

```

'''
#####
##### Correction de l'examen n°1 Décembre 2022#####
#####
# Probleme
'''
def SaisieLogiciel():
    lo={}
    while True:
        lo['Designation']=input('donner designation')
        lo['Licence']=input('donner licence')
        lo['Editeur']=input('donner editeur')
        lo['AnneEdition']=int(input('donner AnneEdition'))
        lo['Version']=input('donner Version')
        lo['TailleDisque']=int(input('donner Taille disque'))
        if len(lo['Designation'])<=20 and lo['Licence'] in 'cClLpP': break
    return lo

def AjoutLogiciel(L,X):
    L.append(X)
    return L

def ListLogicielParEditeur(L,e):
    #Ed=[l for l in L if l['Editeur']==e]
    Ed=[]
    for l in L:
        if l['Editeur']==e:Ed.append(l)
    return tuple(Ed)

def EspaceTotalOccupe(L):
    return sum([l[taille] for l in L])

def rechercheLogiciel(L,d):
    r=[L.index(l) for l in L if l['Designation']==d]
    if len(r)>0:return r[0]
    return -1

def NombreLogicielCommercial(L):
    return len([l for l in L if l['Licence'] in 'cC'])

# Part2
def EspaceOccupe(O):
    return EspaceTotalOccupe(O['LogInst'])

def InstallerLogiciel(O,X):
    el=O['CapaciteDisque']-EspaceOccupe(O)
    if el>X['TailleDisque'] and X not in O['LogInst']:
        O['LogInst'].append(X)

def DesinstallerLogiciel(O,d):
    idx=RechercheLogiciel(O['LogInst'],d)
    #O['LogInst'].remove(O['LogInst'][idx])
    O['LogInst'].pop(idx)

def VideOrdinateur(O):

```

```
O['LogInst'].clear()
#O['LogInst']=[]
```

#Part 3

```
def QjouterOrdinateur(O,L0):
    L0.insert(O,0)
    #[O]+L0
```

```
def SupprimerOrdinateur(L0,N):
    for o in L0:
        if o['num']==N:
            idx=L0.index(o)
            L0.pop(idx)
```

```
def FormaterOrdinateur(L0,N):
    for o in L0:
        if o['num']==N:
            ViderOrdinateur(o)
```

Exercice

Question 1

```
def enfant(F,p):
    return F.get(p , set())
```

Question 2

```
def ens_enfant(F,X):
    S=set()
    for p in X :
        S= S| enfant(F,p)
    return S
```

Question 3

```
def petit_enfant(F, p):
    return ens_enfant(F,enfant(F,p))
```

Question 4

```
def parent(F,p):
    return {x for x in F if p in enfant(F,x)}
```

Question 5

```
def freres_soeurs(F,p):
    return ens_enfant(F,parent(F,p)) - {p}
```

Question 6

```
def neveux_nieces(F, p):
    return ens_enfant(F, freres_soeurs(F,p))
```

Question 7.

```
def oncles_tantes(F,p):
    S=set()
    for x in parent(F,p) :
        S = S | freres_soeurs(F,x)
    return S
```