In [62]:
```
import numpy as np
empID=np.random.choice(range(1,30),size=20,replace=False)

departments= ['Engineering', 'HR', 'Marketing', 'Sales']
dept=np.random.choice(departments,size=20)

temp1=np.random.uniform(1,15,20)
exp=np.array([round(i,1) for i in temp1])

proj=np.random.randint(1,20,20)

temp2=np.random.uniform(1,5,20)
clientSat=np.array([round(i,1) for i in temp2])
```

In [63]:
```
print(f"Employee IDs: {empID}\n")
print(f"Departments of employees: {dept}\n")
print(f"Experience of employees: {exp}\n")
print(f"Projects Completed successfully: {proj}\n")
print(f"Client satisfaction rating:{clientSat} \n")
```

```
Employee IDs: [ 6  9 13 18  1 25 22 29 27  4 23  7 11  2 28 16 24 19 14  8]

Departments of employees: ['Engineering' 'Marketing' 'HR' 'Marketing' 'Marketing' 'Engineering'
 'Sales' 'HR' 'Engineering' 'Sales' 'Marketing' 'Marketing' 'Sales'
 'Marketing' 'HR' 'HR' 'HR' 'Sales' 'Sales' 'HR']

Experience of employees: [ 4.3  8.7 14.5 12.4  3.2 13.1  8.3 12.2  3.5  2.7 12.9  5.   7.3  1.1
  6.1  5.5  9.5 11.5 14.4 12.7]

Projects Completed successfully: [ 5  2  7  9  4  9 12  4  4  5 12 11  3  4  9 15  1  1 14  1]

Client satisfaction rating:[2.7 3.6 1.2 2.4 1.9 1.9 3.2 2.8 3.1 1.4 4.8 3.1 3.7 1.3 4.4 4.6 1.3 3.3
 1.8 1.4]
```

In [64]:
```
#Question 1.(a)
dtype=[('empID','i4'),   # int32 (4-byte integer)
       ('dept','U20'),   # string (up to 20 characters)
       ('exp','f4'),     # float32
       ('proj','i4'),
       ('clientSat','f4')]

struct_array=np.zeros(20,dtype=dtype)

struct_array['empID']=empID
struct_array['dept']=dept
struct_array['exp']=exp
struct_array['proj']=proj
struct_array['clientSat']=clientSat

print(struct_array)
```

```
[( 6, 'Engineering',  4.3,  5, 2.7) ( 9, 'Marketing',  8.7,  2, 3.6)
 (13, 'HR', 14.5,  7, 1.2) (18, 'Marketing', 12.4,  9, 2.4)
 ( 1, 'Marketing',  3.2,  4, 1.9) (25, 'Engineering', 13.1,  9, 1.9)
 (22, 'Sales',  8.3, 12, 3.2) (29, 'HR', 12.2,  4, 2.8)
 (27, 'Engineering',  3.5,  4, 3.1) ( 4, 'Sales',  2.7,  5, 1.4)
 (23, 'Marketing', 12.9, 12, 4.8) ( 7, 'Marketing',  5. , 11, 3.1)
 (11, 'Sales',  7.3,  3, 3.7) ( 2, 'Marketing',  1.1,  4, 1.3)
 (28, 'HR',  6.1,  9, 4.4) (16, 'HR',  5.5, 15, 4.6)
 (24, 'HR',  9.5,  1, 1.3) (19, 'Sales', 11.5,  1, 3.3)
 (14, 'Sales', 14.4, 14, 1.8) ( 8, 'HR', 12.7,  1, 1.4)]
```

In [65]:
```
#(b)
def filter_data(arr,dept=None,max_clientSat=None,exp_crit=None):
    mask=np.ones(len(arr),dtype=bool)

    if dept is not None:
        mask &=(arr['dept']==dept)

    if max_clientSat is not None:
        mask &=(arr['clientSat']==max_clientSat)

    if exp_crit is not None:
        mask &=(arr['exp']<exp_crit)

    return arr[mask]

filt_dept="HR"
filter_by_dept=filter_data(struct_array,dept=filt_dept)
print(f"Details of employees working in the {filt_dept}: ",filter_by_dept)
```

```
Details of employees working in the HR:  [(13, 'HR', 14.5,  7, 1.2) (29, 'HR', 12.2,  4, 2.8)
 (28, 'HR',  6.1,  9, 4.4) (16, 'HR',  5.5, 15, 4.6)
 (24, 'HR',  9.5,  1, 1.3) ( 8, 'HR', 12.7,  1, 1.4)]
```

In [66]:
```
#(c)
filter_by_highest_clientSat=filter_data(struct_array,max_clientSat=max(struct_array['clientSat']))
print(f"Details of Employee with highest Client Satisfaction Rating: \n",filter_by_highest_clientSat)
```

```
Details of Employee with highest Client Satisfaction Rating:
 [(23, 'Marketing', 12.9, 12, 4.8)]
```

In [67]:
```
#(d)
avg_proj_completed=np.mean(struct_array['proj'])
avg_yrs_exp=np.mean(struct_array['exp'])

print(f"Average number of projects completed {avg_proj_completed}")
print(f"Average years of experience {avg_yrs_exp}")
```

```
Average number of projects completed 6.6
Average years of experience 8.444999694824219
```

In [68]:
```
#(e)
filter_by_yrs=filter_data(struct_array,exp_crit=2)
print(f"Employees with less than 2 years of experience: \n",filter_by_yrs)
```

```
Employees with less than 2 years of experience:
 [(2, 'Marketing', 1.1, 4, 1.3)]
```