)=hmodel/n11
end do
do i=1,n21
ii=i+n11
i1=ii+1
i2=ii+2
s(ii)=sqrt((x(i2)-x(i1))**2+(z(i2)-z(i1))**2)
end do
do i=1,n31
ii=i+ns2
s(ii)=sqrt(hmodel**2+xslope**2)/n31
end do

```



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```

do i=1,n41
ii=ns3+i
s(ii)=(xls-xslope)/n41
end do

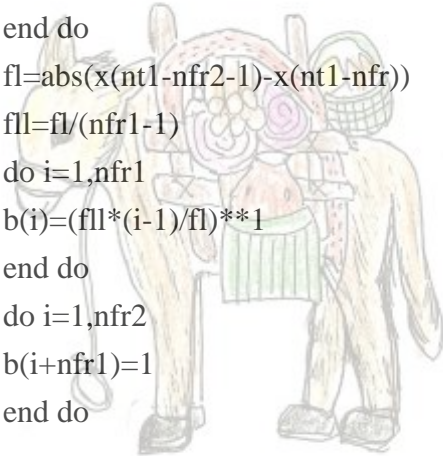
```

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```

do i=1,n2
f2b(i)=0
f2(i)=0
end do
fl=abs(x(nt1-nfr2-1)-x(nt1-nfr))
fll=fl/(nfr1-1)
do i=1,nfr1
b(i)=(fll*(i-1)/fl)**1
end do
do i=1,nfr2
b(i+nfr1)=1
end do

```



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```

do ix=2,n2-1
iix=ix-1
do iz=1,nz
posx(iix,iz)=x(ix+n1)
posz(iix,iz)=-hmodel/nz*(iz-1)
end do

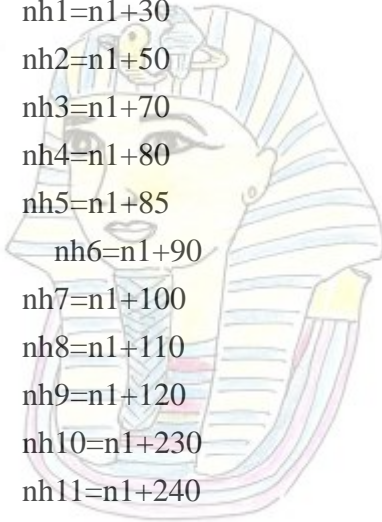
```

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end do

end if

```
nh1=n1+30
nh2=n1+50
nh3=n1+70
nh4=n1+80
nh5=n1+85
nh6=n1+90
nh7=n1+100
nh8=n1+110
nh9=n1+120
nh10=n1+230
nh11=n1+240
nh12=n1+360
nh13=n1+480
```

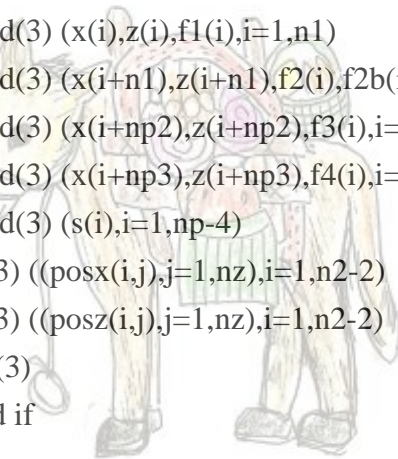


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nh14=n1+n2

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```
if(icase.ne.1)then
open(3,file=path//'fin.old',form='unformatted',status='old')
read(3) (x(i),z(i),f1(i),i=1,n1)
read(3) (x(i+n1),z(i+n1),f2(i),f2b(i),i=1,n2)
read(3) (x(i+np2),z(i+np2),f3(i),i=1,n3)
read(3) (x(i+np3),z(i+np3),f4(i),i=1,n4)
read(3) (s(i),i=1,np-4)
read(3) ((posx(i,j),j=1,nz),i=1,n2-2)
read(3) ((posz(i,j),j=1,nz),i=1,n2-2)
close(3)
end if
```



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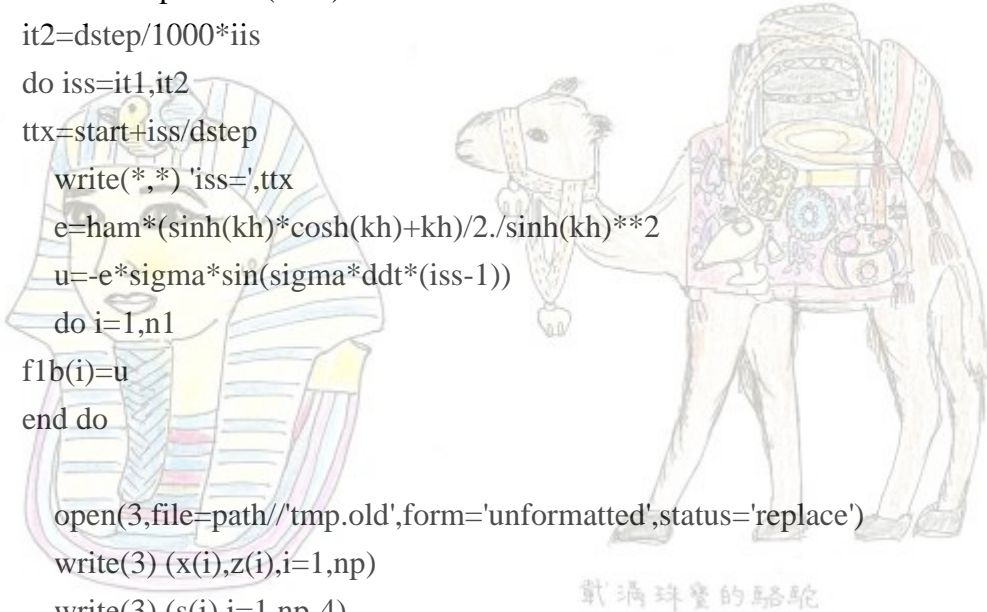
```
! ***** begin to repeat *****
istart=start*1000
iend=end*1000
istart1=istart+1
iend1=iend
if(icase.ne.1) istart1=istart-istart+1
```

```

if(icase.ne.1) iend1=iend-istart
  do iis=istart1,iend1
it1=1+dstep/1000*(iis-1)
it2=dstep/1000*iis
do iss=it1,it2
ttx=start+iss/dstep
write(*,*) 'iss=',ttx
e=ham*(sinh(kh)*cosh(kh)+kh)/2./sinh(kh)**2
u=-e*sigma*sin(sigma*ddt*(iss-1))
do i=1,n1
f1b(i)=u
end do

open(3,file=path/'tmp.old',form='unformatted',status='replace')
write(3) (x(i),z(i),i=1,np)
write(3) (s(i),i=1,np-4)
close(3)

```



```
!*****
```

```
! 傳訊給 rank1
```

```
call mpi_send(9,1,mpi_integer,1,1,mpi_comm_world,ierror)
```

```
!*****
```

```

open(51,file=path/'51.tmp',form='unformatted',status='replace')
open(52,file=path/'52.tmp',form='unformatted',status='replace')
open(61,file=path/'61.tmp',form='unformatted',status='replace')
open(62,file=path/'62.tmp',form='unformatted',status='replace')
open(71,file=path/'71.tmp',form='unformatted',status='replace')
open(72,file=path/'72.tmp',form='unformatted',status='replace')
open(81,file=path/'81.tmp',form='unformatted',status='replace')
open(82,file=path/'82.tmp',form='unformatted',status='replace')

```

```
do jj=1,2
```

```
if(jj.eq.1) js=1
```

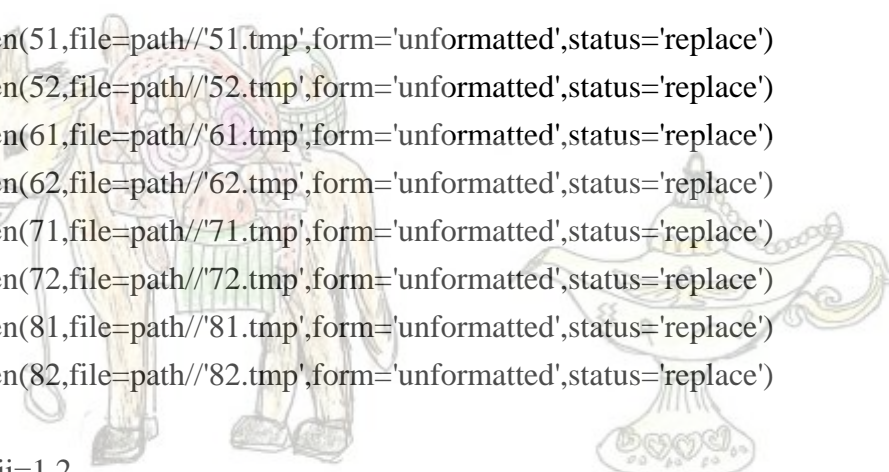
```
if(jj.eq.1) je=nt1
```

```
if(jj.eq.2) js=nt1+1
```

```
if(jj.eq.2) je=nt1+nt2
```

```
do i=1,nt1
```

```
do j=js,je
```

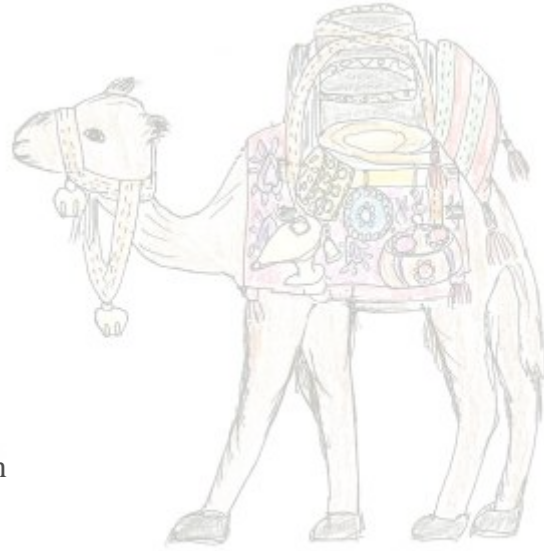




```

if(jj.eq.1) jx=j
if(jj.eq.2) jx=j-nt1
if(j.le.n1) then
in=1
jsx=1
jex=n1
end if
if(j.gt.n1.and.j.le.nt1) then
in=2
jsx=n1+1
jex=nt1
end if
if(j.gt.nt1.and.j.le.nt1+n3) then
in=3
jsx=nt1+1
jex=nt1+n3
end if

```



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```

if(j.gt.nt1+n3.and.j.le.nt1+nt2) then
in=4
jsx=nt1+n3+1
jex=nt1+nt2
end if

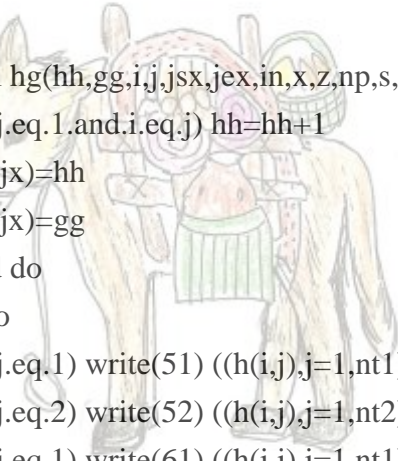
```

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```

call hg(hh,gg,i,j,jsx,jex,in,x,z,np,s,ns)
if(jj.eq.1.and.i.eq.j) hh=hh+1
h(i,j)=hh
g(i,j)=gg
end do
end do
if(jj.eq.1) write(51) ((h(i,j),j=1,nt1),i=1,nt1)
if(jj.eq.2) write(52) ((h(i,j),j=1,nt2),i=1,nt1)
if(jj.eq.1) write(61) ((h(i,j),j=1,nt1),i=1,nt1)
if(jj.eq.2) write(62) ((h(i,j),j=1,nt2),i=1,nt1)

```



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if(jj.eq.1) write(71) ((g(i,j),j=1,nt1),i=1,nt1)
if(jj.eq.2) write(72) ((g(i,j),j=1,nt2),i=1,nt1)
if(jj.eq.1) write(81) ((g(i,j),j=1,nt1),i=1,nt1)
if(jj.eq.2) write(82) ((g(i,j),j=1,nt2),i=1,nt1)

```

```

end do
close(51)
close(52)
close(61)
close(62)
close(71)
close(72)
close(81)
close(82)

```

```

!*****
call mpi_recv(c(1),1,mpi_integer,1,1,mpi_comm_world,stat,ierror)
call mpi_send(9,1,mpi_integer,1,1,mpi_comm_world,ierror)
call mir2_1(h,g,nt0,nt1,nt2,path)
call mpi_recv(c(1),1,mpi_integer,1,1,mpi_comm_world,stat,ierror)
call mpi_send(9,1,mpi_integer,1,1,mpi_comm_world,ierror)
call mtr2_1(h,g,nt0,nt1,nt2,nt1,nt2,nt1,nt2,path)
call mpi_recv(c(1),1,mpi_integer,1,1,mpi_comm_world,stat,ierror)

```

```

!*****

```

```

open(75,file=path/'75.tmp',form='unformatted',status='old')
read(75)((h(i,j),j=1,nt1),i=1,nt1)
close(75)

```

```

do i=1,n2
do j=1,n2
g(i,j)=h(i+n1,j+n1)
end do
end do
illd=10
call minvs(g,nt0,n2,1e-8,ill)
if(ill.ne.0) write(*,10) illd,ill

```

```

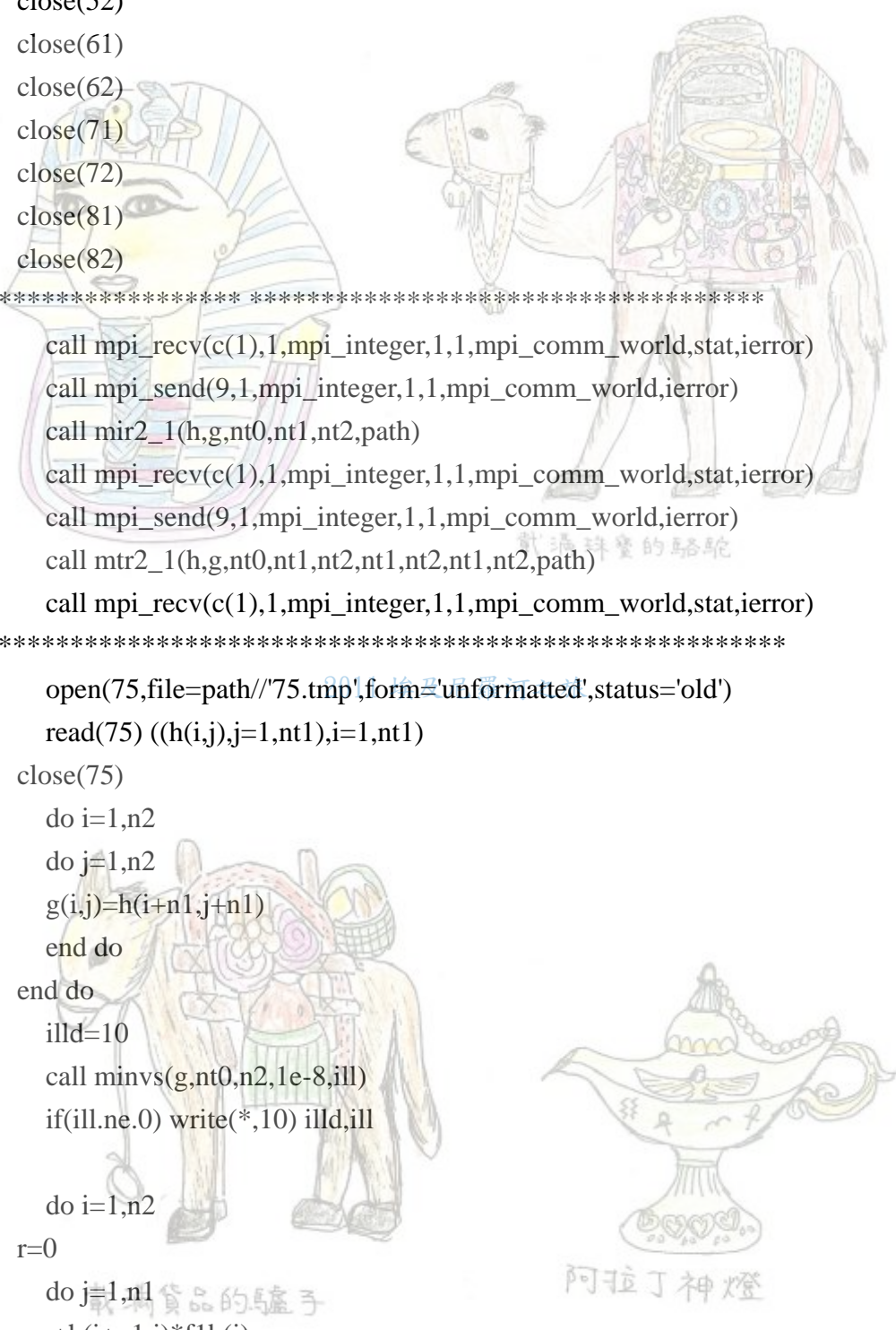
do i=1,n2
r=0
do j=1,n1
r=r+h(i+n1,j)*f1b(j)
end do
tmp(i)=f2(i)-r
end do

```

```

end do

```



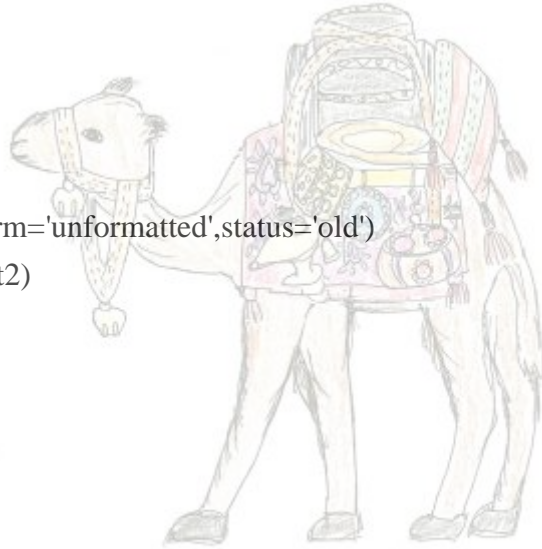
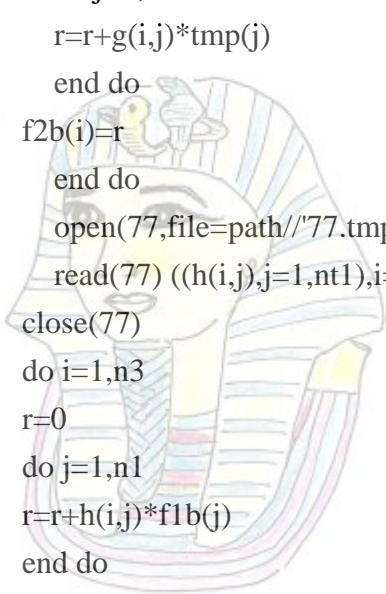
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```

do i=1,n2
  r=0.
  do j=1,n2
    r=r+g(i,j)*tmp(j)
  end do
  f2b(i)=r
end do
open(77,file=path/'77.tmp',form='unformatted',status='old')
read(77) ((h(i,j),j=1,nt1),i=1,nt2)
close(77)
do i=1,n3
  r=0
  do j=1,n1
    r=r+h(i,j)*f1b(j)
  end do
  do j=1,n2
    r=r+h(i+n1,j)*f2b(j)
  end do
  f3(i)=r
end do

```



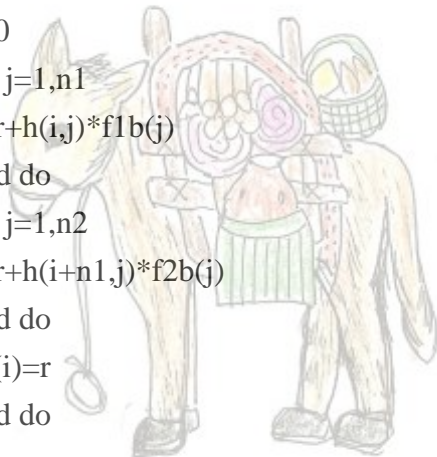
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```

do i=1,n4
  r=0
  do j=1,n1
    r=r+h(i,j)*f1b(j)
  end do
  do j=1,n2
    r=r+h(i+n1,j)*f2b(j)
  end do
  f4(i)=r
end do

```



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!

```

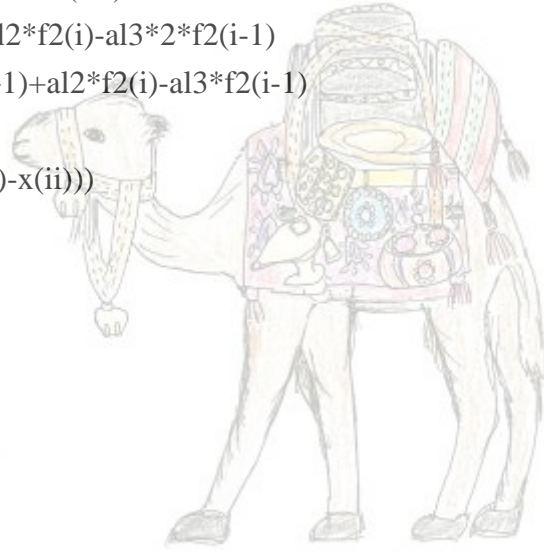
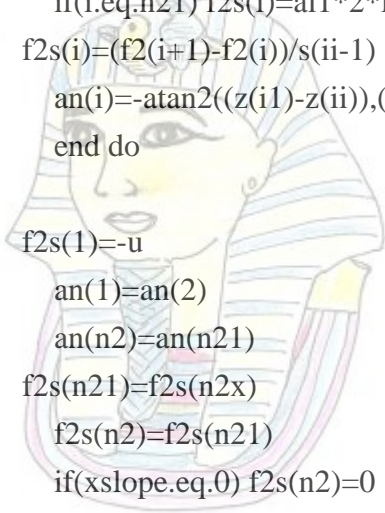
===== 載滿貨品的馱子 =====
do i=2,n21
  ii=i+n1
  i1=ii-1
  i2=ii-2
  all=s(i2)/(s(i1)*s(i2)+s(i1)**2)

```

```

al2=(s(i1)**2-s(i2)**2)/(s(i1)*(s(i2)**2)+s(i2)*(s(i1)**2))
al3=s(i1)/(s(i2)**2+s(i1)*s(i2))
f2s(i)=al1*f2(i+1)+al2*f2(i)-al3*f2(i-1)
if(i.eq.2) f2s(i)=al1*f2(i+1)+al2*f2(i)-al3**2*f2(i-1)
if(i.eq.n21) f2s(i)=al1**2*f2(i+1)+al2*f2(i)-al3*f2(i-1)
f2s(i)=(f2(i+1)-f2(i))/s(ii-1)
an(i)=-atan2((z(i1)-z(ii)),(x(i1)-x(ii)))
end do
f2s(1)=-u
an(1)=an(2)
an(n2)=an(n21)
f2s(n21)=f2s(n2x)
f2s(n2)=f2s(n21)
if(xslope.eq.0) f2s(n2)=0

```



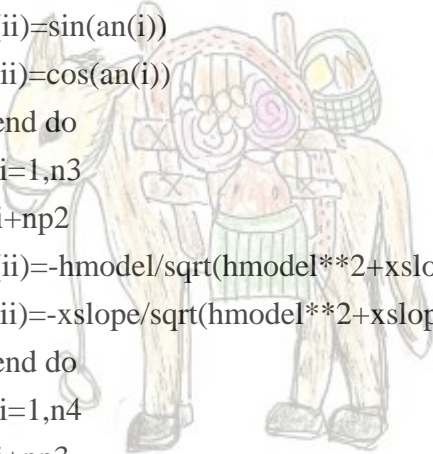
載滿珠寶的駱駝

```

do i=1,n1
xn(i)=1
zn(i)=0
end do
do i=1,n2
ii=i+n1
xn(ii)=sin(an(i))
zn(ii)=cos(an(i))
end do
do i=1,n3
ii=i+np2
xn(ii)=-hmodel/sqrt(hmodel**2+xslope**2)
zn(ii)=-xslope/sqrt(hmodel**2+xslope**2)
end do
do i=1,n4
ii=i+np3
xn(ii)=0
zn(ii)=-1
end do
do i=1,n2
sn=sin(an(i))
cs=cos(an(i))

```

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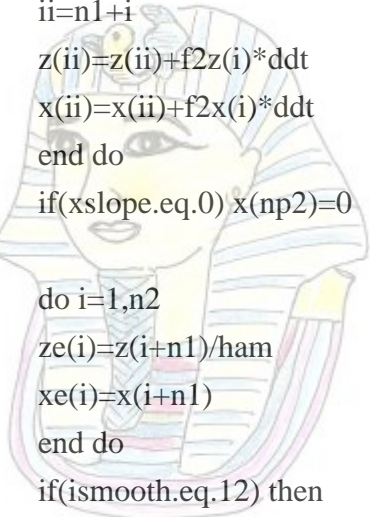
載滿貨品的驢子

```

f2x(i)=f2b(i)*sn-f2s(i)*cs
f2z(i)=f2b(i)*cs+f2s(i)*sn
end do
do i=1,n2
ii=n1+i
z(ii)=z(ii)+f2z(i)*ddt
x(ii)=x(ii)+f2x(i)*ddt
end do
if(xslope.eq.0) x(np2)=0

do i=1,n2
ze(i)=z(i+n1)/ham
xe(i)=x(i+n1)
end do
if(ismooth.eq.12) then
itemp = mod(iss,5)

```



載滿珠寶的駱駝

```

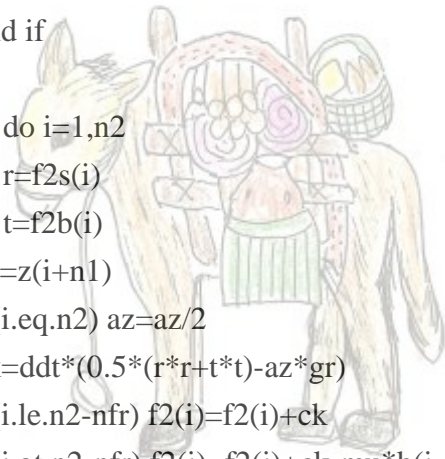
if(itemp.eq.0) then
do i=3,n2-2
ze(i)=(-ze(i+2)+4*ze(i+1)+10*ze(i)+4*ze(i-1)-ze(i-2))/16
z(n1+i)=ze(i)*ham
end do
end if
end if

```

```

do i=1,n2
r=f2s(i)
t=f2b(i)
az=z(i+n1)
if(i.eq.n2) az=az/2
ck=ddt*(0.5*(r*r+t*t)-az*gr)
if(i.le.n2-nfr) f2(i)=f2(i)+ck
if(i.gt.n2-nfr) f2(i)=f2(i)+ck-mu*b(i-n2+nfr)*f2(i)*ddt
end do

```



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```

hw1=hmodel+z(n1+1)
do i=1,n1
x(i)=x(n1+1)
z(i)=-hmodel+hw1/n11*(i-1)
end do

```

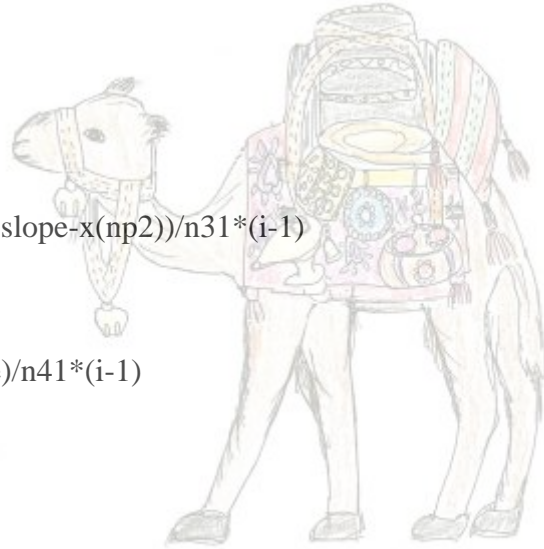
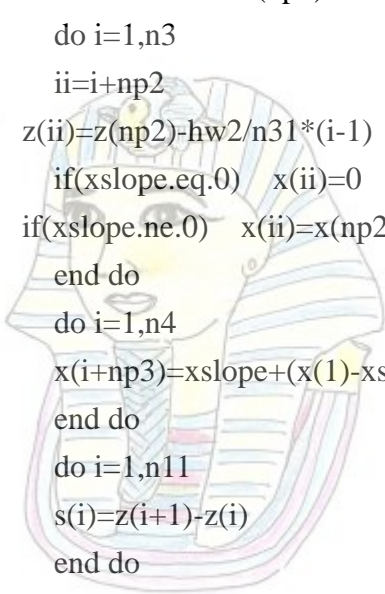
載滿貨品的驢子

!  $x(n1+1)=x(n1)$

```
hw2=hmodel+z(np2)
do i=1,n3
  ii=i+np2
  z(ii)=z(np2)-hw2/n31*(i-1)
  if(xslope.eq.0) x(ii)=0
  if(xslope.ne.0) x(ii)=x(np2)+(xslope-x(np2))/n31*(i-1)
end do
do i=1,n4
  x(i+np3)=xslope+(x(1)-xslope)/n41*(i-1)
end do
do i=1,n11
  s(i)=z(i+1)-z(i)
end do
do i=1,n21
  ii=i+n11
  i1=ii+1
  i2=ii+2
  s(ii)=sqrt((x(i2)-x(i1))**2+(z(i2)-z(i1))**2)
```

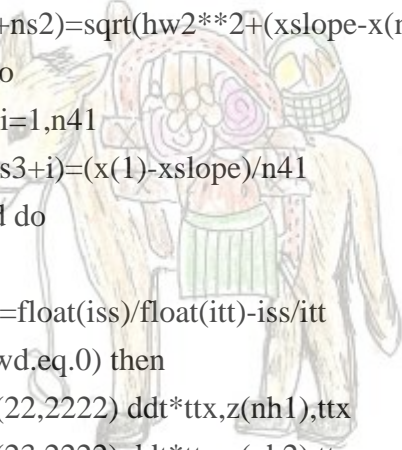
```
end do
do i=1,n31
  s(i+ns2)=sqrt(hw2**2+(xslope-x(np2))**2)/n31
end do
do i=1,n41
  s(ns3+i)=(x(1)-xslope)/n41
end do
```

```
wd=float(iss)/float(itt)-iss/itt
if(wd.eq.0) then
write(22,2222) ddt*ttx,z(nh1),ttx
write(23,2222) ddt*ttx,z(nh2),ttx
write(24,2222) ddt*ttx,z(nh3),ttx
write(25,2222) ddt*ttx,z(nh4),ttx
write(26,2222) ddt*ttx,z(nh5),ttx
write(27,2222) ddt*ttx,z(nh6),ttx
write(28,2222) ddt*ttx,z(nh7),ttx
write(29,2222) ddt*ttx,z(nh8),ttx
```



載滿珠寶的駱駝

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阿拉丁神燈

```

write(30,2222) ddt*ttx,z(nh9),ttx
write(31,2222) ddt*ttx,z(nh10),ttx
write(32,2222) ddt*ttx,z(nh11),ttx
write(33,2222) ddt*ttx,z(nh12),ttx
write(34,2222) ddt*ttx,z(nh13),ttx
write(35,2222) ddt*ttx,z(nh14),ttx
end if
2222 format(2f10.6,i7)

```

! \*\*\*\*\*

```

idis=1
if(idis.eq.1) then
ind=10
nm=n2/ind
do j=1,nm+1
j1=ind*(j-1)+1
j2=ind*j
write(*,8) (ze(i),i=j1,j2),(xe(i),i=j1,j2)
end do
end if

```

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```

8 format(10f5.2,10f7.2)
go to 8787

```

!=====

```

wd=float(iss)/float(itt)-iss/itt
if(wd.eq.0) then
write(7,*) 'iss=',ttx
do j=1,nm+1
j1=ind*(j-1)+1
j2=ind*j
write(7,9) (ze(i),i=j1,j2),(xe(i),i=j1,j2)
end do
end if

```

載滿貨品的驢子



阿拉丁神燈

```

9 format(10f6.2,10f7.2)

```

!=====

```

wd=float(iss)/float(itt)-iss/itt
if(wd.ne.0) go to 1001
test=1

```

```

if(test.eq.1) go to 10001
DO IX=1,N2-2
DO IZ=1,NZ
XR=POSX(IX,IZ)
ZR=POSZ(IX,IZ)
IF(IZ.EQ.1) GO TO 8811
IF(XSLOPE.NE.0.AND.XR.LE.XSLOPE.AND.ZR.LE.-XR/XSLOPE)
/ GO TO 8812
CALL volx(u,xr,zr,ID,X,Z,XN,ZN,F1,F1B,F2,F2B,F3,F3B,F4,
/ F4B,N1,N2,N3,N4,NP,S)
CALL volZ(W,xr,zr,ID,X,Z,XN,ZN,F1,F1B,F2,F2B,F3,F3B,F4,
/ F4B,N1,N2,N3,N4,NP,S)
CALL POT(P,xr,zr,ID,X,Z,F1,F1B,F2,F2B,F3,F3B,F4,
/ F4B,N1,N2,N3,N4,NP,S)
rw=SQRT(U**2+W**2)

```

```
VABS(IX,IZ)=rw/SQRT(HMODEL*GR)
```

載滿珠寶的駱駝

```
VANG(IX,IZ)=Acos(u/rw)
```

```
uu(IX,IZ)=u/SQRT(HMODEL*GR)
```

```
ww(IX,IZ)=w/SQRT(HMODEL*GR) 尼羅河之旅
```

```
posz(ix,iz)=-hmodel/nz*(iz-1)
```

```
posx(ix,iz)=x(n1+ix+1)
```

```
pxe(ix,iz)=posx(ix,iz)
```

```
PT(IX,IZ)=P
```

```
GO TO 8810
```

```
8812 VABS(IX,IZ)=0
```

```
VANG(IX,IZ)=0
```

```
uu(IX,IZ)=0
```

```
ww(IX,IZ)=0
```

```
POSZ(IX,IZ)=0
```

```
pxe(ix,iz)=posx(ix,iz)
```

```
PT(IX,IZ)=0
```

```
GO TO 8810
```

```
8811 rw=sqrt(F2X(IX+1)**2+f2z(ix+1)**2)
```

```
c uw=atan2(f2z(ix+1),f2x(ix+1))
```

```
c if(f2z(ix+1).lt.0) uw=uw+2*pai
```

```
c vang(ix,1)=uw
```

```
VANG(IX,1)=acos(f2x(ix+1)/rw)
```

```
VABS(IX,1)=rw/SQRT(HMODEL*GR)
```



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```

uu(IX,1)=f2x(ix+1)
ww(IX,1)=f2z(ix+1)
POSX(IX,1)=X(IX+1+N1)
pxe(ix,1)=posx(ix,1)
POSZ(IX,1)=Z(IX+1+N1)
PT(IX,1)=F2(IX+1)
8810 continue
end do
end do

```

```

10001 continue
CALL CHECK(PM,Pe,PTT,ppv,ID,X,Z,F1,F1B,F2,F2B,F3,F3B,F4,
/ F4B,N1,N2,N3,N4,NP,S)
write(21,3) ttx
WRITE(21,777) PM,PE,PtT,PPV
write(2,3) ttx
write(15,3) ttx
write(16,3) ttx
write(17,3) ttx
write(18,3) ttx
write(19,3) ttx
write(20,3) ttx

```

```

3 format('ttx=',f10.3)
6 format(2f9.3,i5)
5 format(3f9.3,i5)
77 format(4f9.3,i5)
87 format(8f7.2,i5)
777 FORMAT(4F9.4)

```

```

write(2,6) (xe(i),ze(i),i,i=1,n2)
WRITE(15,77) ((VABS(I,J),J=1,NZ),i,I=1,N2-2)
WRITE(16,77) ((VANG(I,J),J=1,NZ),i,I=1,N2-2)
WRITE(17,77) ((PT(I,J),J=1,NZ),i,I=1,N2-2)
WRITE(18,87) ((Pxe(I,J),posz(i,j),J=1,NZ),i,I=1,N2-2)
WRITE(19,77) ((uu(I,J),J=1,NZ),i,I=1,N2-2)
WRITE(20,77) ((ww(I,J),J=1,NZ),i,I=1,N2-2)

```

```

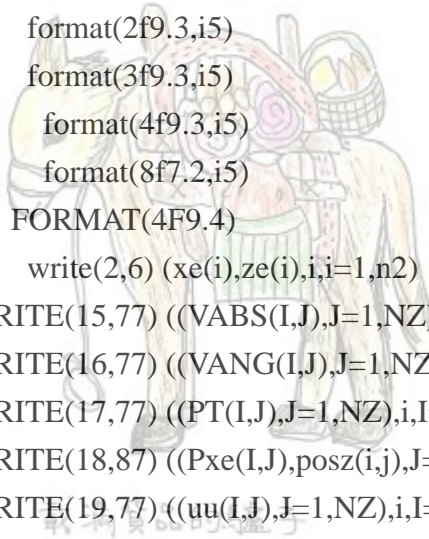
1001 continue
!=====
if(IiS.eq.iend1.and.iss.eq.it2) then
OPEN(UNIT=3,FILE=path/'fin.old',form='unformatted'

```



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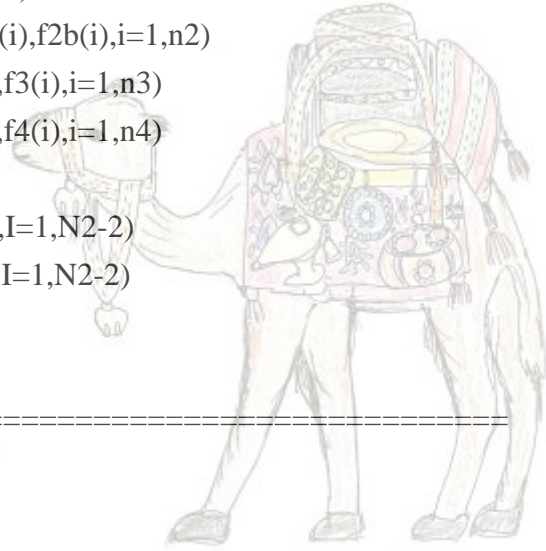
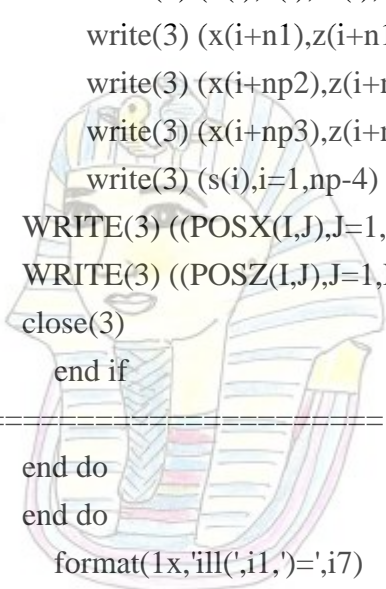
阿拉丁神燈

```

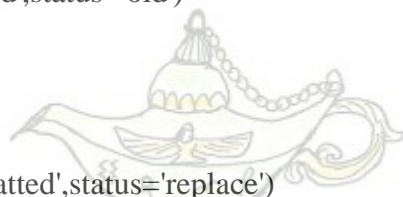
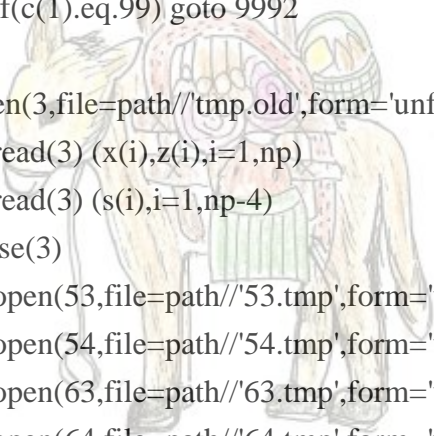
& ,status='replace')
  rewind 3
  write(3) (x(i),z(i),f1(i),i=1,n1)
  write(3) (x(i+n1),z(i+n1),f2(i),f2b(i),i=1,n2)
  write(3) (x(i+np2),z(i+np2),f3(i),i=1,n3)
  write(3) (x(i+np3),z(i+np3),f4(i),i=1,n4)
  write(3) (s(i),i=1,np-4)
WRITE(3) ((POSX(I,J),J=1,NZ),I=1,N2-2)
WRITE(3) ((POSZ(I,J),J=1,NZ),I=1,N2-2)
close(3)
  end if
!=====
end do
end do
10  format(1x,'ill('i1,')='i7)
  end if
!=====
!  rank1 執行的部分
  if(rank.eq.1)then      2011 埃及尼羅河之旅
9991  continue
!  接收從 rank0 的訊息
  call mpi_recv(c(1),1,mpi_integer,0,1,mpi_comm_world,stat,ierror)
  if(c(1).eq.99) goto 9992

open(3,file=path//'tmp.old',form='unformatted',status='old')
  read(3) (x(i),z(i),i=1,np)
  read(3) (s(i),i=1,np-4)
close(3)
  open(53,file=path//'53.tmp',form='unformatted',status='replace')
  open(54,file=path//'54.tmp',form='unformatted',status='replace')
  open(63,file=path//'63.tmp',form='unformatted',status='replace')
  open(64,file=path//'64.tmp',form='unformatted',status='replace')
  open(73,file=path//'73.tmp',form='unformatted',status='replace')
  open(74,file=path//'74.tmp',form='unformatted',status='replace')
  open(83,file=path//'83.tmp',form='unformatted',status='replace')
  open(84,file=path//'84.tmp',form='unformatted',status='replace')
  do jj=1,2
  if(jj.eq.1) js=1

```



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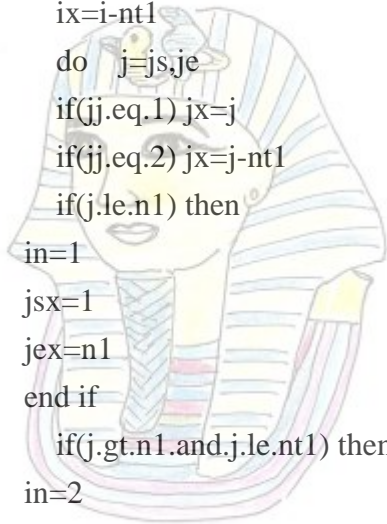


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```

if(jj.eq.1) je=nt1
if(jj.eq.2) js=nt1+1
if(jj.eq.2) je=nt1+nt2
do i=nt1+1,nt1+nt2
ix=i-nt1
do j=js,je
if(jj.eq.1) jx=j
if(jj.eq.2) jx=j-nt1
if(j.le.n1) then
in=1
jsx=1
jex=n1
end if
if(j.gt.n1.and.j.le.nt1) then
in=2
jsx=n1+1
jex=nt1
end if

```



載滿珠寶的駱駝

```

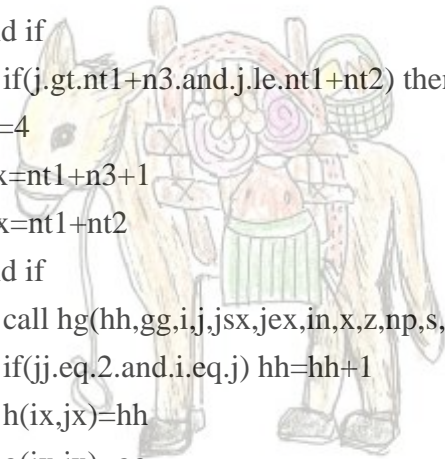
if(j.gt.nt1.and.j.le.nt1+n3) then 埃及尼羅河之旅

```

```

in=3
jsx=nt1+1
jex=nt1+n3
end if
if(j.gt.nt1+n3.and.j.le.nt1+nt2) then
in=4
jsx=nt1+n3+1
jex=nt1+nt2
end if
call hg(hh,gg,i,j,jsx,jex,in,x,z,np,s,ns)
if(jj.eq.2.and.i.eq.j) hh=hh+1
h(ix,jx)=hh
g(ix,jx)=gg
end do
end do

```



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```

if(jj.eq.1) write(53) ((h(i,j),j=1,nt1),i=1,nt2)
if(jj.eq.2) write(54) ((h(i,j),j=1,nt2),i=1,nt2)
if(jj.eq.1) write(63) ((h(i,j),j=1,nt1),i=1,nt2)

```

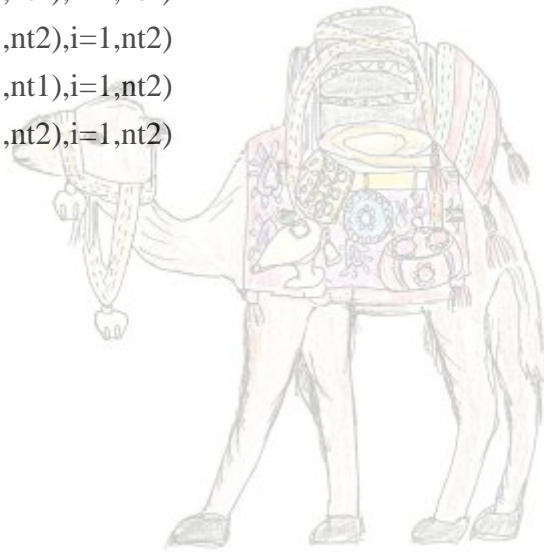
```

if(jj.eq.2) write(64) ((h(i,j),j=1,nt2),i=1,nt2)

if(jj.eq.1) write(73) ((g(i,j),j=1,nt1),i=1,nt2)
if(jj.eq.2) write(74) ((g(i,j),j=1,nt2),i=1,nt2)
if(jj.eq.1) write(83) ((g(i,j),j=1,nt1),i=1,nt2)
if(jj.eq.2) write(84) ((g(i,j),j=1,nt2),i=1,nt2)

end do
close(53)
close(54)
close(63)
close(64)
close(73)
close(74)
close(83)
close(84)

```



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```
call mpi_send(9,1,mpi_integer,0,1,mpi_comm_world,ierror)
```

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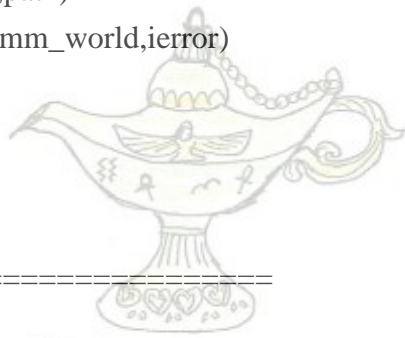
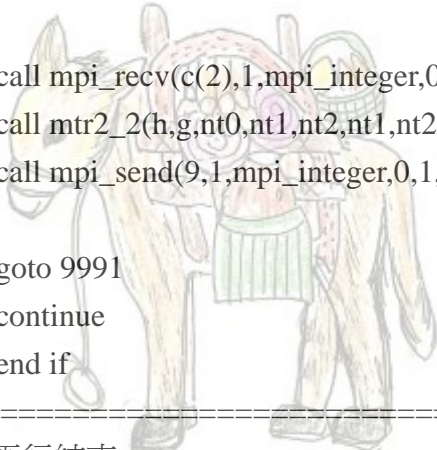
```
call mpi_recv(c(2),1,mpi_integer,0,1,mpi_comm_world,stat,ierror)
call mir2_2(h,g,nt0,nt1,nt2,path)
call mpi_send(9,1,mpi_integer,0,1,mpi_comm_world,ierror)
```

```
call mpi_recv(c(2),1,mpi_integer,0,1,mpi_comm_world,stat,ierror)
call mtr2_2(h,g,nt0,nt1,nt2,nt1,nt2,nt1,nt2,path)
call mpi_send(9,1,mpi_integer,0,1,mpi_comm_world,ierror)
```

```

goto 9991
9992 continue
end if

```



阿拉丁神燈

```

=====
! 平行結束
call mpi_finalize(ierror)
stop
end

```

!\*\*\*\*\*

```

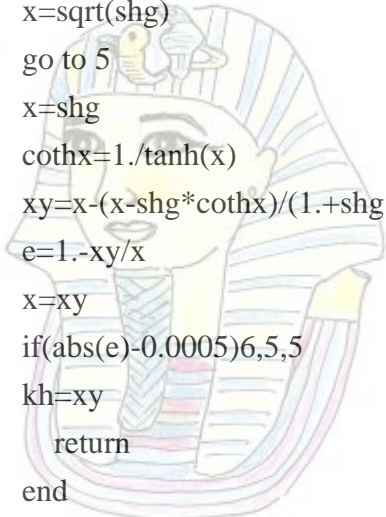
subroutine hk(shg,kh)
real kh

```

```

if(shg-10.) 2,2,1
1 xy=shg
  go to 6
2 if(shg-1.0) 3,4,4
3 x=sqrt(shg)
  go to 5
4 x=shg
5 cothx=1./tanh(x)
  xy=x-(x-shg*cothx)/(1.+shg*(cothx**2-1.))
  e=1.-xy/x
  x=xy
  if(abs(e)-0.0005)6,5,5
6 kh=xy
  return
end

```

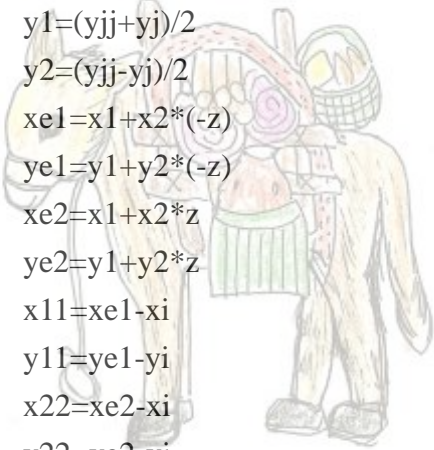


! \*\*\*\*\*

```

subroutine hg1(h1,g1,xi,yi,xjj,yjj,xj,yj,sjj)
if(sjj.eq.0) go to 100
pai=3.1415927      2011 埃及尼羅河之旅
z=.57735
x1=(xjj+xj)/2
x2=(xjj-xj)/2
y1=(yjj+yj)/2
y2=(yjj-yj)/2
xe1=x1+x2*(-z)
ye1=y1+y2*(-z)
xe2=x1+x2*z
ye2=y1+y2*z
x11=xe1-xi
y11=ye1-yi
x22=xe2-xi
y22=ye2-yi
rm1=sqrt(x11**2+y11**2)
rm2=sqrt(x22**2+y22**2)
a1=xi*2*y2-yi*2*x2
a2=yj*2*x2-xj*2*y2
aa=abs(a1+a2)
bb=sqrt((2*y2)**2+(2*x2)**2)

```



阿拉丁神燈

```

rrp=aa/bb
c1=(xj-xi)*(yjj-yi)
d1=(xjj-xi)*(yj-yi)
if(c1.lt.d1) rrp=-rrp
h1=-sjj/4/pai*(1.57735*rrp/rm1**2+.42265*rrp/rm2**2)
g1=-sjj/4/pai*(1.57735*alog(rm1)+.42265*alog(rm2))
go to 101
100 h1=0
g1=0
101 continue
return
end

```

!\*\*\*\*\*

```

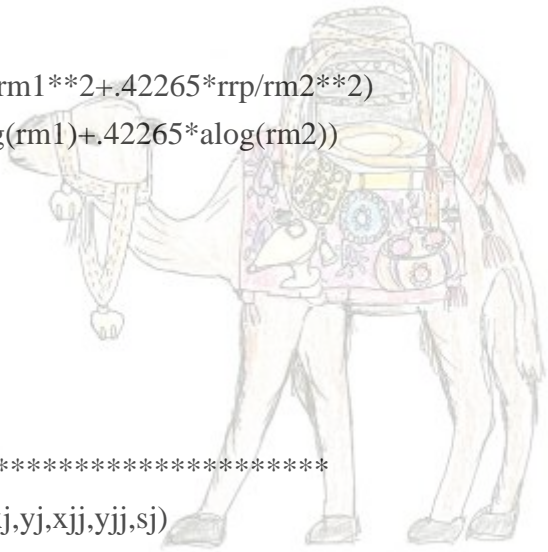
subroutine hg2(h2,g2,xi,yi,xj,yj,xjj,yjj,sj)

```

```

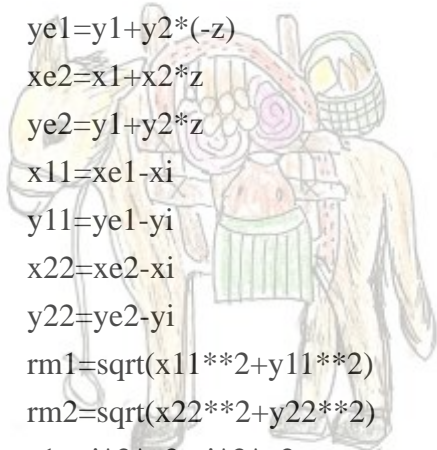
if(sj.eq.0) go to 100
pai=3.1415927
z=.57735
x1=(xj+xjj)/2
x2=(xj-xjj)/2
y1=(yj+yjj)/2
y2=(yj-yjj)/2
xe1=x1+x2*(-z)
ye1=y1+y2*(-z)
xe2=x1+x2*z
ye2=y1+y2*z
x11=xe1-xi
y11=ye1-yi
x22=xe2-xi
y22=ye2-yi
rm1=sqrt(x11**2+y11**2)
rm2=sqrt(x22**2+y22**2)
a1=xi*2*y2-yi*2*x2
a2=yjj*2*x2-xjj*2*y2
aa=abs(a1+a2)
bb=sqrt((2*y2)**2+(2*x2)**2)
rrp=aa/bb
c1=(xjj-xi)*(yj-yi)
d1=(xj-xi)*(yjj-yi)

```



載滿珠寶的駱駝

2011 埃及尼羅河之旅



阿拉丁神燈

```

if(c1.lt.d1) rrp=-rrp
h2=-sj/4/pai*(0.42265*rrp/rm1**2+1.57735*rrp/rm2**2)
g2=-sj/4/pai*(0.42265*alog(rm1)+1.57735*alog(rm2))
go to 101
100 h2=0
g2=0
101 continue
return
end

```

```

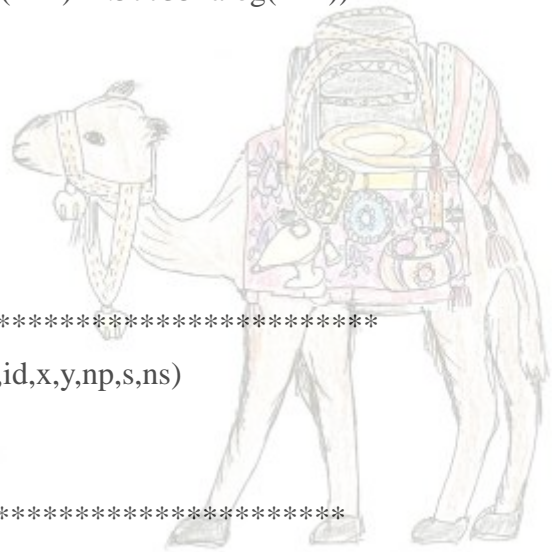
*****
subroutine hg(hh,gg,i,j,js,je,id,x,y,np,s,ns)
real x(np),y(np),s(ns)
pai=3.1415927
!***** id=1~4*****

```

```

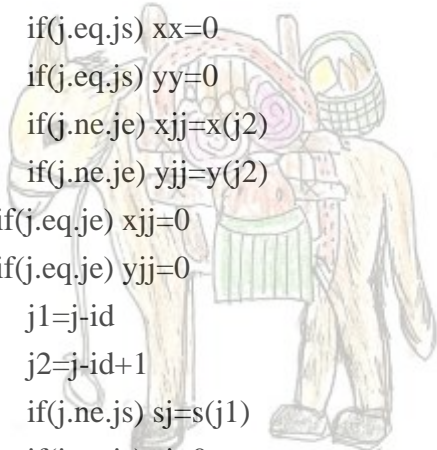
xi=x(i)
yi=y(i)
xj=x(j)
yj=y(j)
j1=j-1
j2=j+1
if(j.ne.js) xx=x(j1)
if(j.ne.js) yy=y(j1)
if(j.eq.js) xx=0
if(j.eq.js) yy=0
if(j.ne.je) xjj=x(j2)
if(j.ne.je) yjj=y(j2)
if(j.eq.je) xjj=0
if(j.eq.je) yjj=0
j1=j-id
j2=j-id+1
if(j.ne.js) sj=s(j1)
if(j.eq.js) sj=0
if(j.ne.je) sjj=s(j2)
if(j.eq.je) sjj=0
if(i.eq.j) go to 31
call hg1(h1,g1,xi,yi,xjj,yjj,xj,yj,sjj)
call hg2(h2,g2,xi,yi,xj,yj,xx,yy,sj)
go to 25

```



載滿珠寶的駱駝

2011 埃及尼羅河之旅



戴著珠寶的帽子



阿拉丁神燈

```

31  h1=0
    h2=0
    if(sjj.eq.0) g1=0
    if(sjj.ne.0) g1=sjj/2/pai*(3./4.-1./2.*alog(sjj/2))
    if(sj.eq.0) g2=0
    if(sj.ne.0) g2=sj/2/pai*(5./4.-3./2.*alog(sj/2))
25  hh=h1+h2
    gg=g1+g2
    if(j.eq.js.or.j.eq.je) hh=hh*2
    return
    end
! *****
subroutine volx(u,xr,zr,id,x,z,xn,zn,f1,f1b,f2,f2b,f3,f3b,f4,
/ f4b,n1,n2,n3,n4,np,s)
real x(np),z(np),xn(np),zn(np),f1(n1),f1b(n1),
/ f2(n2),f2b(n2),f3(n3),f3b(n3),f4(n4),f4b(n4),s(np-4)
np2=n1+n2
np3=np2+n3
pai=3.1415927
c=.57735

```

```

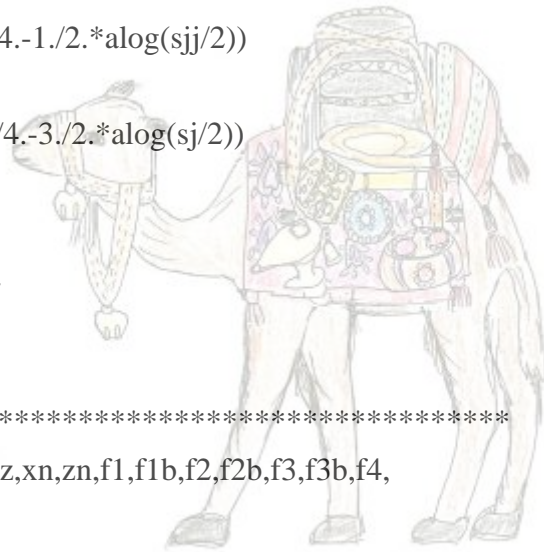
!***** for the case id=1~4 *****
!

```

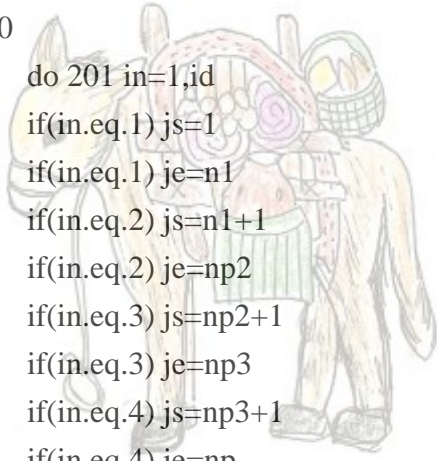
```

u=0
do 201 in=1,id
if(in.eq.1) js=1
if(in.eq.1) je=n1
if(in.eq.2) js=n1+1
if(in.eq.2) je=np2
if(in.eq.3) js=np2+1
if(in.eq.3) je=np3
if(in.eq.4) js=np3+1
if(in.eq.4) je=np
do 201 j=js,je-1
if(in.eq.1) jj=j
if(in.eq.2) jj=j-n1
if(in.eq.3) jj=j-np2
if(in.eq.4) jj=j-np3
jj1=jj+1

```



撒哈拉沙漠的駱駝



撒哈拉沙漠的馱廬子



阿拉丁神燈

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```

if(in.eq.1) ff=f1(jj)
if(in.eq.1) fb=f1b(jj)
if(in.eq.1) ff1=f1(jj1)
if(in.eq.1) fb1=f1b(jj1)
if(in.eq.2) ff=f2(jj)
if(in.eq.2) fb=f2b(jj)
if(in.eq.2) ff1=f2(jj1)
if(in.eq.2) fb1=f2b(jj1)
if(in.eq.3) ff=f3(jj)
if(in.eq.3) fb=f3b(jj)
if(in.eq.3) ff1=f3(jj1)
if(in.eq.3) fb1=f3b(jj1)
if(in.eq.4) ff=f4(jj)
if(in.eq.4) fb=f4b(jj)
if(in.eq.4) ff1=f4(jj1)
if(in.eq.4) fb1=f4b(jj1)

```



載滿珠寶的駱駝

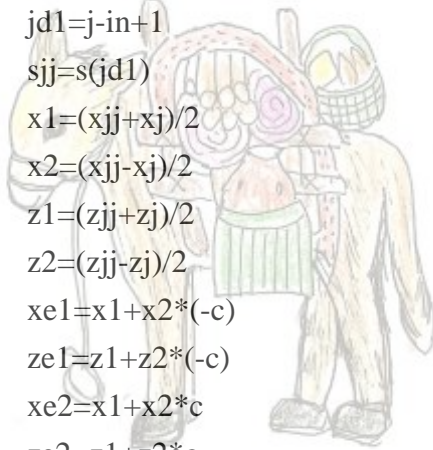
!

```

xj=x(j)
zj=z(j)
j1=j+1
xjj=x(j1)
zjj=z(j1)
jd1=j-in+1
sjj=s(jd1)
x1=(xjj+xj)/2
x2=(xjj-xj)/2
z1=(zjj+zj)/2
z2=(zjj-zj)/2
xe1=x1+x2*(-c)
ze1=z1+z2*(-c)
xe2=x1+x2*c
ze2=z1+z2*c
x11=xe1-xr
z11=ze1-zr
x22=xe2-xr
z22=ze2-zr
rm1=sqrt(x11**2+z11**2)
rm2=sqrt(x22**2+z22**2)

```

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阿拉丁神燈

載滿寶物的驢子

csf1=x11/rm1

snf1=z11/rm1

csf2=x22/rm2

snf2=z22/rm2

c11=1+c

c12=1-c

c21=1-c

c22=1+c

c1=c11\*csf1/rm1+c12\*csf2/rm2

c2=c21\*csf1/rm1+c22\*csf2/rm2

d1=c11\*(1./rm1\*\*2-2.\*(csf1/rm1)\*\*2)  
/ +c12\*(1./rm2\*\*2-2.\*(csf2/rm2)\*\*2)

d2=c21\*(1./rm1\*\*2-2.\*(csf1/rm1)\*\*2)  
/ +c22\*(1./rm2\*\*2-2.\*(csf2/rm2)\*\*2)

e1=c11\*2.\*csf1\*snf1/rm1\*\*2  
/ +c12\*2.\*csf2\*snf2/rm2\*\*2

e2=c21\*2.\*csf1\*snf1/rm1\*\*2  
/ +c22\*2.\*csf2\*snf2/rm2\*\*2

u1=fb\*c1+fb1\*c2      2011 埃及尼羅河之旅

u2=ff\*xn(j)\*d1+ff1\*xn(j)\*d2

u3=ff\*zn(j)\*e1+ff1\*zn(j)\*e2

u=u+(u1-u2+u3)\*s(jd1)/8./pai

201 continue

return

end

!

! \*\*\*\*\*

subroutine volz(w,xr,zr,id,x,z,xn,zn,f1,f1b,f2,f2b,f3,f3b,f4,

/ f4b,n1,n2,n3,n4,np,s)

real x(np),z(np),xn(np),zn(np),f1(n1),f1b(n1),

/ f2(n2),f2b(n2),f3(n3),f3b(n3),f4(n4),f4b(n4),s(np-4)

np2=n1+n2

np3=np2+n3

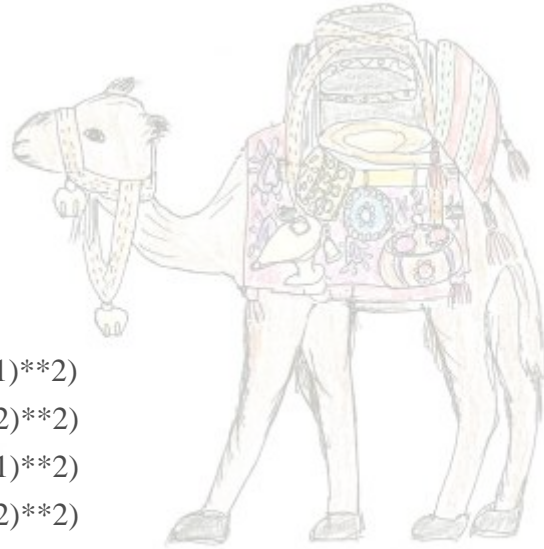
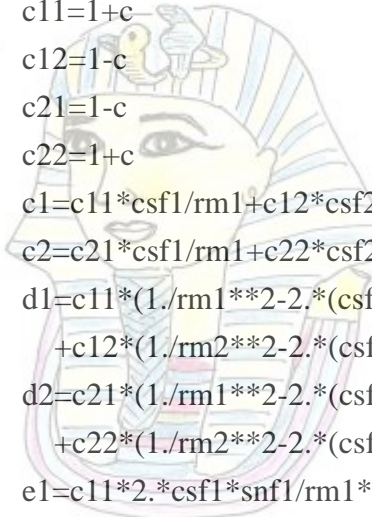
pai=3.1415927

c=.57735

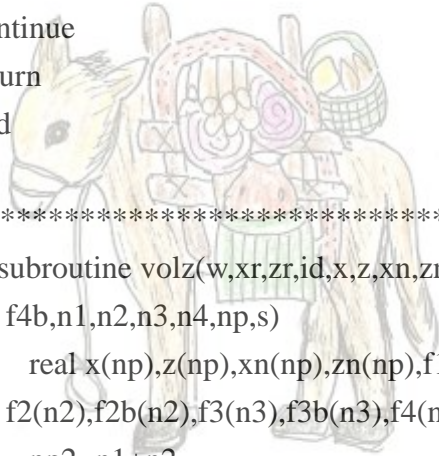
!\*\*\*\*\* for the case id=1~4 \*\*\*\*\*

!

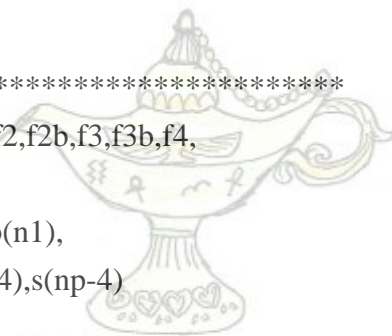
w=0



載滿珠寶的駱駝



載珠寶的馬廐子

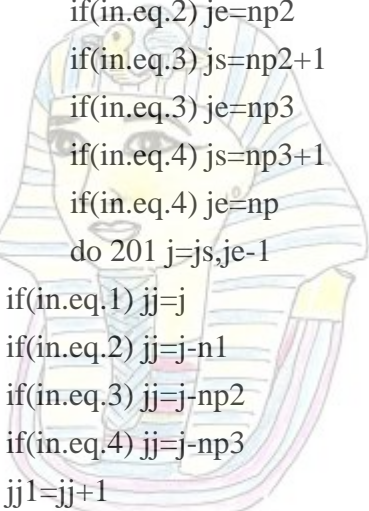


阿拉丁神燈

```

do 201 in=1,id
if(in.eq.1) js=1
if(in.eq.1) je=n1
if(in.eq.2) js=n1+1
if(in.eq.2) je=np2
if(in.eq.3) js=np2+1
if(in.eq.3) je=np3
if(in.eq.4) js=np3+1
if(in.eq.4) je=np
do 201 j=js,je-1
if(in.eq.1) jj=j
if(in.eq.2) jj=j-n1
if(in.eq.3) jj=j-np2
if(in.eq.4) jj=j-np3
jj1=jj+1

```



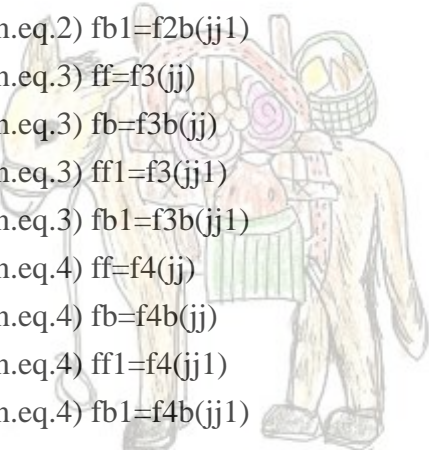
載滿珠寶的駱駝

```

if(in.eq.1) ff=f1(jj)
if(in.eq.1) fb=f1b(jj)
if(in.eq.1) ff1=f1(jj1)
if(in.eq.1) fb1=f1b(jj1)
if(in.eq.2) ff=f2(jj)
if(in.eq.2) fb=f2b(jj)
if(in.eq.2) ff1=f2(jj1)
if(in.eq.2) fb1=f2b(jj1)
if(in.eq.3) ff=f3(jj)
if(in.eq.3) fb=f3b(jj)
if(in.eq.3) ff1=f3(jj1)
if(in.eq.3) fb1=f3b(jj1)
if(in.eq.4) ff=f4(jj)
if(in.eq.4) fb=f4b(jj)
if(in.eq.4) ff1=f4(jj1)
if(in.eq.4) fb1=f4b(jj1)

```

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阿拉丁神燈

!

```

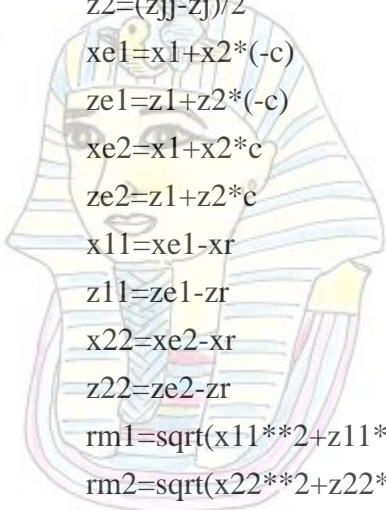
xj=x(j) 貨品的驢子
zj=z(j)
j1=j+1
xj1=x(j1)
zj1=z(j1)
jd1=j-in+1

```

```

sjj=s(jd1)
x1=(xjj+xj)/2
x2=(xjj-xj)/2
z1=(zjj+zj)/2
z2=(zjj-zj)/2
xe1=x1+x2*(-c)
ze1=z1+z2*(-c)
xe2=x1+x2*c
ze2=z1+z2*c
x11=xe1-xr
z11=ze1-zr
x22=xe2-xr
z22=ze2-zr
rm1=sqrt(x11**2+z11**2)
rm2=sqrt(x22**2+z22**2)

```



載滿珠寶的駱駝

csf1=x11/rm1

snf1=z11/rm1

csf2=x22/rm2

snf2=z22/rm2

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c11=1+c

c12=1-c

c21=1-c

c22=1+c

c1=c11\*snf1/rm1+c12\*snf2/rm2

c2=c21\*snf1/rm1+c22\*snf2/rm2

d1=c11\*(1./rm1\*\*2-2.\*(snf1/rm1)\*\*2)  
/ +c12\*(1./rm2\*\*2-2.\*(snf2/rm2)\*\*2)

d2=c21\*(1./rm1\*\*2-2.\*(snf1/rm1)\*\*2)  
/ +c22\*(1./rm2\*\*2-2.\*(snf2/rm2)\*\*2)

e1=c11\*2.\*csf1\*snf1/rm1\*\*2  
/ +c12\*2.\*csf2\*snf2/rm2\*\*2

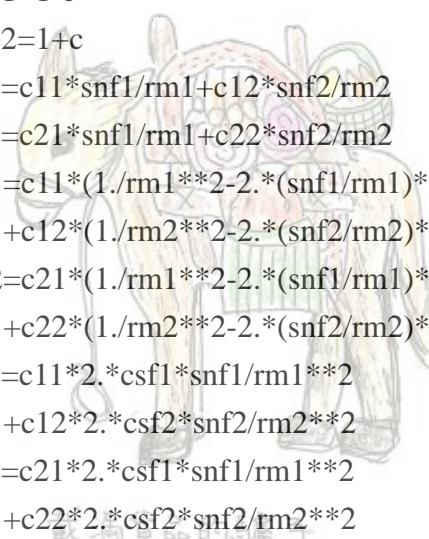
e2=c21\*2.\*csf1\*snf1/rm1\*\*2  
/ +c22\*2.\*csf2\*snf2/rm2\*\*2

u1=fb\*c1+fb1\*c2

u2=ff\*zn(j)\*d1+ff1\*zn(j1)\*d2

u3=ff\*xn(j)\*e1+ff1\*xn(j1)\*e2

w=w+(u1-u2+u3)\*s(jd1)/8./pai



阿拉丁神燈

```

return
end

```

```

! *****

```

```

    subroutine pot(p,xr,zr,id,x,z,f1,f1b,f2,f2b,f3,f3b,f4,
/   f4b,n1,n2,n3,n4,np,s)
    real x(np),z(np),f1(n1),f1b(n1),
/   f2(n2),f2b(n2),f3(n3),f3b(n3),f4(n4),f4b(n4),s(np-4)

```

```

    np2=n1+n2
    np3=np2+n3
    pai=3.1415927
    c=.57735

```

```

!***** for the case id=1~4 *****

```

```

!

```

```

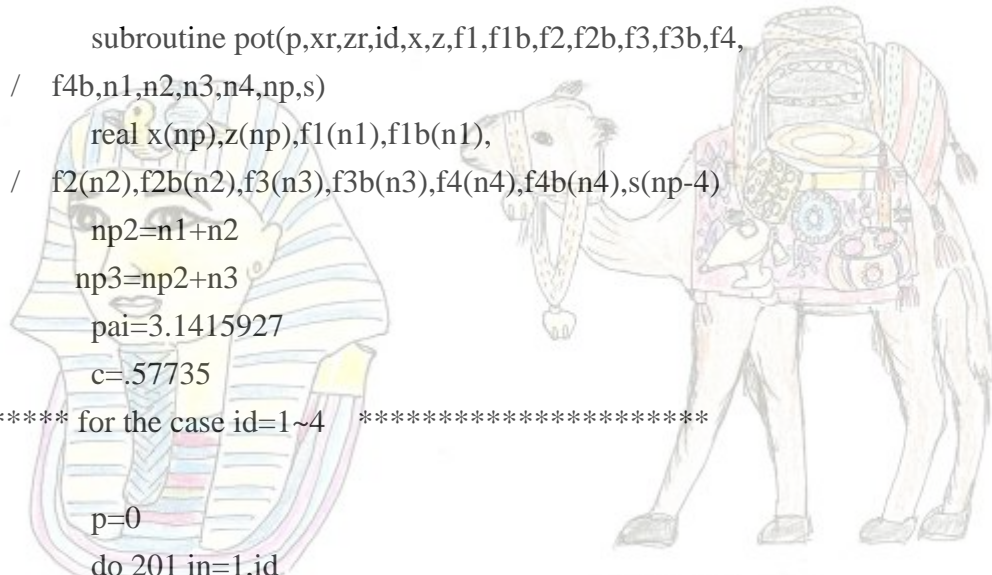
    p=0
    do 201 in=1,id
    if(in.eq.1) js=1
    if(in.eq.1) je=n1
    if(in.eq.2) js=n1+1
    if(in.eq.2) je=np2
    if(in.eq.3) js=np2+1
    if(in.eq.3) je=np3
    if(in.eq.4) js=np3+1
    if(in.eq.4) je=np
    do 201 j=js,je-1

```

```

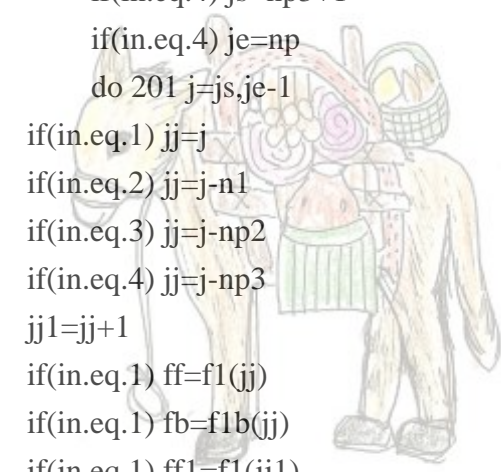
if(in.eq.1) jj=j
if(in.eq.2) jj=j-n1
if(in.eq.3) jj=j-np2
if(in.eq.4) jj=j-np3
jj1=jj+1
if(in.eq.1) ff=f1(jj)
if(in.eq.1) fb=f1b(jj)
if(in.eq.1) ff1=f1(jj1)
if(in.eq.1) fb1=f1b(jj1)
if(in.eq.2) ff=f2(jj)
if(in.eq.2) fb=f2b(jj)
if(in.eq.2) ff1=f2(jj1)
if(in.eq.2) fb1=f2b(jj1)
if(in.eq.3) ff=f3(jj)

```



戴滿珠寶的駱駝

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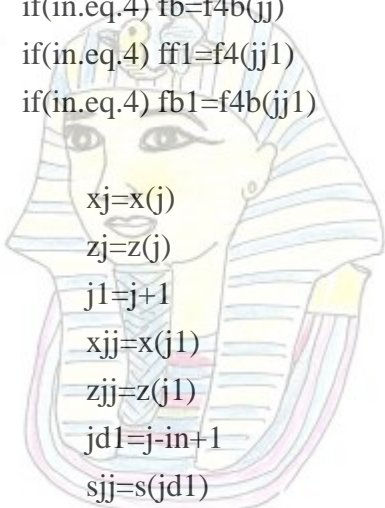
阿拉丁神燈

```

if(in.eq.3) fb=f3b(jj)
if(in.eq.3) ff1=f3(jj1)
if(in.eq.3) fb1=f3b(jj1)
if(in.eq.4) ff=f4(jj)
if(in.eq.4) fb=f4b(jj)
if(in.eq.4) ff1=f4(jj1)
if(in.eq.4) fb1=f4b(jj1)

```

!



```

xj=x(j)
zj=z(j)
j1=j+1
xjj=x(j1)
zjj=z(j1)
jd1=j-in+1
sjj=s(jd1)

```

```

x1=(xjj+xj)/2
x2=(xjj-xj)/2
z1=(zjj+zj)/2
z2=(zjj-zj)/2

```



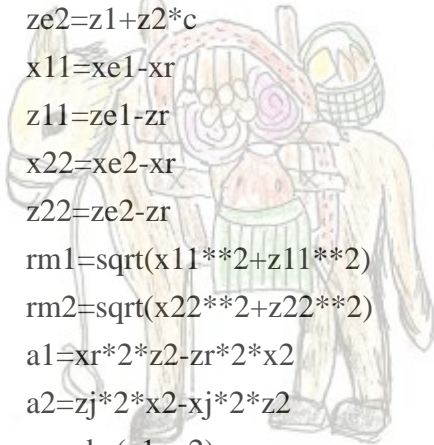
戴满珠宝的骆驼

### 2011 埃及尼羅河之旅

```

xe1=x1+x2*(-c)
ze1=z1+z2*(-c)
xe2=x1+x2*c
ze2=z1+z2*c
x11=xe1-xr
z11=ze1-zr
x22=xe2-xr
z22=ze2-zr
rm1=sqrt(x11**2+z11**2)
rm2=sqrt(x22**2+z22**2)
a1=xr*2*z2-zr*2*x2
a2=zj*2*x2-xj*2*z2
aa=abs(a1+a2)
bb=sqrt((2*z2)**2+(2*x2)**2)
rrp=aa/bb
c1=(xj-xr)*(zjj-zr)
d1=(xjj-xr)*(zj-zr)
if(c1.lt.d1) rrp=-rrp
h1=-sjj/8/pai*(1.57735*rrp/rm1**2+.42265*rrp/rm2**2)

```



阿拉丁神燈

```

g1=-sjj/8/pai*(1.57735*log(rm1)+4.2265*log(rm2))
h2=-sjj/8/pai*(0.42265*rrp/rm1**2+1.57735*rrp/rm2**2)
g2=-sjj/8/pai*(0.42265*log(rm1)+1.57735*log(rm2))

```

```

p=p+g1*fb+g2*fb1-h1*ff-h2*ff1

```

```

201 continue

```

```

return

```

```

end

```

```

!*****

```

```

subroutine check(pm,pe,ptt,ppv,id,x,z,f1,f1b,f2,f2b,f3,f3b,f4,
/ f4b,n1,n2,n3,n4,np,s)
real x(np),z(np),f1(n1),f1b(n1),
/ f2(n2),f2b(n2),f3(n3),f3b(n3),f4(n4),f4b(n4),s(np-4)
np2=n1+n2
np3=np2+n3
c=.57735
gr=981

```

```

!***** for the case id=1~4 *****

```

```

!

```

```

pm=0

```

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```

ptt=0

```

```

pv=0

```

```

do 201 in=1,id

```

```

if(in.eq.1) js=1

```

```

if(in.eq.1) je=n1

```

```

if(in.eq.2) js=n1+1

```

```

if(in.eq.2) je=np2

```

```

if(in.eq.3) js=np2+1

```

```

if(in.eq.3) je=np3

```

```

if(in.eq.4) js=np3+1

```

```

if(in.eq.4) je=np

```

```

do 201 j=js,je-1

```

```

if(in.eq.1) jj=j

```

```

if(in.eq.2) jj=j-n1

```

```

if(in.eq.3) jj=j-np2

```

```

if(in.eq.4) jj=j-np3

```

```

jj1=jj+1

```

```

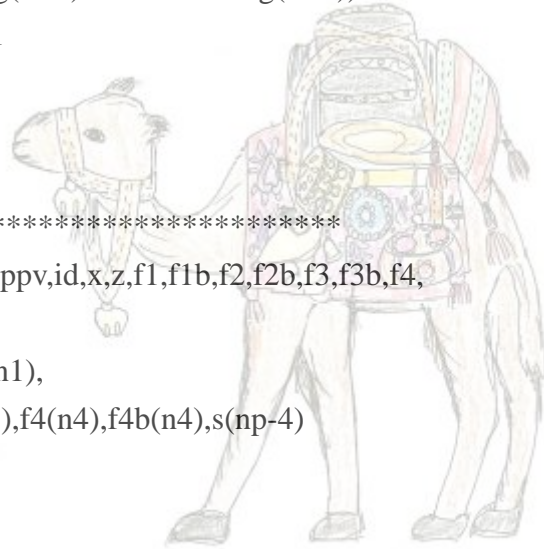
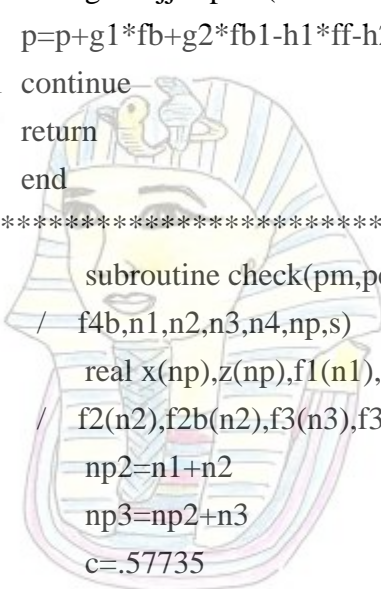
if(in.eq.1) ff=f1(jj)

```

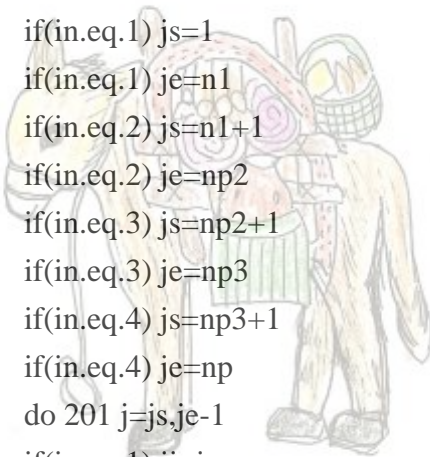
```

if(in.eq.1) fb=f1b(jj)

```



戴滿珠寶的駱駝



戴寶飾的籃子



阿拉丁神燈

```

if(in.eq.1) ff1=f1(jj1)
if(in.eq.1) fb1=f1b(jj1)
if(in.eq.2) ff=f2(jj)
if(in.eq.2) fb=f2b(jj)
if(in.eq.2) ff1=f2(jj1)
if(in.eq.2) fb1=f2b(jj1)
if(in.eq.3) ff=f3(jj)
if(in.eq.3) fb=f3b(jj)
if(in.eq.3) ff1=f3(jj1)
if(in.eq.3) fb1=f3b(jj1)
if(in.eq.4) ff=f4(jj)
if(in.eq.4) fb=f4b(jj)
if(in.eq.4) ff1=f4(jj1)
if(in.eq.4) fb1=f4b(jj1)
jd1=j-in+1
sjj=s(jd1)

```



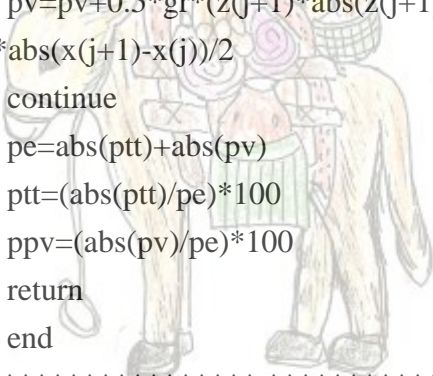
戴滿珠寶的駱駝

!

```

u1=((1+c)**2+(1-c)**2)*ff*fb
u2=2*(1-c**2)*(ff*fb1+ff1*fb)
u3=((1-c)**2+(1+c)**2)*ff1*fb1
ptt=ptt+(u1+u2+u3)*sjj/16.
if(in.ne.2) go to 201
pm=pm+(z(j+1)+z(j))*abs(x(j+1)-x(j))/2
pv=pv+0.5*gr*(z(j+1)*abs(z(j+1))+z(j)*abs(z(j)))
/ *abs(x(j+1)-x(j))/2
201 continue
pe=abs(ptt)+abs(pv)
ptt=(abs(ptt)/pe)*100
ppv=(abs(pv)/pe)*100
return
end

```



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!\*\*\*\*\*

```

subroutine seki(a,b,m,na,nk,nb)
real a(m,m),b(m,m),c(3000)
do 100 i=1,na
do 101 k=1,nk
c(k)=a(i,k)
101 continue

```

101



```

do 100 j=1,nb
r=0.
do 102 k=1,nk
r=r+c(k)*b(k,j)
102 continue
a(i,j)=r
100 continue
return
end

```

! \*\*\*\*\*

```

subroutine minvs(a,ko,n,eps,ill)
real a(ko,ko)
integer x(3000)
logical b
ill=0

```

```

if((ko.ge.n).and.(n.ge.2).and.(n.le.3000).and.(eps.gt.0.0))

```

```

/ go to 1

```

```

ill=30000

```

```

return

```

```

1 do 10 i=1,n
x(i)=i

```

```

10 continue

```

```

do 110 k=1,n

```

```

m=k

```

```

w=0.0

```

```

do 20 i=k,n

```

```

absa=abs(a(i,k))

```

```

if(absa.le.w) go to 20

```

```

w=absa

```

```

m=i

```

```

20 continue

```

```

if(m.eq.k) go to 50

```

```

l=x(m)

```

```

x(m)=x(k)

```

```

x(k)=l

```

```

do 40 j=1,n

```

```

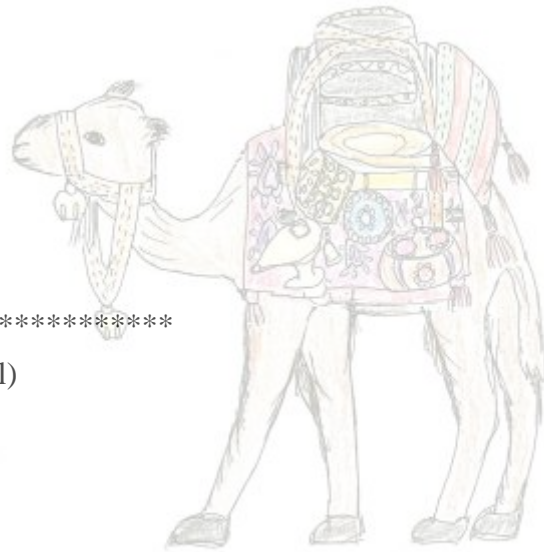
w=a(k,j)

```

```

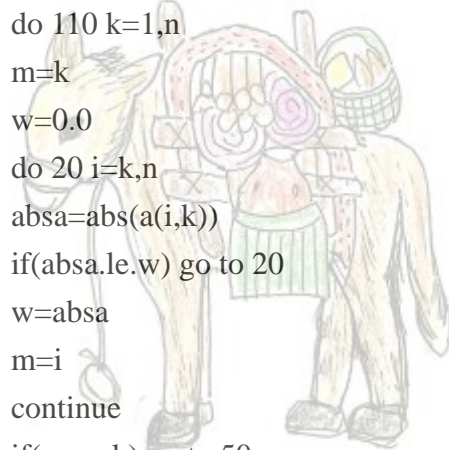
a(k,j)=a(m,j)

```



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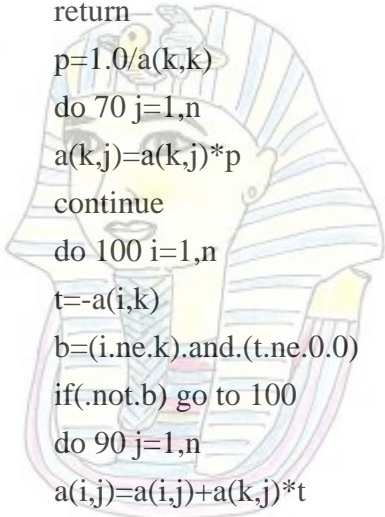


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```

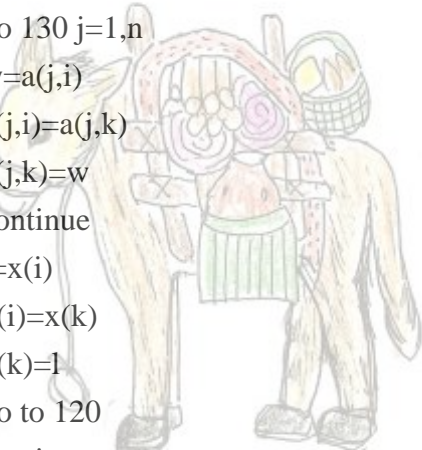
a(m,j)=w
40  continue
50  if(abs(a(k,k)).ge.eps) go to 60
    ill=k
    return
60  p=1.0/a(k,k)
    do 70 j=1,n
        a(k,j)=a(k,j)*p
70  continue
    do 100 i=1,n
        t=-a(i,k)
        b=(i.ne.k).and.(t.ne.0.0)
        if(.not.b) go to 100
        do 90 j=1,n
            a(i,j)=a(i,j)+a(k,j)*t
90  continue
100 a(i,k)=p*t
    a(k,k)=p
110 continue
    do 140 i=1,n
120 if(x(i).eq.i) go to 140
        k=x(i)
        do 130 j=1,n
            w=a(j,i)
            a(j,i)=a(j,k)
            a(j,k)=w
130 continue
        l=x(i)
        x(i)=x(k)
        x(k)=l
        go to 120
140 continue
    return
end

```



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```

subroutine wa(a,b,na,n,ns)
!*****
! [a]n,ns + [b]n,ns =====> [b]n,ns

```

```
!*****
```

```
    real a(na,na),b(na,na)
    do 100 i=1,n
    do 100 j=1,ns
    b(i,j)=a(i,j)+b(i,j)
100  continue
    return
    end
```

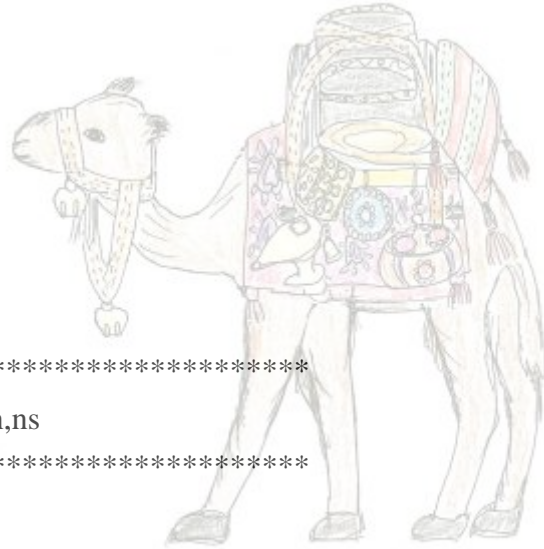
```
    subroutine sa(a,b,na,n,ns)
```

```
!*****
```

```
! [a]n,ns - [b]n,ns =====> [b]n,ns
```

```
!*****
```

```
    real a(na,na),b(na,na)
    do 100 i=1,n
    do 100 j=1,ns
    b(i,j)=a(i,j)-b(i,j)
100  continue
    return
    end
```



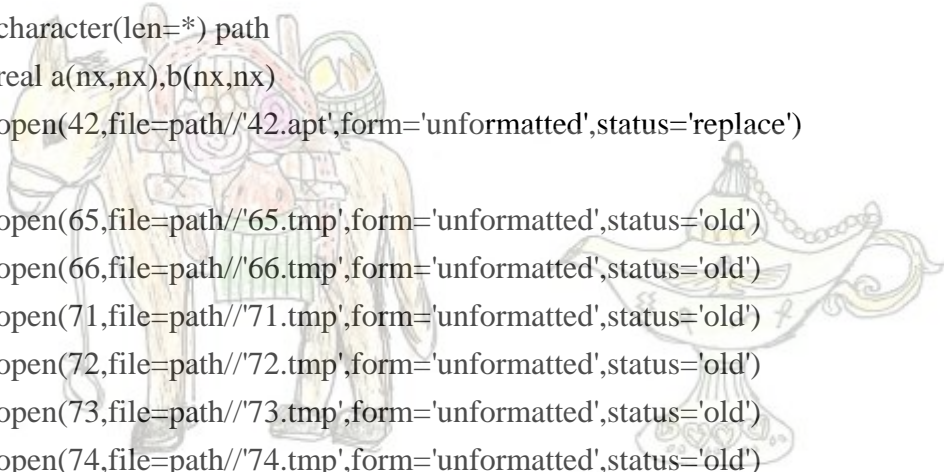
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```
!=====
```

```
    subroutine mtr2_1(a,b,nx,na,nb,nc,nd,ne,nf,path)
    character(len=*) path
    real a(nx,nx),b(nx,nx)
    open(42,file=path/'42.apr',form='unformatted',status='replace')
    open(65,file=path/'65.tmp',form='unformatted',status='old')
    open(66,file=path/'66.tmp',form='unformatted',status='old')
    open(71,file=path/'71.tmp',form='unformatted',status='old')
    open(72,file=path/'72.tmp',form='unformatted',status='old')
    open(73,file=path/'73.tmp',form='unformatted',status='old')
    open(74,file=path/'74.tmp',form='unformatted',status='old')
    open(75,file=path/'75.tmp',form='unformatted',status='replace')
    open(76,file=path/'76.tmp',form='unformatted',status='replace')

    read(65)((a(i,j),j=1,nc),i=1,na)
    read(71)((b(i,j),j=1,ne),i=1,nc)
    call seki(a,b,nx,na,nc,ne)
```

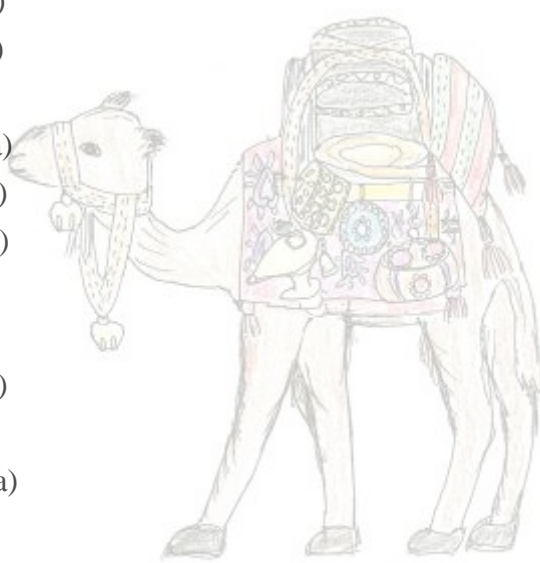
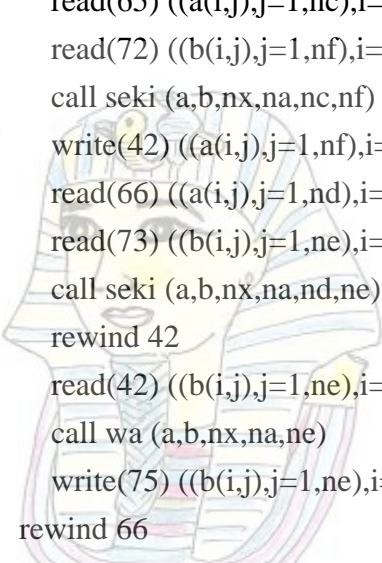


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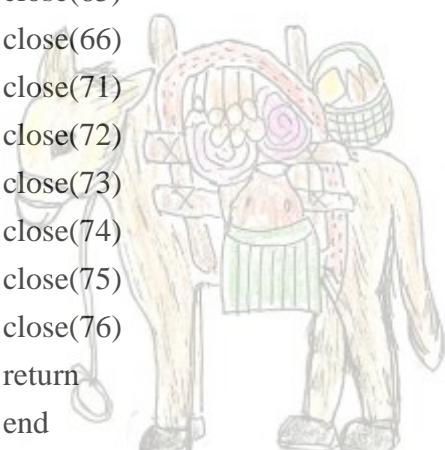
```

write(42) ((a(i,j),j=1,ne),i=1,na)
rewind 65
read(65) ((a(i,j),j=1,nc),i=1,na)
read(72) ((b(i,j),j=1,nf),i=1,nc)
call seki (a,b,nx,na,nc,nf)
write(42) ((a(i,j),j=1,nf),i=1,na)
read(66) ((a(i,j),j=1,nd),i=1,na)
read(73) ((b(i,j),j=1,ne),i=1,nd)
call seki (a,b,nx,na,nd,ne)
rewind 42
read(42) ((b(i,j),j=1,ne),i=1,na)
call wa (a,b,nx,na,ne)
write(75) ((b(i,j),j=1,ne),i=1,na)
rewind 66
read(66) ((a(i,j),j=1,nd),i=1,na)
read(74) ((b(i,j),j=1,nf),i=1,nd)
call seki (a,b,nx,na,nd,nf)
read(42) ((b(i,j),j=1,nf),i=1,na)
call wa (a,b,nx,na,nf)
write(76) ((b(i,j),j=1,nf),i=1,na)
close(42)
close(65)
close(66)
close(71)
close(72)
close(73)
close(74)
close(75)
close(76)
return
end

```



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!=====

```

subroutine mtr2_2(a,b,nx,na,nb,nc,nd,ne,nf,path)
character(len=*) path
real a(nx,nx),b(nx,nx)

open(43,file=path/'43.apr',form='unformatted',status='replace')
open(67,file=path/'67.tmp',form='unformatted',status='old')

```

```

open(68,file=path//'68.tmp',form='unformatted',status='old')
open(81,file=path//'81.tmp',form='unformatted',status='old')
open(82,file=path//'82.tmp',form='unformatted',status='old')
open(83,file=path//'83.tmp',form='unformatted',status='old')
open(84,file=path//'84.tmp',form='unformatted',status='old')
open(77,file=path//'77.tmp',form='unformatted',status='replace')
open(78,file=path//'78.tmp',form='unformatted',status='replace')

```

```

read(81) ((b(i,j),j=1,ne),i=1,nc)
read(67) ((a(i,j),j=1,nc),i=1,nb)
call seki (a,b,nx,nb,nc,ne)
write(43) ((a(i,j),j=1,ne),i=1,nb)
rewind 67
read(67) ((a(i,j),j=1,nc),i=1,nb)
read(82) ((b(i,j),j=1,nf),i=1,nc)
call seki (a,b,nx,nb,nc,nf)
write(43) ((a(i,j),j=1,nf),i=1,nb)
read(68) ((a(i,j),j=1,nd),i=1,nb)
read(83) ((b(i,j),j=1,ne),i=1,nc)
call seki (a,b,nx,nb,nd,ne)

```

```

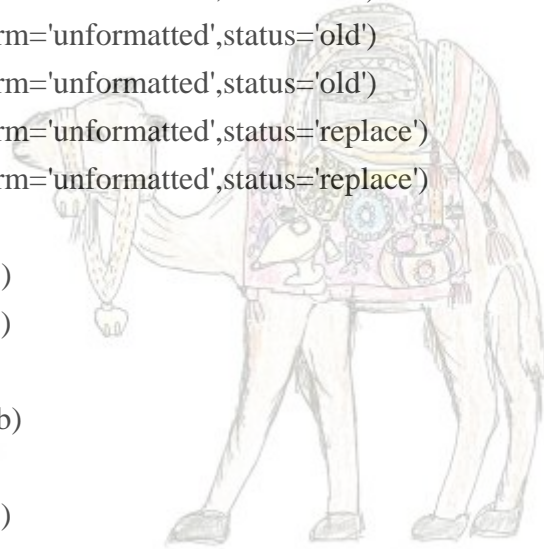
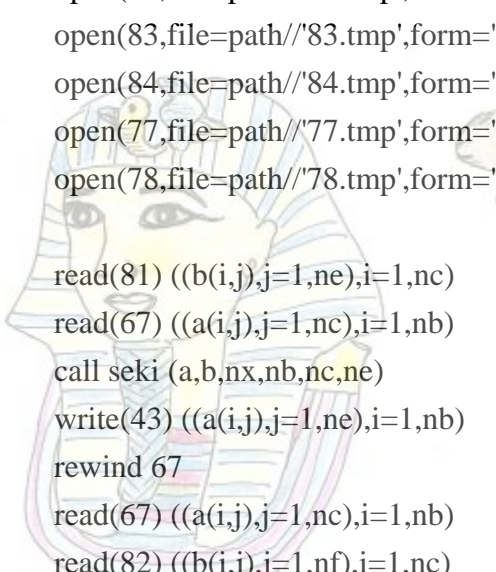
rewind 43
read(43) ((b(i,j),j=1,ne),i=1,nb)
call wa (a,b,nx,nb,ne)
write(77) ((b(i,j),j=1,ne),i=1,nb)
rewind 68
read(68) ((a(i,j),j=1,nd),i=1,nb)
read(84) ((b(i,j),j=1,nf),i=1,nd)
call seki (a,b,nx,nb,nd,nf)
read(43) ((b(i,j),j=1,nf),i=1,nb)
call wa (b,a,nx,nb,nf)
write(78) ((a(i,j),j=1,nf),i=1,nb)
close(43)

```

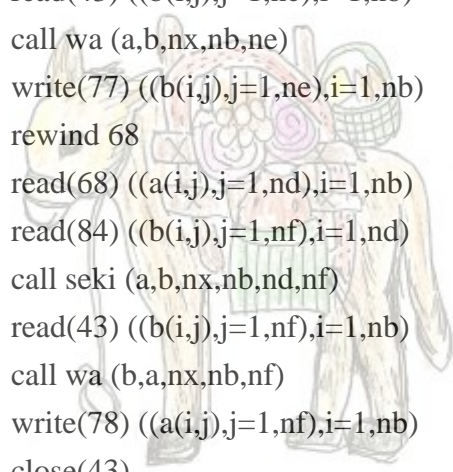
```

close(67)
close(68)
close(81)
close(82)
close(83)
close(84)

```



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```
close(77)
```

```
close(78)
```

```
return
```

```
end
```

```
!*****
```

```
subroutine mir2_1(a,b,nx,n,ns,path)
character(len=*) path
real a(nx,nx),b(nx,nx)

open(40,file=path/'40.apt',form='unformatted',status='replace')
open(51,file=path/'51.tmp',form='unformatted',status='old')
open(52,file=path/'52.tmp',form='unformatted',status='old')
open(53,file=path/'53.tmp',form='unformatted',status='old')
open(54,file=path/'54.tmp',form='unformatted',status='old')
open(65,file=path/'65.tmp',form='unformatted',status='replace')
open(67,file=path/'67.tmp',form='unformatted',status='replace')
```

```
read(53) ((a(i,j),j=1,n ),i=1,ns)
```

```
read(54) ((b(i,j),j=1,ns),i=1,ns) 埃及尼羅河之旅
```

```
call minvs(b,nx,ns,1e-8,ill)
```

```
illd=1
```

```
if(ill.ne.0) write (*,10) illd,ill
```

```
call seki(b,a,nx,ns,ns,n)
```

```
write(40) ((b(i,j),j=1,n),i=1,ns)
```

```
read(52) ((a(i,j),j=1,ns),i=1,n)
```

```
call seki(a,b,nx,n,ns,n)
```

```
read(51) ((b(i,j),j=1,n ),i=1,n )
```

```
call sa(b,a,nx,n,n)
```

```
call minvs(a,nx,n,1e-8,ill)
```

```
illd=2
```

```
if(ill.ne.0) write (*,10) illd,ill
```

```
rewind 40
```

```
read(40) ((b(i,j),j=1,n ),i=1,ns)
```

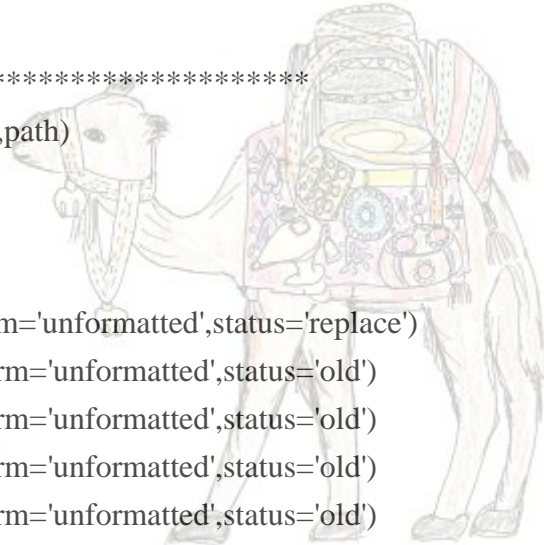
```
call seki(b,a,nx,ns,n,n)
```

```
write(65) ((a(i,j),j=1,n ),i=1,n)
```

```
write(67) ((-b(i,j),j=1,n ),i=1,ns)
```

```
close(40)
```

```
close(51)
```



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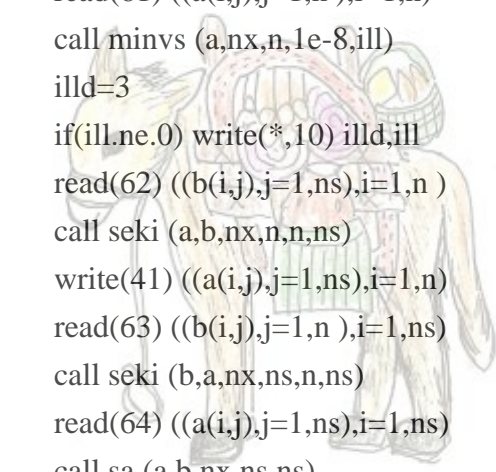
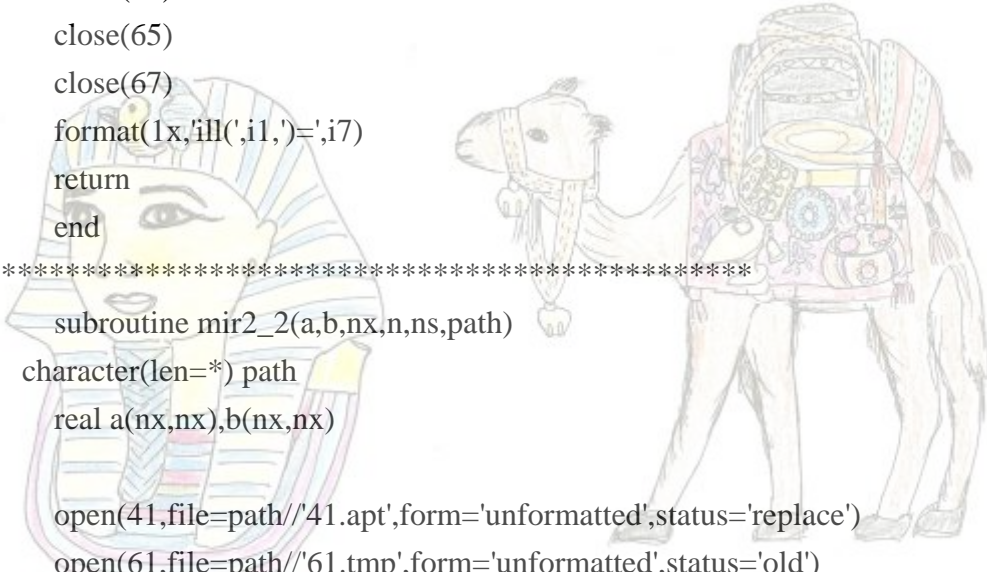
```

close(52)
close(53)
close(54)
close(65)
close(67)
10  format(1x,ill('i1,')='i7)
    return
    end
!*****
subroutine mir2_2(a,b,nx,n,ns,path)
character(len=*) path
real a(nx,nx),b(nx,nx)

open(41,file=path//'41.apr',form='unformatted',status='replace')
open(61,file=path//'61.tmp',form='unformatted',status='old')
open(62,file=path//'62.tmp',form='unformatted',status='old')
open(63,file=path//'63.tmp',form='unformatted',status='old')
open(64,file=path//'64.tmp',form='unformatted',status='old')
open(66,file=path//'66.tmp',form='unformatted',status='replace')
open(68,file=path//'68.tmp',form='unformatted',status='replace')

read(61) ((a(i,j),j=1,n ),i=1,n)
call minvs (a,nx,n,1e-8,ill)
illd=3
if(ill.ne.0) write(*,10) illd,ill
read(62) ((b(i,j),j=1,ns),i=1,n )
call seki (a,b,nx,n,n,ns)
write(41) ((a(i,j),j=1,ns),i=1,n)
read(63) ((b(i,j),j=1,n ),i=1,ns)
call seki (b,a,nx,ns,n,ns)
read(64) ((a(i,j),j=1,ns),i=1,ns)
call sa (a,b,nx,ns,ns)
call minvs (b,nx,ns,1e-8,ill)
illd=4
if(ill.ne.0) write(*,10) illd,ill
write(68) ((b(i,j),j=1,ns),i=1,ns)
rewind 41
read(41) ((a(i,j),j=1,ns),i=1,n)

```

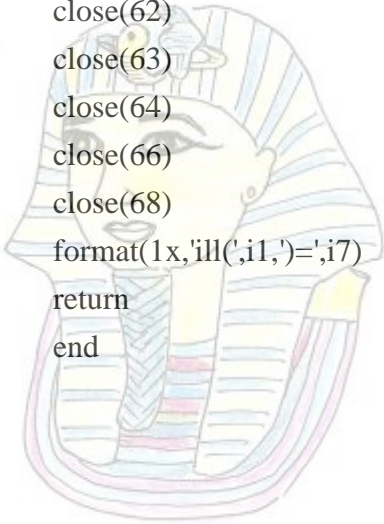


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```

call seki (a,b,nx,n,ns,ns)
write(66) ((-a(i,j),j=1,ns),i=1,n)
close(41)
close(61)
close(62)
close(63)
close(64)
close(66)
close(68)
10 format(1x,'ill(',i1,')='',i7)
return
end

```



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