Homework 5. Pandas - Titanic

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- Submission date: 2019/05/02

In [1]:

```
import pandas as pd
```

In [2]:

```
titanic = pd.read_csv('titanic_dataset.csv')
```

Data Dictionary

- Survived: 0 = No, 1 = Yes
- pclass: Ticket class 1 = 1st, 2 = 2nd, 3 = 3rd
- name: Name
- sex: {'male', 'female'}
- age: Age
- sibsp: # of siblings / spouses aboard the Titanic
- parch: # of parents / children aboard the Titanic
- ticket: Ticket number
- cabin: Cabin number
- embarked: Port of Embarkation C = Cherbourg, Q = Queenstown, S = Southampton
- boat: boat # of survived passengers

Problem 1. Find mean fare that the first class passengers paid (In Korean current currency) (5 pts)

- Note that there are many unpaid free passengers. They are out of consideration.
- 1 pound when Titanic launched is worth 57.5 US dollars.
- Suppose US currency exchange ratio is 1141 won per dollar.
- Before printing, truncate to two decimal places (소수점 이하 두자리)

In [3]:

```
# YOUR CODE HERE
# 0원 이상, fair 모두 더해서 min, 평균 계산
import numpy as np
fare=titanic.loc[(titanic['pclass']==1) & (titanic['fare']>0),['fare']]['fare']
print("mean fare that the first class passengers paid = %.2f"%(np.mean(fare)*57.
5*1141))
```

```
mean fare that the first class passengers paid = 5868425.67
```

```
mean fare that the first class passengers paid = 5868425.67
```

Problem 2. (15 pts)

2.1 Find the names who paid the highest fare. Are they survived?

In [4]:

```
# YOUR CODE HERE
maxFare=titanic.loc[(titanic['survived']==1) & (titanic['pclass']==1),['fare']].
max()
print(titanic.loc[(titanic['fare']==maxFare[0]),['name','survived']])
```

```
                                                 name  survived
49                    Cardeza, Mr. Thomas Drake Martinez         1
50     Cardeza, Mrs. James Warburton Martinez (Charlo...         1
183                               Lesurer, Mr. Gustave J         1
302                                    Ward, Miss. Anna          1


                                                 name  survived
49                    Cardeza, Mr. Thomas Drake Martinez         1
50     Cardeza, Mrs. James Warburton Martinez (Charlo...         1
183                               Lesurer, Mr. Gustave J         1
302                                    Ward, Miss. Anna          1
```

2.2 Find the names who paid the lowest fare. Are they survived?

In [5]:

```
# YOUR CODE HERE
minFare=titanic.fare.min()
print(titanic.loc[(titanic['fare']==minFare),['name','pclass','survived']])
```

```
                                      name  pclass  survived
7                     Andrews, Mr. Thomas Jr       1         0
70     Chisholm, Mr. Roderick Robert Crispin       1         0
125                           Fry, Mr. Richard       1         0
150                    Harrison, Mr. William       1         0
170                  Ismay, Mr. Joseph Bruce       1         1
223            Parr, Mr. William Henry Marsh       1         0
234          Reuchlin, Jonkheer. John George       1         0
363                    Campbell, Mr. William       2         0
384           Cunningham, Mr. Alfred Fleming       2         0
410         Frost, Mr. Anthony Wood "Archie"       2         0
473                     Knight, Mr. Robert J       2         0
528              Parkes, Mr. Francis "Frank"       2         0
581               Watson, Mr. Ennis Hastings       2         0
896                      Johnson, Mr. Alfred       3         0
898          Johnson, Mr. William Cahoone Jr       3         0
963                      Leonard, Mr. Lionel       3         0
1254           Tornquist, Mr. William Henry       3         1
```

	name	pclass	survived
7	Andrews, Mr. Thomas Jr	1	0
70	Chisholm, Mr. Roderick Robert Crispin	1	0
125	Fry, Mr. Richard	1	0
150	Harrison, Mr. William	1	0
170	Ismay, Mr. Joseph Bruce	1	1
223	Parr, Mr. William Henry Marsh	1	0
234	Reuchlin, Jonkheer. John George	1	0
363	Campbell, Mr. William	2	0
384	Cunningham, Mr. Alfred Fleming	2	0
410	Frost, Mr. Anthony Wood "Archie"	2	0
473	Knight, Mr. Robert J	2	0
528	Parkes, Mr. Francis "Frank"	2	0
581	Watson, Mr. Ennis Hastings	2	0
896	Johnson, Mr. Alfred	3	0
898	Johnson, Mr. William Cahoone Jr	3	0
963	Leonard, Mr. Lionel	3	0
1254	Tornquist, Mr. William Henry	3	1

2.3 Find the names who paid the lowest fare (> 0). Are they survived?

In [6]:

```
# YOUR CODE HERE
minFare=titanic.loc[(titanic['fare']>0) & (titanic['survived']==1),['fare']].min
()
print(titanic.loc[(titanic['fare']==minFare[0]),['name','pclass','survived']])
```

```
                         name  pclass  survived
1082  Olsen, Master. Artur Karl       3         1
```

	name	pclass	survived
1082	Olsen, Master. Artur Karl	3	1

Problem 3. (10 pts)

3.1 Find the survival ratio who paid more than 0 and less than or equal to the mean fare of third class

In [7]:

```
# YOUR CODE HERE
fareMean = titanic.loc[(titanic['pclass']==3) & (titanic['fare']>0)].fare.mean()
fareMore = titanic.loc[(titanic['fare']>0) & (titanic['fare']<=fareMean)]
fareSurvived = titanic.loc[(titanic['survived']==1) & (titanic['fare']>0) & (tit
anic['fare']<=fareMean)]
print("survived ratio of low 1 group = %.2f%%"%float(len(fareSurvived)/len(fareM
ore)*100))
```

```
survived ratio of low 1 group = 25.33%
```


```
survived ratio of low 1 group = 25.33%
```


3.2 Find the survival ratio who paid more than the mean fare of first class

In [8]:

```
# YOUR CODE HERE
fareMean = titanic.loc[titanic['pclass']==1].fare.mean()
firstMore = titanic.loc[(titanic['fare']>fareMean)]
firstMoreSurvived = titanic.loc[(titanic['survived']==1) & (titanic['fare']>fare
Mean)]
print("survived ratio of high 1 group = %.2f%%"%float(len(firstMoreSurvived)/len
(firstMore)*100))
```

```
survived ratio of high 1 group = 72.16%
```


```
survived ratio of high 1 group = 72.16%
```


Problem 4. (10 pts)

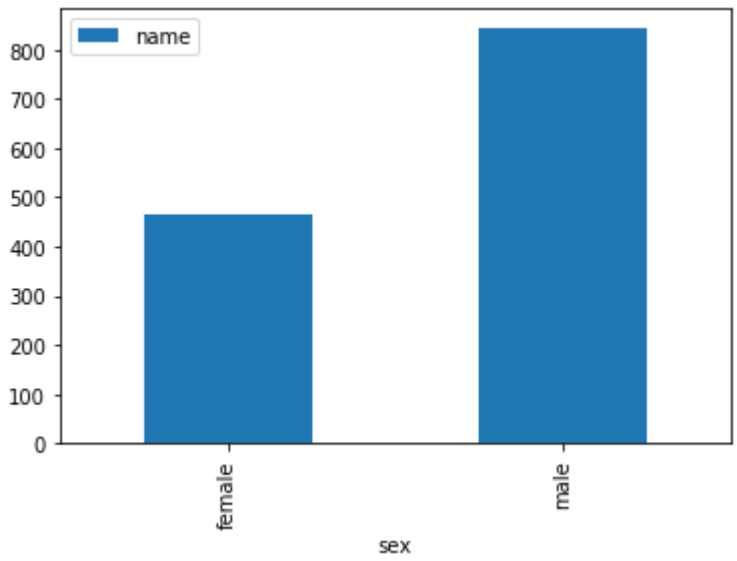
4.1 Plot the number of male and female passengers

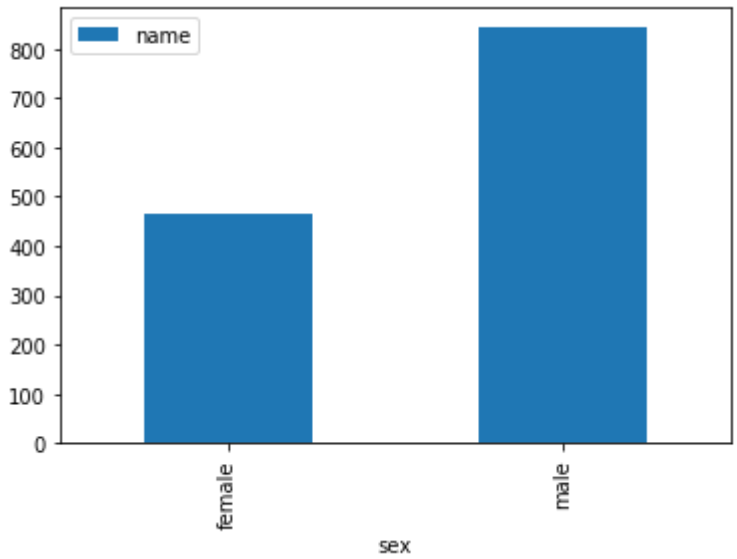
In [10]:

```
# YOUR CODE HERE
import matplotlib.pyplot as plt

def plot_sex():
    plt.bar(np.arange(len(passNumber)),passNumber,width=0.5,label='name')
    plt.xticks([i for i, _ in enumerate(passNumber)], sex,rotation=90)
    plt.xlabel('sex')
    plt.legend(fontsize=10)
    plt.xlim(-0.5,1.5)
    plt.show()

sex = set(titanic.sex.values)
passNumber=tuple(titanic['sex'].value_counts())[::-1]
plot_sex()
```



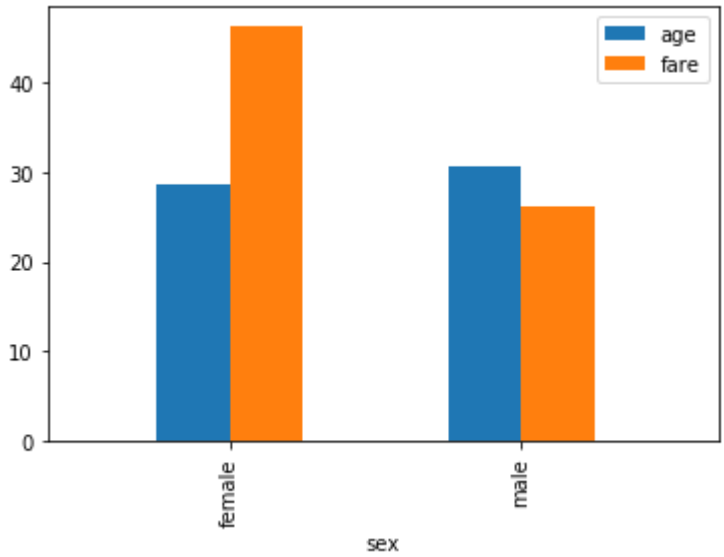


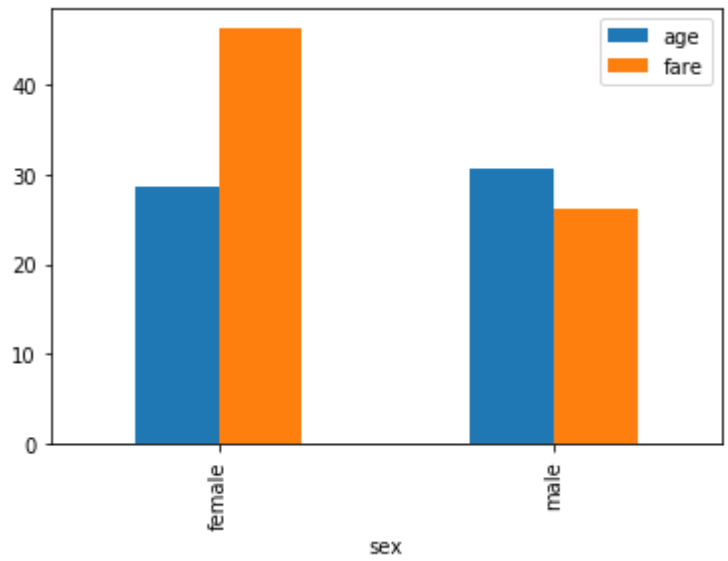
4.2 Plot mean age and mean fare by sex

In [11]:

```
# YOUR CODE HERE
def plot_means():
    bar_width = 0.25
    plt.bar(np.arange(len(age)), age, bar_width, label='age')
    plt.bar(np.arange(len(fare))+bar_width, fare, width=0.25, label='fare')
    plt.xticks([i+bar_width/2 for i, _ in enumerate(passNumber)], sex,rotation=90)
    plt.xlabel('sex')
    plt.legend(fontsize=10)
    plt.xlim(-0.5,1.8)
    plt.show()

male, female = titanic.loc[titanic['sex']=='male'], titanic.loc[titanic['sex']=='female']
age = (female.age.mean(), male.age.mean())
fare = (female.fare.mean(), male.fare.mean())
plot_means()
```





Problem 5. (10 pts)

5.1 Find the number of passengers by passenger's title.

In [12]:

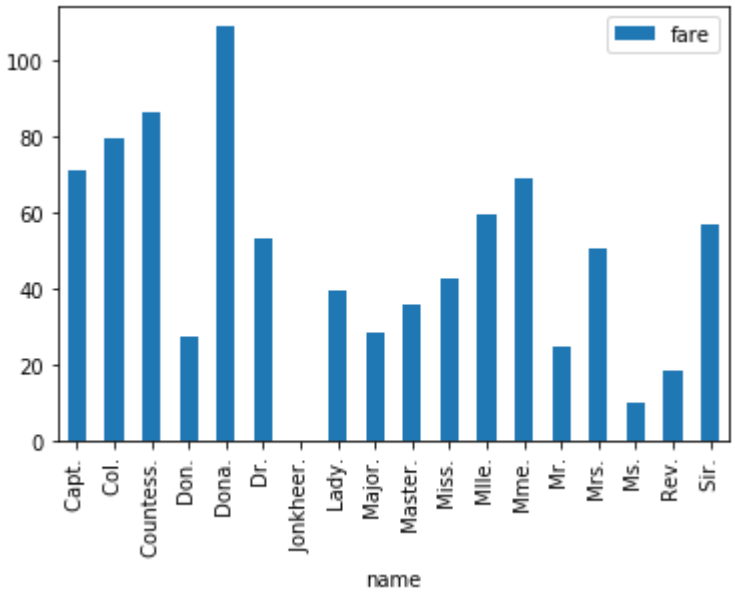
```
# YOUR CODE HERE
title=['Mr.','Miss.','Mrs.','Master.','Rev.','Dr.','Col.','Ms.','Major.','Jonkheer.','Capt.','Countess.','Lady.','Don.','Mme.','Dona.']
```

```
Mr.          757
Miss.        260
Mrs.         197
Master.       61
Rev.           8
Dr.            8
Col.           4
Ms.            2
Mlle.          2
Major.         2
Jonkheer.      1
Sir.           1
Capt.          1
Countess.      1
Lady.          1
Don.           1
Mme.           1
Dona.          1
Name: name, dtype: int64
```

5.2 Plot the mean fare by passenger's title

In [ ]:

```
# YOUR CODE HERE
```


fare
100
80
60
40
20
0
Capt.
Col.
Countess.
Don.
Dona.
Dr.
Jonkheer.
Lady.
Major.
Master.
Miss.
Mlle.
Mme.
Mr.
Mrs.
Ms.
Rev.
Sir.
name

Problem 6. (15 pts)

Compute the confidence and support for the following cases:

조건부 확률

Confidences:

- P(survived = 1 | sex=female, pclass=1)
- P(survived = 1 | sex=female, pclass=2)
- P(survived = 1 | sex=female, pclass=3)
- P(survived = 1 | sex=male, pclass=1)
- P(survived = 1 | sex=male, pclass=2)
- P(survived = 1 | sex=male, pclass=3)
- P(survived = 1 | age <= 10, pclass=1)
- P(survived = 1 | age <= 10, pclass=2)
- P(survived = 1 | age <= 10, pclass=3)

Support:

- P(survived = 1, sex=female, pclass=1)
- P(survived = 1, sex=female, pclass=2)
- P(survived = 1, sex=female, pclass=3)
- P(survived = 1, sex=male, pclass=1)
- P(survived = 1, sex=male, pclass=2)
- P(survived = 1, sex=male, pclass=3)
- P(survived = 1, age <= 10, pclass=1)
- P(survived = 1, age <= 10, pclass=2)
- P(survived = 1, age <= 10, pclass=3)

6.1 P(survived = 1 | sex=female, pclass=1), P(survived = 1, sex=female, pclass=1)

In [13]:

```
# YOUR CODE HERE
C = titanic.loc[(titanic['sex']=='female') & (titanic['pclass']==1)]
S = titanic.loc[(titanic['survived']==1) & (titanic['sex']=='female') & (titanic
['pclass']==1)]
print("Confidence: P(survived = 1 | sex=female, pclass=1) = %.2f"%(len(S)/len(C)
*100))
print("Support: P(survived = 1, sex=female, pclass=1) = %.2f"%(len(S)/len(titani
c)*100))
```

```
Confidence: P(survived = 1 | sex=female, pclass=1) = 96.53
Support: P(survived = 1, sex=female, pclass=1) = 10.62
```

Confidence: P(survived = 1 | sex=female, pclass=1) = 96.53
Support: P(survived = 1, sex=female, pclass=1) = 10.62

6.2 P(survived = 1 | sex=female, pclass=2), P(survived = 1, sex=female, pclass=2)

In [14]:

```
# YOUR CODE HERE
C = titanic.loc[(titanic['sex']=='female') & (titanic['pclass']==2)]
S = titanic.loc[(titanic['survived']==1) & (titanic['sex']=='female') & (titanic
['pclass']==2)]
print("Confidence: P(survived = 1 | sex=female, pclass=2) = %.2f"%(len(S)/len(C)
*100))
print("Support: P(survived = 1, sex=female, pclass=2) = %.2f"%(len(S)/len(titani
c)*100))
```

```
Confidence: P(survived = 1 | sex=female, pclass=2) = 88.68
Support: P(survived = 1, sex=female, pclass=2) = 7.18
```


```
Confidence: P(survived = 1 | sex=female, pclass=2) = 88.68
Support: P(survived = 1, sex=female, pclass=2) = 7.18
```


6.3 P(survived = 1 | sex=female, pclass=3), P(survived = 1, sex=female, pclass=3)

In [15]:

```
# YOUR CODE HERE
C = titanic.loc[(titanic['sex']=='female') & (titanic['pclass']==3)]
S = titanic.loc[(titanic['survived']==1) & (titanic['sex']=='female') & (titanic
['pclass']==3)]
print("Confidence: P(survived = 1 | sex=female, pclass=3) = %.2f"%(len(S)/len(C)
*100))
print("Support: P(survived = 1, sex=female, pclass=3) = %.2f"%(len(S)/len(titani
c)*100))
```

```
Confidence: P(survived = 1 | sex=female, pclass=3) = 49.07
Support: P(survived = 1, sex=female, pclass=3) = 8.10
```


```
Confidence: P(survived = 1 | sex=female, pclass=3) = 49.07
Support: P(survived = 1, sex=female, pclass=3) = 8.10
```


6.4 P(survived = 1 | sex=male, pclass=1), P(survived = 1, sex=male, pclass=1)

In [16]:

```
# YOUR CODE HERE
C = titanic.loc[(titanic['sex']=='male') & (titanic['pclass']==1)]
S = titanic.loc[(titanic['survived']==1) & (titanic['sex']=='male') & (titanic[
'pclass']==1)]
print("Confidence: P(survived = 1 | sex=male, pclass=1) = %.2f"%(len(S)/len(C)*1
00))
print("Support: P(survived = 1, sex=male, pclass=1) = %.2f"%(len(S)/len(titanic)
*100))
```

```
Confidence: P(survived = 1 | sex=male, pclass=1) = 34.08
Support: P(survived = 1, sex=male, pclass=1) = 4.66
```


Confidence: P(survived = 1 | sex=male, pclass=1) = 34.08
Support: P(survived = 1, sex=male, pclass=1) = 4.66

6.5 P(survived = 1 | sex=male, pclass=2), P(survived = 1, sex=male, pclass=2)

In [17]:

```
# YOUR CODE HERE
C = titanic.loc[(titanic['sex']=='male') & (titanic['pclass']==2)]
S = titanic.loc[(titanic['survived']==1) & (titanic['sex']=='male') & (titanic[
'pclass']==2)]
print("Confidence: P(survived = 1 | sex=male, pclass=2) = %.2f"%(len(S)/len(C)*1
00))
print("Support: P(survived = 1, sex=male, pclass=2) = %.2f"%(len(S)/len(titanic)
*100))
```

```
Confidence: P(survived = 1 | sex=male, pclass=2) = 14.62
Support: P(survived = 1, sex=male, pclass=2) = 1.91
```


Confidence: P(survived = 1 | sex=male, pclass=2) = 14.62
Support: P(survived = 1, sex=male, pclass=2) = 1.91

6.6 P(survived = 1 | sex=male, pclass=3), P(survived = 1, sex=male, pclass=3)

In [18]:

```
# YOUR CODE HERE
C = titanic.loc[(titanic['sex']=='male') & (titanic['pclass']==3)]
S = titanic.loc[(titanic['survived']==1) & (titanic['sex']=='male') & (titanic[
'pclass']==3)]
print("Confidence: P(survived = 1 | sex=male, pclass=3) = %.2f"%(len(S)/len(C)*1
00))
print("Support: P(survived = 1, sex=male, pclass=3) = %.2f"%(len(S)/len(titanic)
*100))
```

```
Confidence: P(survived = 1 | sex=male, pclass=3) = 15.21
Support: P(survived = 1, sex=male, pclass=3) = 5.73
```

Confidence: P(survived = 1 | sex=male, pclass=3) = 15.21
Support: P(survived = 1, sex=male, pclass=3) = 5.73

6.7 P(survived = 1 | age <= 10, pclass=1), P(survived = 1, age <= 10, pclass=1)

In [19]:

```
# YOUR CODE HERE
C = titanic.loc[(titanic['age']<=10) & (titanic['pclass']==1)]
S = titanic.loc[(titanic['survived']==1) & (titanic['age']<=10) & (titanic['pcla
ss']==1)]
print("Support: P(survived = 1 | age <= 10, pclass=1) = %.2f"%(len(S)/len(C)*100
))
print("Support: P(survived = 1, age <= 10, pclass=1) = %.2f"%(len(S)/len(titanic
)*100))
```

```
Support: P(survived = 1 | age <= 10, pclass=1) = 75.00
Support: P(survived = 1, age <= 10, pclass=1) = 0.23
```

Confidence: P(survived = 1 | age <= 10, pclass=1) = 75.00
Support: P(survived = 1, age <= 10, pclass=1) = 0.23

6.8 P(survived = 1 | age <= 10, pclass=2), P(survived = 1, age <= 10, pclass=2)

In [20]:

```
# YOUR CODE HERE
C = titanic.loc[(titanic['age']<=10) & (titanic['pclass']==2)]
S = titanic.loc[(titanic['survived']==1) & (titanic['age']<=10) & (titanic['pcla
ss']==2)]
print("Support: P(survived = 1 | age <= 10, pclass=2) = %.2f"%(len(S)/len(C)*100
))
print("Support: P(survived = 1, age <= 10, pclass=2) = %.2f"%(len(S)/len(titanic
)*100))
```

```
Support: P(survived = 1 | age <= 10, pclass=2) = 100.00
Support: P(survived = 1, age <= 10, pclass=2) = 1.68
```

Confidence: P(survived = 1 | age <= 10, pclass=2) = 100.00
Support: P(survived = 1, age <= 10, pclass=2) = 1.68

6.9 P(survived = 1 | age <= 10, pclass=3), P(survived = 1, age <= 10, pclass=3)

In [21]:

```
# YOUR CODE HERE
C = titanic.loc[(titanic['age']<=10) & (titanic['pclass']==3)]
S = titanic.loc[(titanic['survived']==1) & (titanic['age']<=10) & (titanic['pcla
ss']==3)]
print("Support: P(survived = 1 | age <= 10, pclass=3) = %.2f"%(len(S)/len(C)*100
))
print("Support: P(survived = 1, age <= 10, pclass=3) = %.2f"%(len(S)/len(titanic
)*100))
```

```
Support: P(survived = 1 | age <= 10, pclass=3) = 41.67
Support: P(survived = 1, age <= 10, pclass=3) = 1.91
```

Confidence: P(survived = 1 | age <= 10, pclass=3) = 41.67
Support: P(survived = 1, age <= 10, pclass=3) = 1.91

6.10 Discussion

- Discuss what you learned from this analysis
- WRITE HERE (To edit, double click this cell)

좌석의 등급이 높을수록, 남자보다 여자가, 어린 아이보다 성인이 살 확률이 더 높다는것을 알게 되었습니다

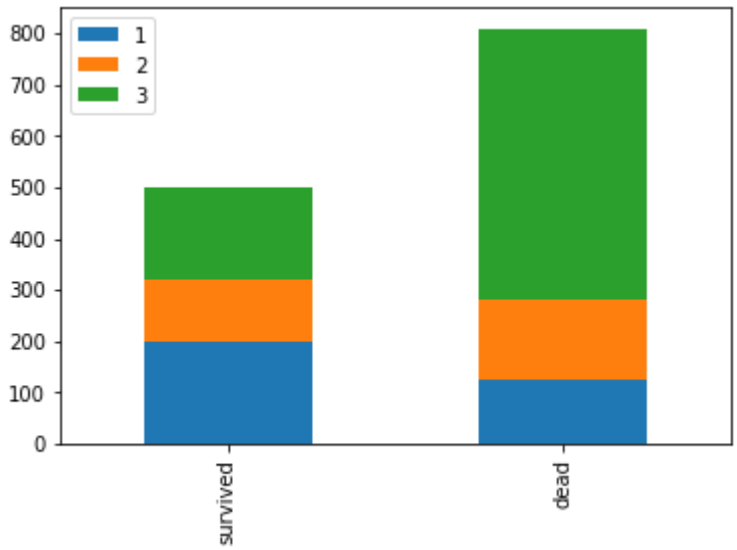
Problem 7. (10 pts)

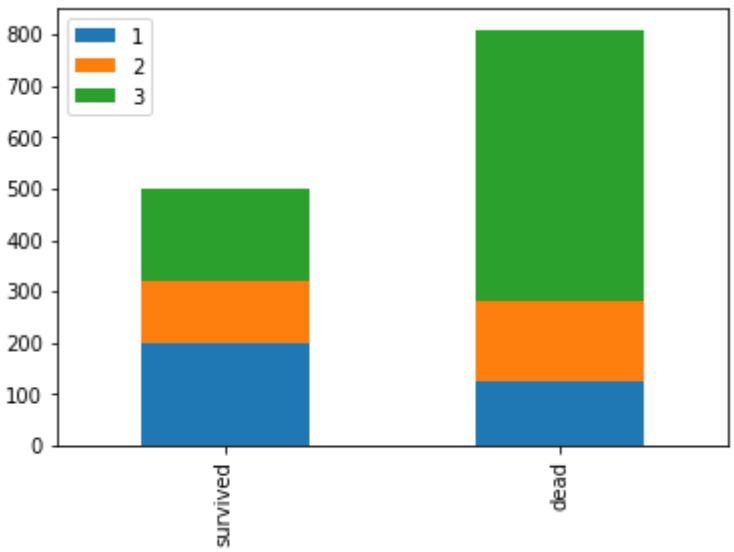
7.1 Plot numbers of survived and numbers of dead by passenger classes

In [22]:

```
# YOUR CODE HERE
def plot_survive():
    bars = np.add(pclass1, pclass2).tolist()
    plt.bar(np.arange(len(pclass1)),pclass1,width=0.5,label=1)
    plt.bar(np.arange(len(pclass2)),pclass2,bottom=pclass1,width=0.5,label=2)
    plt.bar(np.arange(len(pclass3)),pclass3,bottom=bars,width=0.5,label=3)
    plt.xticks([i for i, _ in enumerate(labels)], labels,rotation=90)
    plt.legend(fontsize=10)
    plt.xlim(-0.5,1.5)
    plt.show()

pclass1 = (len(titanic.loc[(titanic['survived']==1) & (titanic['pclass']==1)]),
           len(titanic.loc[(titanic['survived']==0) & (titanic['pclass']==1)]))
pclass2 = (len(titanic.loc[(titanic['survived']==1) & (titanic['pclass']==2)]),
           len(titanic.loc[(titanic['survived']==0) & (titanic['pclass']==2)]))
pclass3 = (len(titanic.loc[(titanic['survived']==1) & (titanic['pclass']==3)]),
           len(titanic.loc[(titanic['survived']==0) & (titanic['pclass']==3)]))
labels = ('survived','dead')
plot_survive()
```





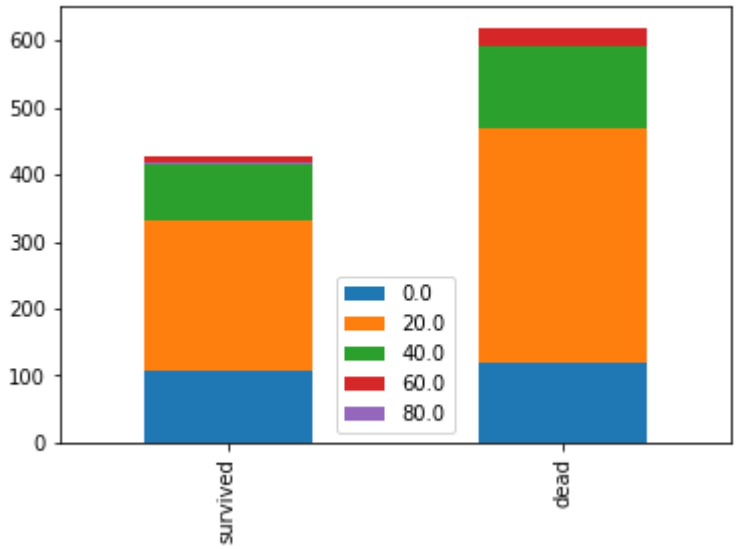
7.2 Plot numbers of survived and numbers of dead by passenger age intervals

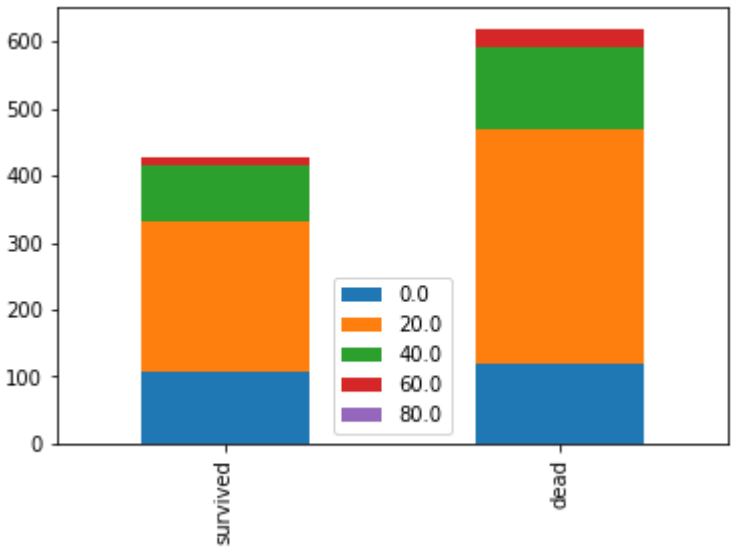
- 0: $0 \leq \text{age} < 20$
- 20: $20 \leq \text{age} < 40$
- 40: $40 \leq \text{age} < 60$
- 60: $60 \leq \text{age} < 80$
- 80: $80 \leq \text{age}$

In [23]:

```
# YOUR CODE HERE
def plot_survive():
    bars = np.add(a0, a20).tolist()
    bars2 = np.add(bars, a40).tolist()
    bars3 = np.add(bars2, a80).tolist()
    plt.bar(np.arange(len(a0)),a0,width=0.5,label=0.0)
    plt.bar(np.arange(len(a20)),a20,bottom=a0,width=0.5,label=20.0)
    plt.bar(np.arange(len(a40)),a40,bottom=bars,width=0.5,label=40.0)
    plt.bar(np.arange(len(a60)),a60,bottom=bars2,width=0.5,label=60.0)
    plt.bar(np.arange(len(a80)),a80,bottom=bars3,width=0.5,label=80.0)
    plt.xticks([i for i, _ in enumerate(labels)], labels,rotation=90)
    plt.legend(fontsize=10,loc='lower center')
    plt.xlim(-0.5,1.5)
    plt.show()

a0 = (len(titanic.loc[(titanic['survived']==1) & (titanic['age']>=0) & (titanic[
'age']<20)]),
      len(titanic.loc[(titanic['survived']==0) & (titanic['age']>=0) & (titanic[
'age']<20)]))
a20 = (len(titanic.loc[(titanic['survived']==1) & (titanic['age']>=20) & (titani
c['age']<40)]),
       len(titanic.loc[(titanic['survived']==0) & (titanic['age']>=20) & (titani
c['age']<40)]))
a40 = (len(titanic.loc[(titanic['survived']==1) & (titanic['age']>=40) & (titani
c['age']<60)]),
       len(titanic.loc[(titanic['survived']==0) & (titanic['age']>=40) & (titani
c['age']<60)]))
a60 = (len(titanic.loc[(titanic['survived']==1) & (titanic['age']>=60) & (titani
c['age']<80)]),
       len(titanic.loc[(titanic['survived']==0) & (titanic['age']>=60) & (titani
c['age']<80)]))
a80 = (len(titanic.loc[(titanic['survived']==1) & (titanic['age']>=80)]),
       len(titanic.loc[(titanic['survived']==0) & (titanic['age']>=80)]))
labels = ('survived','dead')
plot_survive()
```



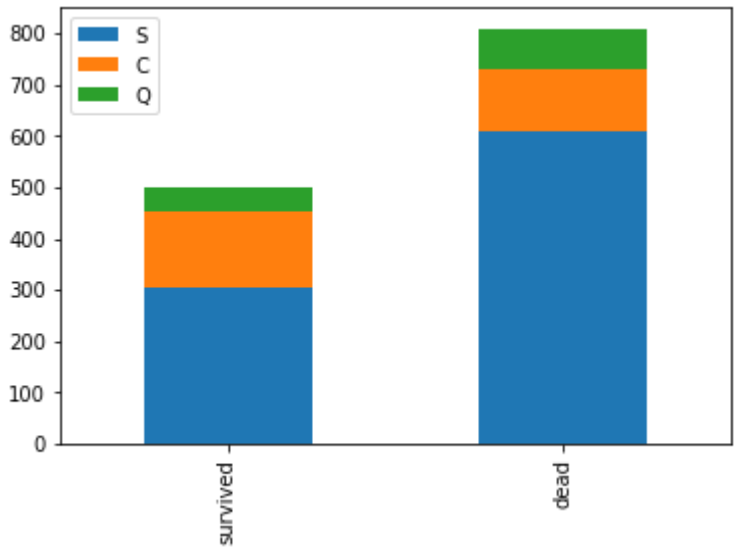


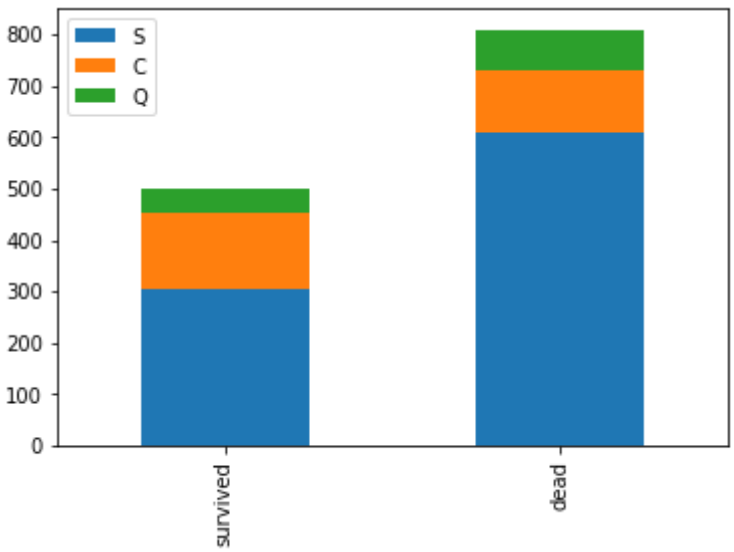
7.3 Plot numbers of survived and numbers of dead by the ports passenger embarked at

In [24]:

```
# YOUR CODE HERE
def plot_survive():
    bars = np.add(S, C).tolist()
    plt.bar(np.arange(len(S)),S,width=0.5,label='S')
    plt.bar(np.arange(len(C)),C,bottom=S,width=0.5,label='C')
    plt.bar(np.arange(len(Q)),Q,bottom=bars,width=0.5,label='Q')
    plt.xticks([i for i, _ in enumerate(labels)], labels,rotation=90)
    plt.legend(fontsize=10)
    plt.xlim(-0.5,1.5)
    plt.show()

S = (len(titanic.loc[(titanic['survived']==1) & (titanic['embarked']=='S')]),
     len(titanic.loc[(titanic['survived']==0) & (titanic['embarked']=='S')]))
C = (len(titanic.loc[(titanic['survived']==1) & (titanic['embarked']=='C')]),
     len(titanic.loc[(titanic['survived']==0) & (titanic['embarked']=='C')]))
Q = (len(titanic.loc[(titanic['survived']==1) & (titanic['embarked']=='Q')]),
     len(titanic.loc[(titanic['survived']==0) & (titanic['embarked']=='Q')]))
labels = ('survived','dead')
plot_survive()
```





7.4 Discussion

- Discuss what you learned from this analysis
- WRITE HERE (To edit, double click this cell)

3등석에 탑승한 승객의 사망률이 가장높음
20대의 사람들이 구조, 사망한것으로 보아 20대 승객이 많았던것으로 추정
Southampton에서 승선한 사람 중 구조자와 사망자가 많은것으로 보아 Southampton에서 가장 많은 사람들을 승선한것으로 추정

Ethics:

If you cheat, you will get negatgive of the total points. If the homework total is 22 and you cheat, you get -22.

What to submit

- Run all cells
- Goto "File -> Print Preview"
- Print the page
- Submit in class
- No late homeworks accepted
- Your homework will be graded on the basis of correctness and programming skills

Deadline: 5/2