In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt;
import seaborn as sns
%matplotlib inline
```

In [2]:
```
train = pd.read_csv('../input/train.csv')
```

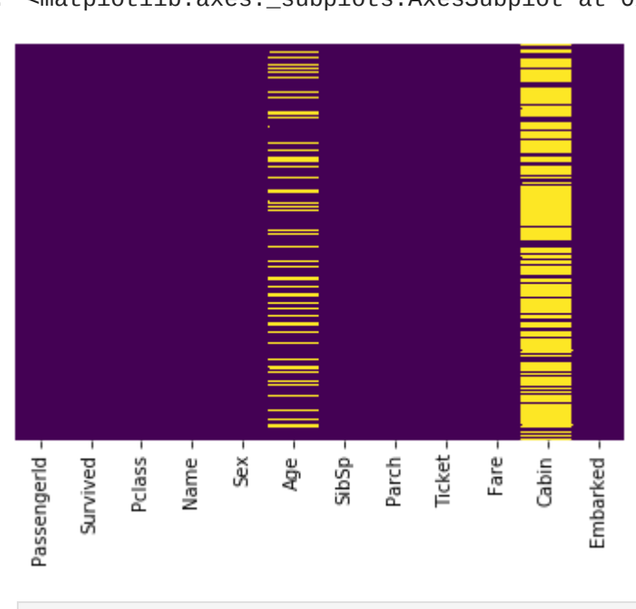
In [3]:
```
train.tail()
```

Out[3]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.00	NaN	S
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.00	B42	S
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.45	NaN	S
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.00	C148	C
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.75	NaN	Q

In [4]:
```
sns.heatmap(train.isnull(),yticklabels=False,cbar=False,cmap='viridis')
```

Out[4]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd795f337b8>
```

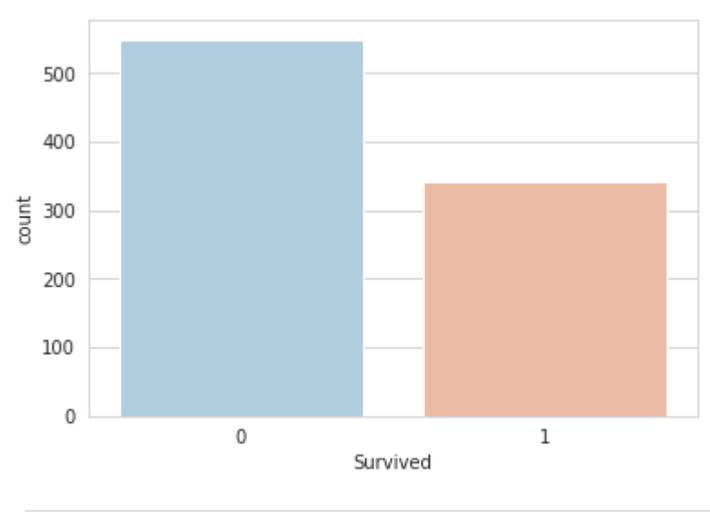


In [5]:
```
train.isnull().sum().sort_values(ascending=False)
```

Out[5]:
```
Cabin          687
Age            177
Embarked         2
Fare             0
Ticket           0
Parch            0
SibSp            0
Sex              0
Name             0
Pclass           0
Survived         0
PassengerId      0
dtype: int64
```

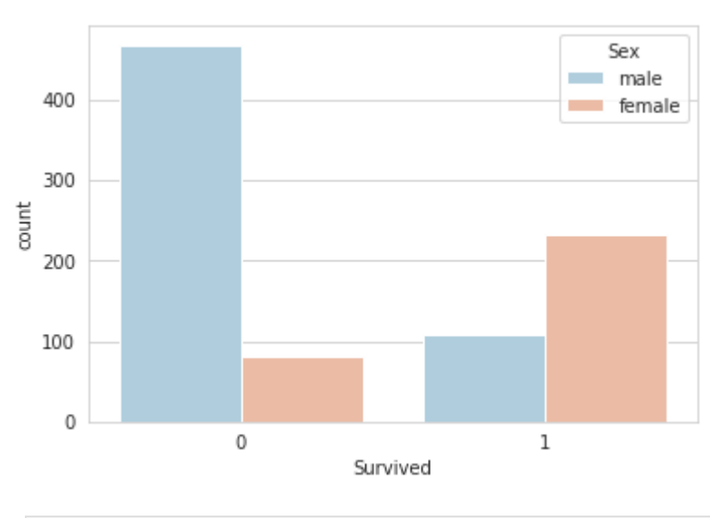
In [6]:
```
sns.set_style('whitegrid')
sns.countplot(x='Survived',data=train,palette='RdBu_r')
```

Out[6]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd793dd8860>
```



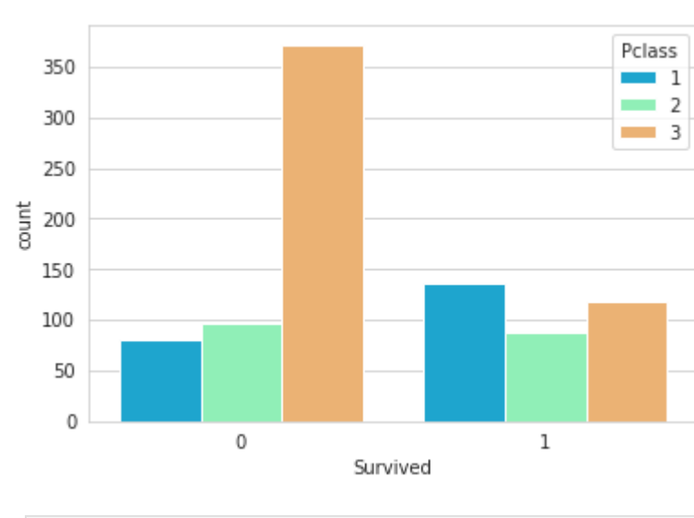
In [7]:
```
sns.set_style('whitegrid')
sns.countplot(x='Survived',hue='Sex',data=train,palette='RdBu_r')
```

Out[7]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd793dc4b38>
```



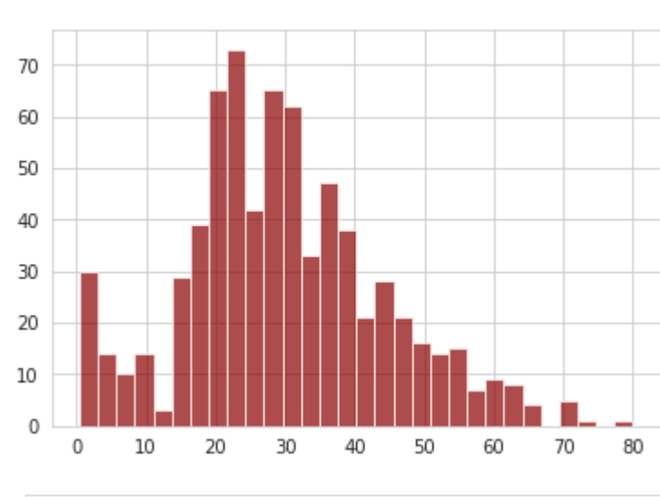
In [8]:
```
sns.set_style('whitegrid')
sns.countplot(x='Survived',hue='Pclass',data=train,palette='rainbow')
```

Out[8]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd793d234a8>
```



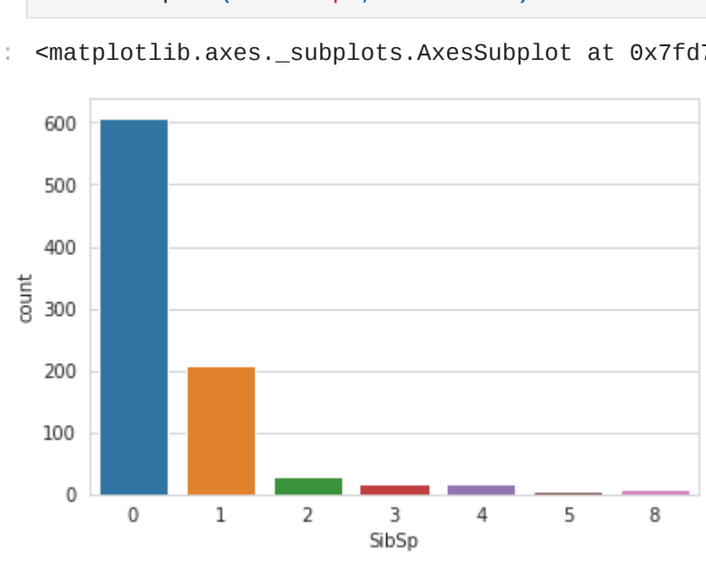
In [9]:
```
train['Age'].hist(bins=30,color='darkred',alpha=0.7)
```

Out[9]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd793c8b128>
```



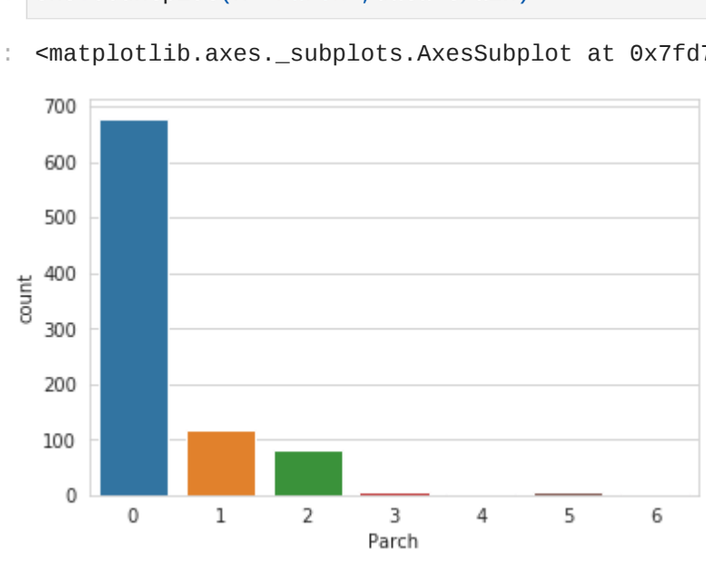
In [10]:
```
sns.countplot(x='SibSp',data=train)
```

Out[10]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd793cee3c8>
```



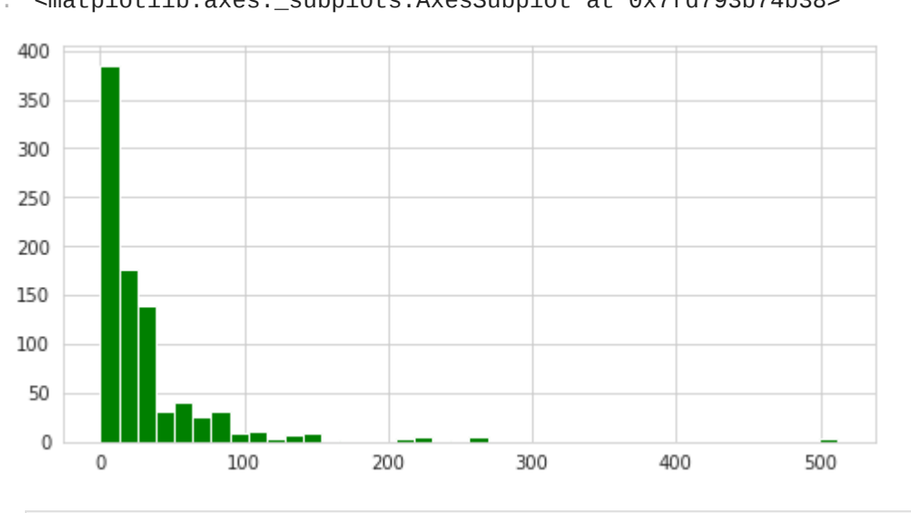
In [11]:
```
sns.countplot(x='Parch',data=train)
```

Out[11]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd793b95668>
```



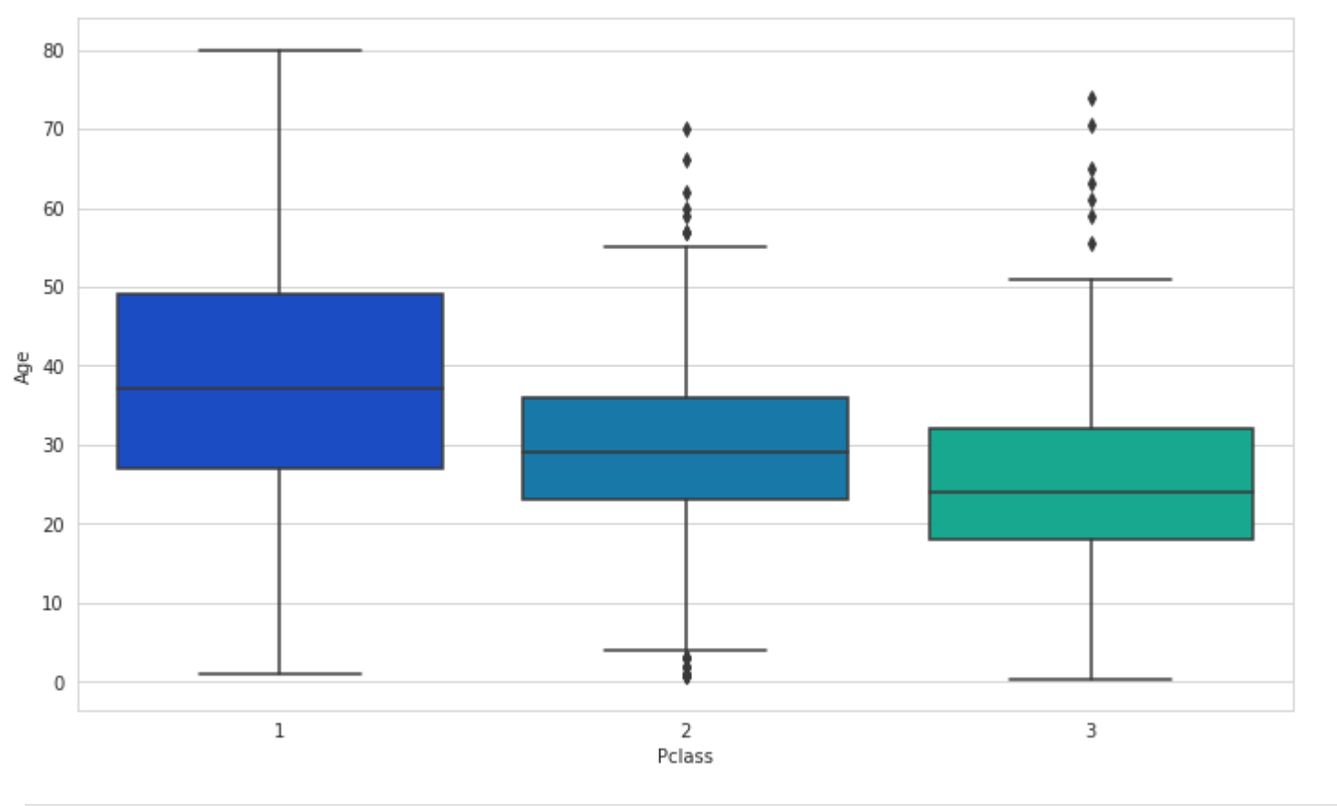
In [12]:
```
train['Fare'].hist(color='green',bins=40,figsize=(8,4))
```

Out[12]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd793b74b38>
```



In [13]:
```
plt.figure(figsize=(12, 7))
sns.boxplot(x='Pclass',y='Age',data=train,palette='winter')
```

Out[13]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd793b67fd0>
```



In [14]:
```
def impute_age(cols):
    Age = cols[0]
    Pclass = cols[1]
    
    if pd.isnull(Age):

        if Pclass == 1:
            return 37

        elif Pclass == 2:
            return 29

        else:
            return 24

    else:
        return Age
```

Now apply that function!

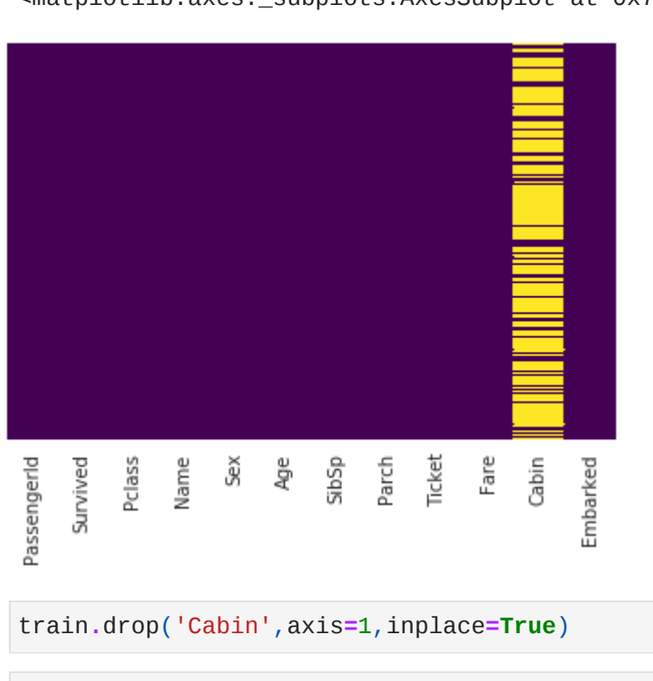
In [15]:
```
train['Age'] = train[['Age','Pclass']].apply(impute_age,axis=1)
```

In [16]:
```
train['Embarked'] = train['Embarked'].fillna('S')
```

Now let's check that heat map again!

In [17]:
```
sns.heatmap(train.isnull(),yticklabels=False,cbar=False,cmap='viridis')
```

Out[17]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd793a13f28>
```



In [18]:
```
train.drop('Cabin',axis=1,inplace=True)
```

In [19]:
```
train.head()
```

Out[19]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	S

In [20]:
```
train.dropna(inplace=True)
```

In [21]:
```
train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 891 entries, 0 to 890
Data columns (total 11 columns):
PassengerId    891 non-null int64
Survived       891 non-null int64
Pclass         891 non-null int64
Name           891 non-null object
Sex            891 non-null object
Age            891 non-null float64
SibSp          891 non-null int64
Parch          891 non-null int64
Ticket         891 non-null object
Fare           891 non-null float64
Embarked       891 non-null object
dtypes: float64(2), int64(5), object(4)
memory usage: 83.5+ KB
```

In [22]:
```
sex = pd.get_dummies(train['Sex'],drop_first=True)
embark = pd.get_dummies(train['Embarked'],drop_first=True)
```

In [23]:
```
train.drop(['Sex','Embarked','Name','Ticket'],axis=1,inplace=True)
```

In [24]:
```
train = pd.concat([train,sex,embark],axis=1)
```

In [25]:
```
train.head()
```

Out[25]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare	male	Q	S
0	1	0	3	22.0	1	0	7.2500	1	0	1
1	2	1	1	38.0	1	0	71.2833	0	0	0
2	3	1	3	26.0	0	0	7.9250	0	0	1
3	4	1	1	35.0	1	0	53.1000	0	0	1
4	5	0	3	35.0	0	0	8.0500	1	0	1

In [26]:
```
from sklearn.model_selection import train_test_split
```

In [27]:
```
X_train, X_test, y_train, y_test = train_test_split(train.drop(['Survived'],axis=1),
                                                    train['Survived'], test_size=0.10,
                                                    random_state=101)
```

In [28]:
```
from sklearn.linear_model import LogisticRegression
```

In [29]:
```
logmodel = LogisticRegression()
logmodel.fit(X_train,y_train)
```

```
/opt/conda/lib/python3.6/site-packages/sklearn/linear_model/logistic.py:432: FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a solver to silence this warning.
  FutureWarning)
```

Out[29]:
```
LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
                   intercept_scaling=1, l1_ratio=None, max_iter=100,
                   multi_class='warn', n_jobs=None, penalty='l2',
                   random_state=None, solver='warn', tol=0.0001, verbose=0,
                   warm_start=False)
```

In [30]:
```
predictions = logmodel.predict(X_test)
X_test.head()
```

Out[30]:

	PassengerId	Pclass	Age	SibSp	Parch	Fare	male	Q	S
331	332	1	45.5	0	0	28.500	1	0	1
700	701	1	18.0	1	0	227.525	0	0	0
748	749	1	19.0	1	0	53.100	1	0	1
751	752	3	6.0	0	1	12.475	1	0	1
481	482	2	29.0	0	0	0.000	1	0	1

In [31]:
```
predictions
```

Out[31]:
```
array([0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0,
       1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 1, 0,
       0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0,
       1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0,
       0, 1])
```

In [32]:
```
from sklearn.metrics import classification_report,confusion_matrix
```

In [33]:
```
print(confusion_matrix(y_test,predictions))
```

```
[[46  5]
 [13 26]]
```

In [34]:
```
print(classification_report(y_test,predictions))
```

```
              precision    recall  f1-score   support

           0       0.78      0.90      0.84        51
           1       0.84      0.67      0.74        39

    accuracy                           0.80        90
   macro avg       0.81      0.78      0.79        90
weighted avg       0.81      0.80      0.80        90
```

In [35]:
```
from sklearn.tree import DecisionTreeClassifier
```

In [36]:
```
dt_model=DecisionTreeClassifier()
dt_model.fit(X_train,y_train)
```

Out[36]:
```
DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=None,
                       max_features=None, max_leaf_nodes=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=1, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, presort=False,
                       random_state=None, splitter='best')
```

In [37]:
```
dt_pred = dt_model.predict(X_test)
```

In [38]:
```
print(confusion_matrix(y_test,dt_pred))
```

```
[[42  9]
 [14 25]]
```

In [39]:
```
print(classification_report(y_test,dt_pred))
```

```
              precision    recall  f1-score   support

           0       0.75      0.82      0.79        51
           1       0.74      0.64      0.68        39

    accuracy                           0.74        90
   macro avg       0.74      0.73      0.73        90
weighted avg       0.74      0.74      0.74        90
```

In [40]:
```
from sklearn.ensemble import RandomForestClassifier
```

In [41]:
```
rf= RandomForestClassifier(n_estimators=500)
rf.fit(X_train,y_train)
```

Out[41]:
```
RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini',
                       max_depth=None, max_features='auto', max_leaf_nodes=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=1, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, n_estimators=500,
                       n_jobs=None, oob_score=False, random_state=None,
                       verbose=0, warm_start=False)
```

In [42]:
```
rf_pre=rf.predict(X_test)
```

In [43]:
```
print(confusion_matrix(y_test,rf_pre))
```

```
[[48  3]
 [15 24]]
```

In [44]:
```
print(classification_report(y_test,rf_pre))
```

```
              precision    recall  f1-score   support

           0       0.76      0.94      0.84        51
           1       0.89      0.62      0.73        39

    accuracy                           0.80        90
   macro avg       0.83      0.78      0.78        90
weighted avg       0.82      0.80      0.79        90
```

In [45]:
```
from xgboost import XGBClassifier
xgboost = XGBClassifier(n_estimators=1000)
xgboost.fit(X_train,y_train)
```

Out[45]:
```
XGBClassifier(base_score=0.5, booster='gbtree', colsample_bylevel=1,
              colsample_bynode=1, colsample_bytree=1, gamma=0,
              learning_rate=0.1, max_delta_step=0, max_depth=3,
              min_child_weight=1, missing=None, n_estimators=1000, n_jobs=1,
              nthread=None, objective='binary:logistic', random_state=0,
              reg_alpha=0, reg_lambda=1, scale_pos_weight=1, seed=None,
              silent=None, subsample=1, verbosity=1)
```

In [46]:
```
xg_pred = xgboost.predict(X_test)
```

In [47]:
```
print(confusion_matrix(y_test,xg_pred))
```

```
[[44  7]
 [16 23]]
```

In [48]:
```
print(classification_report(y_test,xg_pred))
```

```
              precision    recall  f1-score   support

           0       0.73      0.86      0.79        51
           1       0.77      0.59      0.67        39

    accuracy                           0.74        90
   macro avg       0.75      0.73      0.73        90
weighted avg       0.75      0.74      0.74        90
```

In [49]:
```
import keras
from keras.layers import Dense
from keras.models import Sequential
```

```
Using TensorFlow backend.
```

In [50]:
```
ann  = Sequential()
ann.add(Dense(units= 32,init= 'uniform', activation = 'relu', input_dim=9))
ann.add(Dense(units= 32,init= 'uniform', activation = 'relu'))
ann.add(Dense(units= 1,init= 'uniform', activation = 'sigmoid'))
ann.compile(optimizer='adam',
            loss='mean_squared_error',
            metrics=['accuracy'])
```

```
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:2: UserWarning: Update your `Dense` call to the Keras 2 API: `Dense(units=32, activation="relu", input_dim=9, kernel_initializer="uniform")`

/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:3: UserWarning: Update your `Dense` call to the Keras 2 API: `Dense(units=32, activation="relu", kernel_initializer="uniform")`
  This is separate from the ipykernel package so we can avoid doing imports until
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:4: UserWarning: Update your `Dense` call to the Keras 2 API: `Dense(units=1, activation="sigmoid", kernel_initializer="uniform")`
  after removing the cwd from sys.path.
```

In [51]:
```
ann.fit(X_train,y_train, batch_size=32, nb_epoch=300,verbose= 0)
```

```
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:1: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epochs`.
  """Entry point for launching an IPython kernel.
```

Out[51]:
```
<keras.callbacks.callbacks.History at 0x7fd782815e10>
```

In [52]:
```
ann_pred = ann.predict(X_test)
ann_pred = [ 1 if y>=0.5 else 0 for y in ann_pred]
print(ann_pred)
```

```
[0, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0,
0, 1, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0]
```

In [53]:
```
print(confusion_matrix(y_test,ann_pred))
```

```
[[46  5]
 [13 26]]
```

In [54]:
```
print(classification_report(y_test,ann_pred))
```

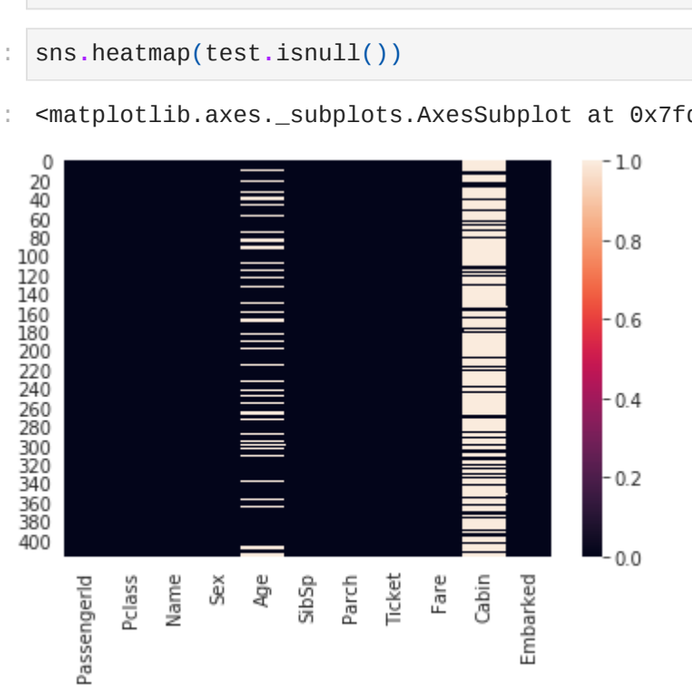
```
              precision    recall  f1-score   support

           0       0.78      0.90      0.84        51
           1       0.84      0.67      0.74        39

    accuracy                           0.80        90
   macro avg       0.81      0.78      0.79        90
weighted avg       0.81      0.80      0.80        90
```

Now we will use test dataset

In [55]:
```
test = pd.read_csv('../input/test.csv')
```

In [56]:
```
sns.heatmap(test.isnull())
```

Out[56]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd7543a8c18>
```



In [57]:
```
test.drop('Cabin',axis=1,inplace=True)
```

In [58]:
```
test['Fare'].fillna(test['Fare'].median(), inplace=True)
```

In [59]:
```
test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 10 columns):
PassengerId    418 non-null int64
Pclass         418 non-null int64
Name           418 non-null object
Sex            418 non-null object
Age            332 non-null float64
SibSp          418 non-null int64
Parch          418 non-null int64
Ticket         418 non-null object
Fare           418 non-null float64
Embarked       418 non-null object
dtypes: float64(2), int64(4), object(4)
memory usage: 32.8+ KB
```

In [60]:
```
test.head()
```

Out[60]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
0	892	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	Q
1	893	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	S
2	894	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	Q
3	895	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	S
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	S

In [61]:
```
test['Age'] = test[['Age','Pclass']].apply(impute_age,axis=1)
```

In [62]:
```
sex_test = pd.get_dummies(test['Sex'],drop_first=True)
embark_test= pd.get_dummies(test['Embarked'],drop_first=True)
```

In [63]:
```
test.drop(['Sex','Embarked','Name','Ticket'],axis=1,inplace=True)
```

In [64]:
```
test = pd.concat([test,sex_test,embark_test],axis=1)
```

In [65]:
```
test.head()
```

Out[65]:

	PassengerId	Pclass	Age	SibSp	Parch	Fare	male	Q	S
0	892	3	34.5	0	0	7.8292	1	1	0
1	893	3	47.0	1	0	7.0000	0	0	1
2	894	2	62.0	0	0	9.6875	1	1	0
3	895	3	27.0	0	0	8.6625	1	0	1
4	896	3	22.0	1	1	12.2875	0	0	1

In [66]:
```
train.head()
```

Out[66]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare	male	Q	S
0	1	0	3	22.0	1	0	7.2500	1	0	1
1	2	1	1	38.0	1	0	71.2833	0	0	0
2	3	1	3	26.0	0	0	7.9250	0	0	1
3	4	1	1	35.0	1	0	53.1000	0	0	1
4	5	0	3	35.0	0	0	8.0500	1	0	1

In [67]:
```
ann.fit(train.drop(['Survived'],axis=1),train['Survived'] , nb_epoch=300,verbose= 0)
```

```
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:1: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epochs`.
  """Entry point for launching an IPython kernel.
```

Out[67]:
```
<keras.callbacks.callbacks.History at 0x7fd74e528e10>
```

In [68]:
```
test_prediction = ann.predict(test)
test_prediction = [ 1 if y>=0.5 else 0 for y in test_prediction]
```

In [69]:
```
test_pred = pd.DataFrame(test_prediction, columns= ['Survived'])
```

In [70]:
```
new_test = pd.concat([test, test_pred], axis=1, join='inner')
```

In [71]:
```
new_test.head()
```

Out[71]:

	PassengerId	Pclass	Age	SibSp	Parch	Fare	male	Q	S	Survived
0	892	3	34.5	0	0	7.8292	1	1	0	0
1	893	3	47.0	1	0	7.0000	0	0	1	0
2	894	2	62.0	0	0	9.6875	1	1	0	0
3	895	3	27.0	0	0	8.6625	1	0	1	0
4	896	3	22.0	1	1	12.2875	0	0	1	1

In [72]:
```
df= new_test[['PassengerId' ,'Survived']]
```

In [73]:
```
df.head()
```

Out[73]:

	PassengerId	Survived
0	892	0
1	893	0
2	894	0
3	895	0
4	896	1

In [74]:
```
df.to_csv('predictions.csv' , index=False)
```