Code:

Direct

```
1.   '''Direct Problem
2.   Yaseen Hull '''



3.   import math
4.   d1= {}
5.   dDis = {}
6.   values=[]
7.   f = open("viper.txt","r")
8.   data = f.read()
9.   spl = data.splitlines()
10.  i = 0
11.  while i < len(spl):
12.  for i in spl:
13.  values = i.split('\t')
14.  staFrm =  values.pop(0)
15.  values = map(float,values)
16.  glat =  values.pop(0)
17.  glong = values.pop(0)
18.  eS = values.pop(0)
19.  fAzi = values.pop(0)
20.  bAzi = values.pop(0)
21.  d1[staFrm] = [glat,glong,eS,fAzi,bAzi]
22.  update3 = dDis.update(d1)



23.  a = 6378137
24.  b = 6356752.314
25.  f = 1/298.257224
26.  e2 = ((a**2)-(b**2))/(a**2)
27.  e2x = ((a**2)-(b**2))/(b**2)
28.  n = 0.0001679220
```

```python
29.  x = dDis.items()



30.  f2 = open("red.txt","w")



31.  for i in range(len(x)):
32.  lat1= (x[i][1][0]) #obtaining lat
33.  fAzi1 = (x[i][1][3]) #forward azimuth to point 2
34.  name = x[i][0] #name of point 2'''
35.  S  = x[i][1][2]



36.  phi2 = lat1
37.  alpha2 = fAzi1




38.  k = 20
39.  while k>0:
40.  k -= 1
41.  mLat =((phi2 + lat1))/2 #mid lat of rbay and hnus
42.  mfAzi =((fAzi1 + alpha2))/2



43.  # mid azi of rbay and hnus



44.  M = (a*(1-e2))/math.pow((1-(e2*math.pow(math.sin(mLat),2))),3.0/2.)
45.  N = (a)/math.sqrt(1-e2*(math.sin(mLat))**2)
46.  Tau = math.tan(mLat)
47.  eta = e2x*(math.cos(mLat))**2



48.  dphi = (S/M) * math.cos(mfAzi) + (S**3/ (24 * (M**3)) )*1/( (1+eta)**2 )*((2 + 3*(Tau**2) + 2*eta)*(math.sin(mfAzi)**2)*math.cos(mfAzi)+3*(-eta + 3*eta*(Tau**2) - eta**2)*(math.cos(mfAzi)**3 ))
49.  dA = (S/N)*(Tau*math.sin(mfAzi))+((S**3)/(24*N**3))*Tau*((2+(Tau**2)+2*eta)*(math.sin(mfAzi)**3)+(2+7*eta+9*eta*(Tau**2)+5*(eta**2)*math.sin(mfAzi)*(math.cos(mfAzi)**2)))
```

```python
50.    phi2 = lat1 + dphi
51.    alpha2 = mfAzi + 0.5*(dA)
52.    Deg =math.degrees(phi2)


53.    DD = int(Deg)
54.    MM = int((Deg - DD)*60)
55.    SS = round((((Deg - DD)*60)-MM),2)
56.    Deg2 = math.degrees(lat1)


57.    dlon_1 = (S/(N*math.cos(mfAzi)))*math.sin(mfAzi) +( (S**3)/(24*(N**3)*math.cos(mfAzi)) )*((Tau**2)*(math.sin(mfAzi)**3)+(-1 - eta + 9*eta*(Tau**2))*math.sin(mfAzi)*(math.cos(mfAzi)**2))
58.    print(name+' '+str(DD)+'"'+str(MM)+"'"+str(SS)+'"')
59.    f2.write(name+' '+str(DD)+'"'+str(MM)+"'"+str(SS)+'"'+'\n')
60.    #print(str(Deg))


61.    f2.close()
```