In [ ]:
```
1
2
3
```

In [2]:
```
1  # data analysis and wrangling
2  import pandas as pd
3  import numpy as np
4  import random as rnd
5
6  # visualization
7  import seaborn as sns
8  import matplotlib.pyplot as plt
9  %matplotlib inline
10
11 # machine learning
12 from sklearn.model_selection import train_test_split
13 from sklearn.linear_model import LogisticRegression
14 from sklearn.svm import SVC, LinearSVC
15 from sklearn.ensemble import RandomForestClassifier
16 from sklearn.neighbors import KNeighborsClassifier
17 from sklearn.naive_bayes import GaussianNB
18 from sklearn.linear_model import Perceptron
19 from sklearn.linear_model import SGDClassifier
20 from sklearn.tree import DecisionTreeClassifier
```

1. Data acquisition of the movielens dataset

In [3]:
```
1  #Data acquisition of the movies dataset
2  df_movie=pd.read_csv('../input/movies.dat', sep = '::', engine='python')
3  df_movie.columns =['MovieIDs','MovieName','Category']
4  df_movie.dropna(inplace=True)
5  df_movie.head()
```

Out[3]:

	MovieIDs	MovieName	Category
0	2	Jumanji (1995)	Adventure|Children's|Fantasy
1	3	Grumpier Old Men (1995)	Comedy|Romance
2	4	Waiting to Exhale (1995)	Comedy|Drama
3	5	Father of the Bride Part II (1995)	Comedy
4	6	Heat (1995)	Action|Crime|Thriller

In [4]:
```
#Data acquisition of the rating dataset
df_rating = pd.read_csv("../input/ratings.dat",sep='::', engine='python')
df_rating.columns =['ID','MovieID','Ratings','TimeStamp']
df_rating.dropna(inplace=True)
df_rating.head()
```

Out[4]:

	ID	MovieID	Ratings	TimeStamp
0	1	661	3	978302109
1	1	914	3	978301968
2	1	3408	4	978300275
3	1	2355	5	978824291
4	1	1197	3	978302268

In [5]:
```
#Data acquisition of the users dataset
df_user = pd.read_csv("../input/users.dat",sep='::',engine='python')
df_user.columns =['UserID','Gender','Age','Occupation','Zip-code']
df_user.dropna(inplace=True)
df_user.head()
```

Out[5]:

	UserID	Gender	Age	Occupation	Zip-code
0	2	M	56	16	70072
1	3	M	25	15	55117
2	4	M	45	7	02460
3	5	M	25	20	55455
4	6	F	50	9	55117

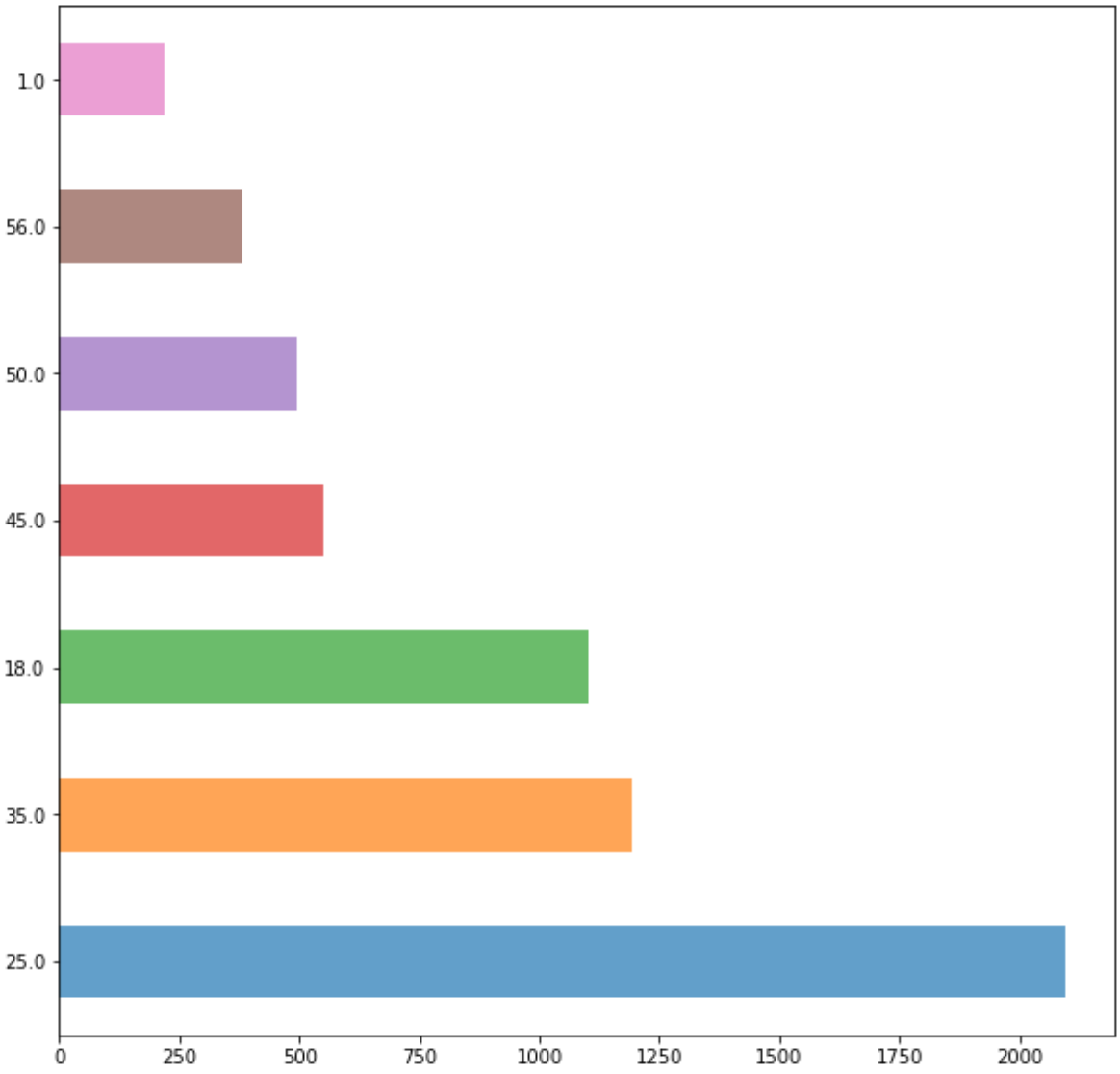
In [6]:
```
df = pd.concat([df_movie, df_rating,df_user], axis=1)
df.head()
```

Out[6]:

	MovieIDs	MovieName	Category	ID	MovieID	Ratings	TimeStamp	UserID
0	2.0	Jumanji (1995)	Adventure|Children's|Fantasy	1	661	3	978302109	2.0
1	3.0	Grumpier Old Men (1995)	Comedy|Romance	1	914	3	978301968	3.0
2	4.0	Waiting to Exhale (1995)	Comedy|Drama	1	3408	4	978300275	4.0
3	5.0	Father of the Bride Part II (1995)	Comedy	1	2355	5	978824291	5.0
4	6.0	Heat (1995)	Action|Crime|Thriller	1	1197	3	978302268	6.0

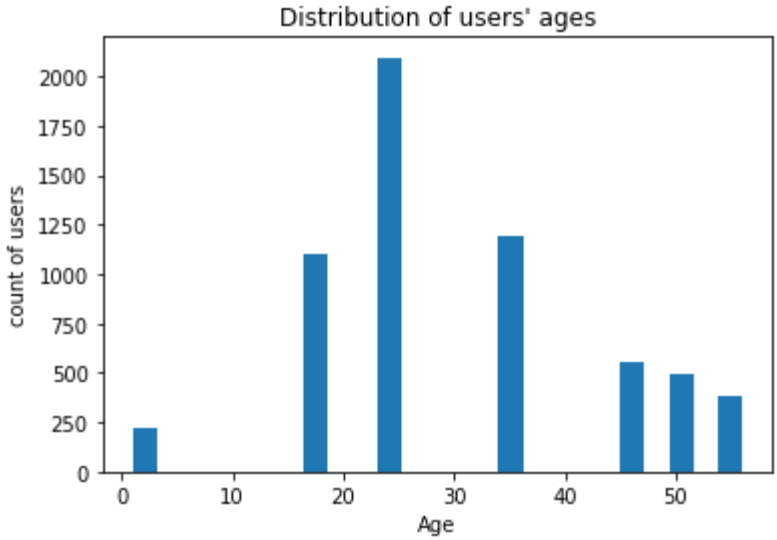
2. Perform the Exploratory Data Analysis (EDA) for the users dataset

In [7]:
```
1 #Visualize user age distribution
2 df['Age'].value_counts().plot(kind='barh',alpha=0.7,figsize=(10,10))
3 plt.show()
```



In [8]:
```
1 df.Age.plot.hist(bins=25)
2 plt.title("Distribution of users' ages")
3 plt.ylabel('count of users')
4 plt.xlabel('Age')
```

Out[8]: Text(0.5, 0, 'Age')

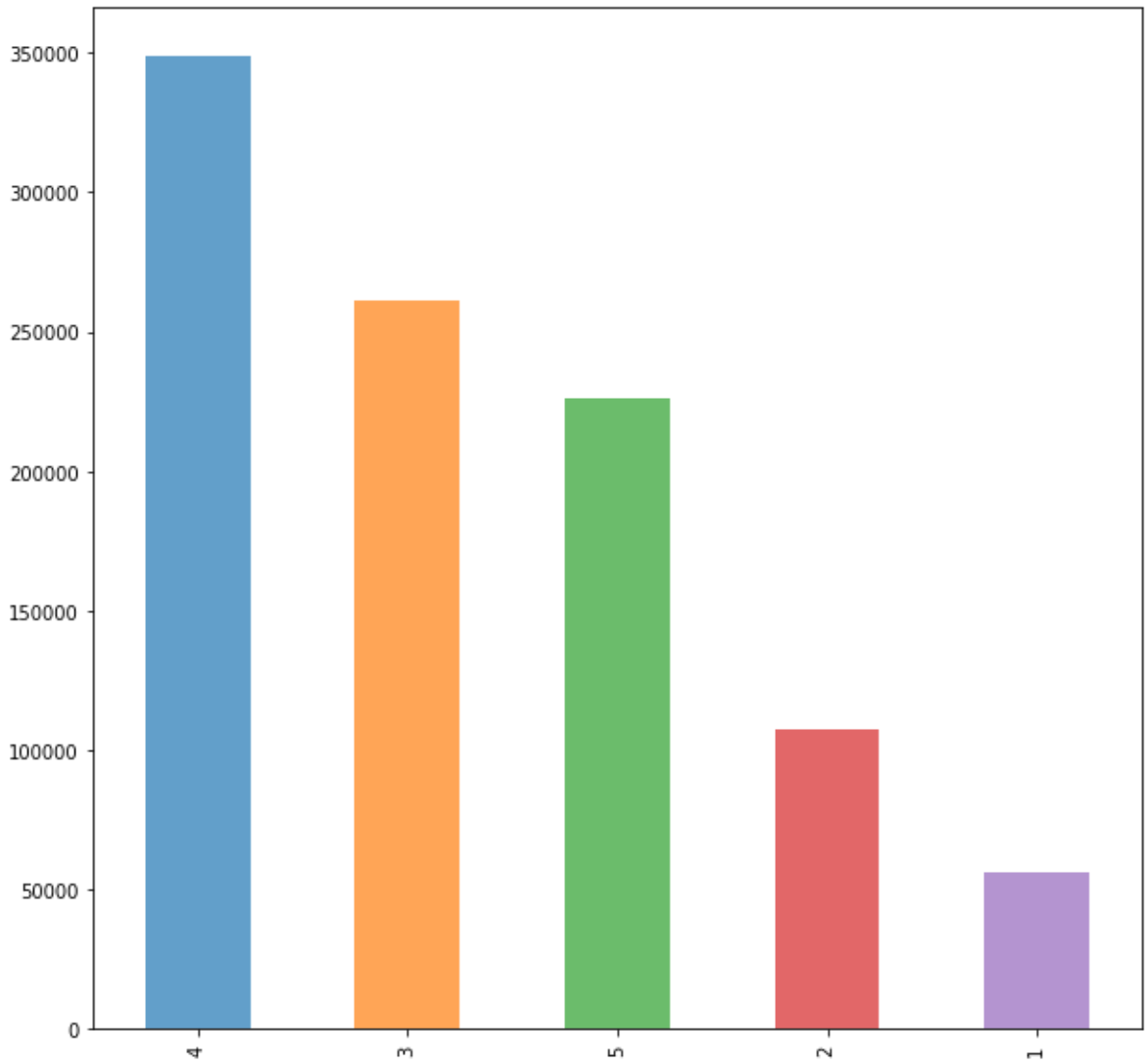


In [9]:
```
1 labels = ['0-9', '10-19', '20-29', '30-39', '40-49', '50-59', '60-69', '70
2 df['age_group'] = pd.cut(df.Age, range(0, 81, 10), right=False, labels=lab
3 df[['Age', 'age_group']].drop_duplicates()[:10]
```

Out[9]:

	Age	age_group
0	56.0	50-59
1	25.0	20-29
2	45.0	40-49
4	50.0	50-59
5	35.0	30-39
16	18.0	10-19
17	1.0	0-9
6039	NaN	NaN

In [10]:
```
#Visualize overall rating by users
df['Ratings'].value_counts().plot(kind='bar',alpha=0.7,figsize=(10,10))
plt.show()
```



In [11]:
```
groupedby_movieName = df.groupby('MovieName')
groupedby_rating = df.groupby('Ratings')
groupedby_uid = df.groupby('UserID')
#groupedby_age = df.loc[most_50.index].groupby(['MovieName', 'age_group'])
```

In [12]:
```
1 movies = df.groupby('MovieName').size().sort_values(ascending=True)[:1000]
2 print(movies)
```

```
MovieName
$1,000,000 Duck (1971)                                          1
Only Angels Have Wings (1939)                                   1
Only You (1994)                                                 1
Open Season (1996)                                              1
Open Your Eyes (Abre los ojos) (1997)                           1
Operation Condor (Feiying gaiwak) (1990)                        1
Operation Condor 2 (Longxiong hudi) (1990)                      1
Operation Dumbo Drop (1995)                                     1
Opportunists, The (1999)                                        1
Opposite of Sex, The (1998)                                     1
Ordinary People (1980)                                          1
Orgazmo (1997)                                                  1
Original Gangstas (1996)                                        1
Onegin (1999)                                                   1
Original Kings of Comedy, The (2000)                            1
Oscar and Lucinda (a.k.a. Oscar & Lucinda) (1997)                1
Otello (1986)                                                   1
Othello (1952)                                                  1
Othello (1995)                                                  1
Other Side of Sunday, The (S♦ndagsengler) (1996)                1
Other Sister, The (1999)                                        1
Other Voices, Other Rooms (1997)                                1
Our Town (1940)                                                 1
Out of Africa (1985)                                            1
Out of Sight (1998)                                             1
Out of the Past (1947)                                          1
Out to Sea (1997)                                               1
Orlando (1993)                                                  1
Out-of-Towners, The (1999)                                      1
One True Thing (1998)                                           1
                                                               ..
Retroactive (1997)                                              1
Tom and Huck (1995)                                             1
Tomb of Ligeia, The (1965)                                      1
Tombstone (1993)                                                1
Tommy (1975)                                                    1
Tommy Boy (1995)                                                1
Tomorrow Never Dies (1997)                                      1
Top Gun (1986)                                                  1
Top Hat (1935)                                                  1
Topaz (1969)                                                    1
Topsy-Turvy (1999)                                              1
Tora! Tora! Tora! (1970)                                        1
Torn Curtain (1966)                                             1
Tom Jones (1963)                                                1
Torso (Corpi Presentano Tracce di Violenza Carnale) (1973)      1
Total Recall (1990)                                             1
Touch (1997)                                                    1
Touch of Evil (1958)                                            1
Tough Guys (1986)                                               1
Tough and Deadly (1995)                                         1
Touki Bouki (Journey of the Hyena) (1973)                       1
```

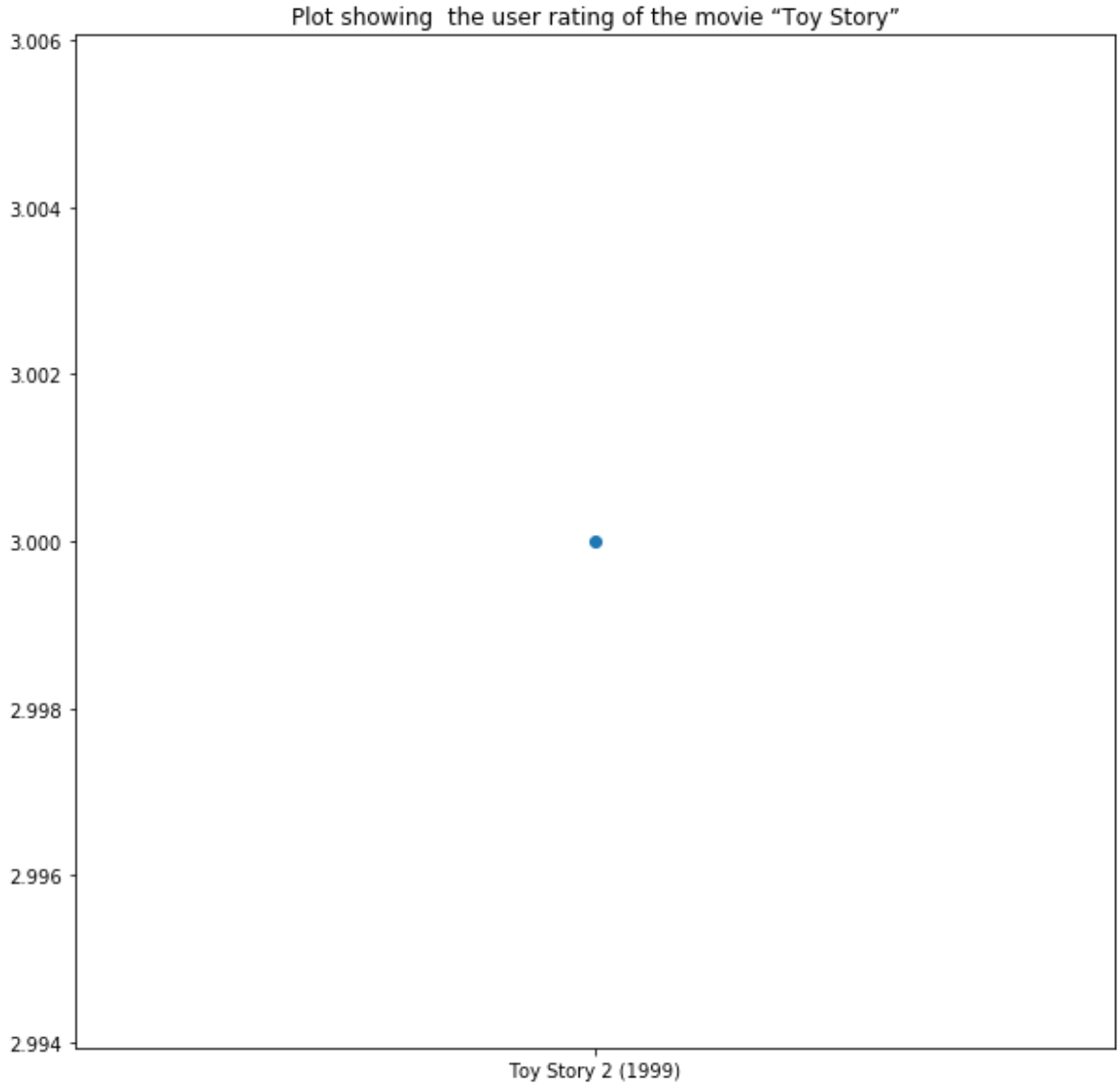
```
Towering Inferno, The (1974)                                          1
Toxic Avenger Part III: The Last Temptation of Toxie, The (1989)      1
Toxic Avenger, Part II, The (1989)                                    1
Toxic Avenger, The (1985)                                             1
Toy Story 2 (1999)                                                    1
Toys (1992)                                                           1
Total Eclipse (1995)                                                  1
Trading Places (1983)                                                 1
Tom & Viv (1994)                                                      1
Length: 1000, dtype: int64
```

In [13]:
```
1 ToyStory_data = groupedby_movieName.get_group('Toy Story 2 (1999)')
2 ToyStory_data.shape
```

Out[13]: (1, 13)

In [14]:
```
#Find and visualize the user rating of the movie “Toy Story”
plt.figure(figsize=(10,10))
plt.scatter(ToyStory_data['MovieName'],ToyStory_data['Ratings'])
plt.title('Plot showing  the user rating of the movie “Toy Story”')
plt.show()

```

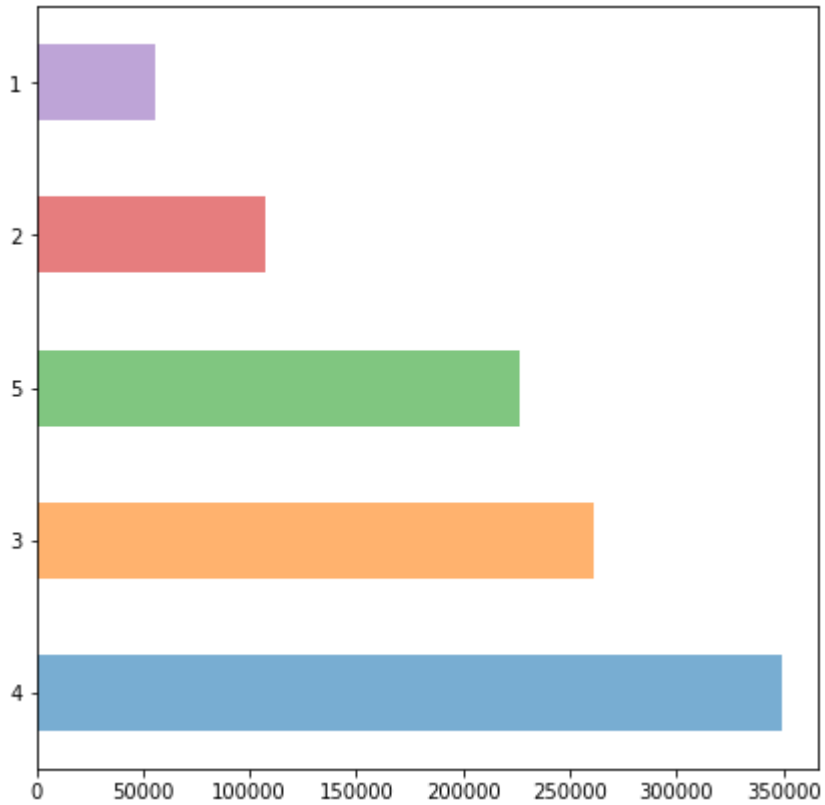


In [15]:
```
#Find and visualize the viewership of the movie “Toy Story” by age group
ToyStory_data[['MovieName','age_group']]
```

Out[15]:

	MovieName	age_group
3044	Toy Story 2 (1999)	0-9

In [16]:
```
#Find and visualize the top 25 movies by viewership rating
top_25 = df[25:]
top_25['Ratings'].value_counts().plot(kind='barh',alpha=0.6,figsize=(7,7))
plt.show()
```



In [17]:
```
#Visualize the rating data by user of user id = 2696
userid_2696 = groupedby_uid.get_group(2696)
userid_2696[['UserID','Ratings']]
```

Out[17]:

	UserID	Ratings
2694	2696.0	3

Perform machine learning on first 500 extracted records

In [18]:
```
#First 500 extracted records
first_500 = df[500:]
first_500.dropna(inplace=True)
```

```
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:3: SettingWithCo
pyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/st
able/indexing.html#indexing-view-versus-copy (http://pandas.pydata.org/pandas
-docs/stable/indexing.html#indexing-view-versus-copy)
  This is separate from the ipykernel package so we can avoid doing imports u
ntil
```

In [19]:
```
#Use the following features:movie id,age,occupation
features = first_500[['MovieID','Age','Occupation']].values
```

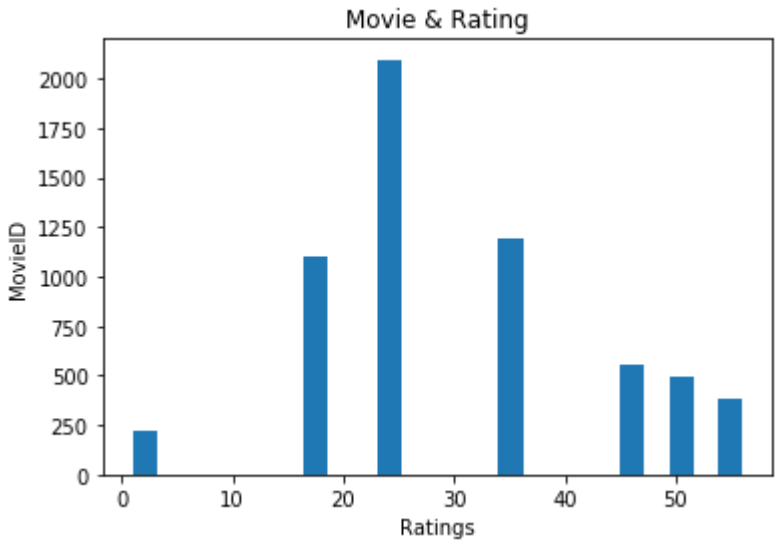
In [20]:
```
#Use rating as label
labels = first_500[['Ratings']].values
```

In [21]:
```
#Create train and test data set
train, test, train_labels, test_labels = train_test_split(features,labels,
```

*Perform the following: *

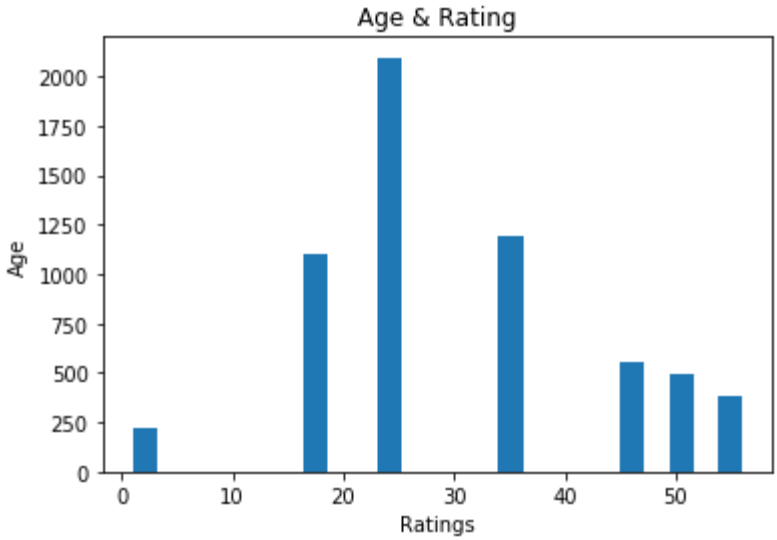
In [22]:
```
#Create a histogram for movie
df.Age.plot.hist(bins=25)
plt.title("Movie & Rating")
plt.ylabel('MovieID')
plt.xlabel('Ratings')
```

Out[22]: Text(0.5, 0, 'Ratings')



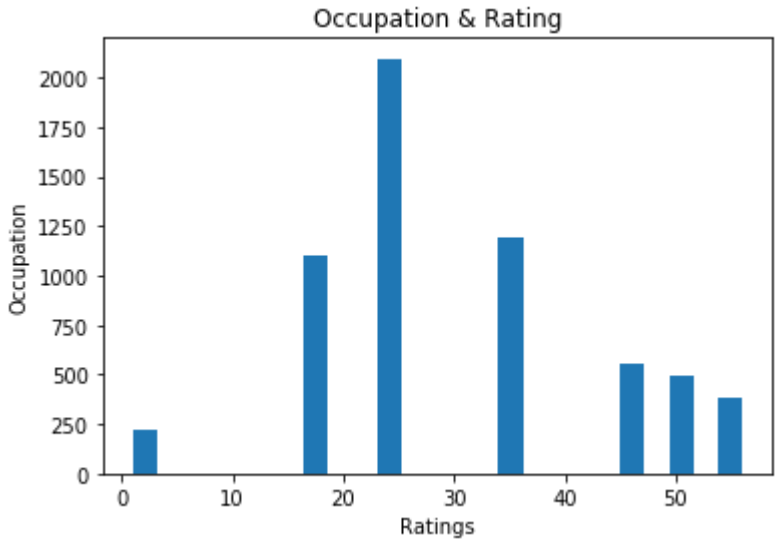
In [23]:
```
#Create a histogram for age
df.Age.plot.hist(bins=25)
plt.title("Age & Rating")
plt.ylabel('Age')
plt.xlabel('Ratings')
```

Out[23]: Text(0.5, 0, 'Ratings')



In [24]:
```
#Create a histogram for occupation
df.Age.plot.hist(bins=25)
plt.title("Occupation & Rating")
plt.ylabel('Occupation')
plt.xlabel('Ratings')
```

Out[24]: Text(0.5, 0, 'Ratings')



In [25]:
```
# Logistic Regression

logreg = LogisticRegression()
logreg.fit(train, train_labels)
Y_pred = logreg.predict(test)
acc_log = round(logreg.score(train, train_labels) * 100, 2)
acc_log
```

```
/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 s
olver to silence this warning.
  FutureWarning)
/opt/conda/lib/python3.6/site-packages/sklearn/utils/validation.py:724: DataC
onversionWarning: A column-vector y was passed when a 1d array was expected.
Please change the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
/opt/conda/lib/python3.6/site-packages/sklearn/linear_model/logistic.py:469:
FutureWarning: Default multi_class will be changed to 'auto' in 0.22. Specify
the multi_class option to silence this warning.
  "this warning.", FutureWarning)
```

Out[25]: 32.98

In [26]:
```
# Support Vector Machines

svc = SVC()
svc.fit(train, train_labels)
Y_pred = svc.predict(test)
acc_svc = round(svc.score(train, train_labels) * 100, 2)
acc_svc
```

```
/opt/conda/lib/python3.6/site-packages/sklearn/utils/validation.py:724: DataC
onversionWarning: A column-vector y was passed when a 1d array was expected.
Please change the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
/opt/conda/lib/python3.6/site-packages/sklearn/svm/base.py:193: FutureWarnin
g: The default value of gamma will change from 'auto' to 'scale' in version
0.22 to account better for unscaled features. Set gamma explicitly to 'auto'
or 'scale' to avoid this warning.
  "avoid this warning.", FutureWarning)
```

Out[26]: 96.42

In [27]:
```
# K Nearest Neighbors Classifier

knn = KNeighborsClassifier(n_neighbors = 3)
knn.fit(train, train_labels)
Y_pred = knn.predict(test)
acc_knn = round(knn.score(train, train_labels) * 100, 2)
acc_knn
```

```
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:4: DataConversio
nWarning: A column-vector y was passed when a 1d array was expected. Please c
hange the shape of y to (n_samples, ), for example using ravel().
  after removing the cwd from sys.path.
```

Out[27]: 57.57

In [28]:
```
# Gaussian Naive Bayes

gaussian = GaussianNB()
gaussian.fit(train, train_labels)
Y_pred = gaussian.predict(test)
acc_gaussian = round(gaussian.score(train, train_labels) * 100, 2)
acc_gaussian
```

```
/opt/conda/lib/python3.6/site-packages/sklearn/utils/validation.py:724: DataC
onversionWarning: A column-vector y was passed when a 1d array was expected.
Please change the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
```

Out[28]: 32.23

In [29]:
```
# Perceptron

perceptron = Perceptron()
perceptron.fit(train, train_labels)
Y_pred = perceptron.predict(test)
acc_perceptron = round(perceptron.score(train, train_labels) * 100, 2)
acc_perceptron
```

```
/opt/conda/lib/python3.6/site-packages/sklearn/utils/validation.py:724: DataC
onversionWarning: A column-vector y was passed when a 1d array was expected.
Please change the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
```

Out[29]: 28.61

In [30]:
```
# Linear SVC

linear_svc = LinearSVC()
linear_svc.fit(train, train_labels)
Y_pred = linear_svc.predict(test)
acc_linear_svc = round(linear_svc.score(train, train_labels) * 100, 2)
acc_linear_svc
```

```
/opt/conda/lib/python3.6/site-packages/sklearn/utils/validation.py:724: DataC
onversionWarning: A column-vector y was passed when a 1d array was expected.
Please change the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
/opt/conda/lib/python3.6/site-packages/sklearn/svm/base.py:929: ConvergenceWa
rning: Liblinear failed to converge, increase the number of iterations.
  "the number of iterations.", ConvergenceWarning)
```

Out[30]: 29.67

In [31]:
```
# Stochastic Gradient Descent

sgd = SGDClassifier()
sgd.fit(train, train_labels)
Y_pred = sgd.predict(test)
acc_sgd = round(sgd.score(train, train_labels) * 100, 2)
acc_sgd
```

```
/opt/conda/lib/python3.6/site-packages/sklearn/utils/validation.py:724: DataC
onversionWarning: A column-vector y was passed when a 1d array was expected.
Please change the shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
```

Out[31]: 28.7

In [32]:
```
# Decision Tree

decision_tree = DecisionTreeClassifier()
decision_tree.fit(train, train_labels)
Y_pred = decision_tree.predict(test)
acc_decision_tree = round(decision_tree.score(train, train_labels) * 100,
acc_decision_tree
```

Out[32]: 98.54

In [33]:
```
# Random Forest

random_forest = RandomForestClassifier(n_estimators=100)
random_forest.fit(train, train_labels)
Y_pred = random_forest.predict(test)
random_forest.score(train, train_labels)
acc_random_forest = round(random_forest.score(train, train_labels) * 100,
acc_random_forest
```

```
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:4: DataConversio
nWarning: A column-vector y was passed when a 1d array was expected. Please c
hange the shape of y to (n_samples,), for example using ravel().
  after removing the cwd from sys.path.
```

Out[33]: 98.5

In [34]:
```
models = pd.DataFrame({
    'Model': ['Support Vector Machines', 'KNN', 'Logistic Regression',
              'Random Forest', 'Naive Bayes', 'Perceptron',
              'Stochastic Gradient Decent', 'Linear SVC',
              'Decision Tree'],
    'Score': [acc_svc, acc_knn, acc_log,
              acc_random_forest, acc_gaussian, acc_perceptron,
              acc_sgd, acc_linear_svc, acc_decision_tree]})
models.sort_values(by='Score', ascending=False)
```

Out[34]:

	Model	Score
8	Decision Tree	98.54
3	Random Forest	98.50
0	Support Vector Machines	96.42
1	KNN	57.57
2	Logistic Regression	32.98
4	Naive Bayes	32.23
7	Linear SVC	29.67
6	Stochastic Gradient Decent	28.70
5	Perceptron	28.61

In [ ]:
```

```

In [ ]:
```

```