PREDICTING WINE VARIETY

About the dataset :

Name	Description
User name	User_name of the reviewer
Country	The country that the wine is from
Review_title	The title of the wine review, which often contains the vintage
Review_description	A verbose review of the wine
Designation	The vineyard within the winery where the grapes that made the wine are from
Points	Ratings given by the user. The ratings are between 0 -100
Price	The cost for a bottle of the wine
Province	The province or state that the wine is from
Region_1	The wine-growing area in a province or state (ie Napa)
Region_2	Sometimes there are more specific regions specified within a wine-growing area (ie Rutherford inside the Napa Valley), but this value can sometimes be blank
Winery	The winery that made the wine
Variety	The type of grapes used to make the wine.

1. Importing the necessary libraries

In [134]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

2. Importing the necessary data

In [4]:

```
train = pd.read_csv('Data/train.csv')
test  = pd.read_csv('Data/test.csv')
```

High-level details about the train

In [6]:

```
train.head()
```

Out[6]:

	user_name	country	review_title	review_description	designation	points	price	pro
0	NaN	Australia	Andrew Peace 2007 Peace Family Vineyard Chardo...	Classic Chardonnay aromas of apple, pear and h...	Peace Family Vineyard	83	10.0	Au
1	@wawinereport	US	North by Northwest 2014 Red (Columbia Valley (...	This wine is near equal parts Syrah and Merlot...	NaN	89	15.0	Washi
2	NaN	Italy	Renato Ratti 2007 Conca (Barolo)	Barolo Conca opens with inky dark concentratio...	Conca	94	80.0	Pie
3	@vossroger	France	Domaine l'Ancienne Cure 2010 L'Abbaye White (B...	It's impressive what a small addition of Sauvi...	L'Abbaye	87	22.0	Sout F
4	@vossroger	France	Château du Cèdre 2012 Le Cèdre Vintage Malbec ...	This ripe, sweet wine is rich and full of drie...	Le Cèdre Vintage	88	33.0	F

Dimensions of the train set

In [10]:

```
print("Dimensions of the train set :",train.shape)
```

```
Dimensions of the train set : (82657, 12)
```

Columns with missing values in train

In [21]:

```
missing_meta_train = pd.DataFrame(train.isnull().sum(),columns=['missing values'
])
missing_meta_train
```

Out[21]:

	missing values
user_name	19393
country	35
review_title	0
review_description	0
designation	23647
points	0
price	5569
province	35
region_1	12754
region_2	46708
winery	0
variety	0

High-level details about the test

In [18]:

```
test.head()
```

Out[18]:

	user_name	country	review_title	review_description	designation	points	price	prov
0	@paulgwine	US	Boedecker Cellars 2011 Athena Pinot Noir (Will...	Nicely differentiated from the companion Stewa...	Athena	88	35.0	Ore
1	@wineschach	Argentina	Mendoza Vineyards 2012 Gran Reserva by Richard...	Charred, smoky, herbal aromas of blackberry tr...	Gran Reserva by Richard Bonvin	90	60.0	Menc Prov
2	@vboone	US	Prime 2013 Chardonnay (Coombsville)	Slightly sour and funky in earth, this is a re...	NaN	87	38.0	Califc
3	@wineschach	Argentina	Bodega Cuarto Dominio 2012 Chento Vineyard Sel...	This concentrated, midnight-black Malbec deliv...	Chento Vineyard Selection	91	20.0	Menc Prov
4	@kerinokeefe	Italy	SassodiSole 2012 Brunello di Montalcino	Earthy aromas suggesting grilled porcini, leat...	NaN	90	49.0	Tusc

Dimensions of the test set

In [19]:

```
print("Dimensions of the test set :",test.shape)
```

```
Dimensions of the test set : (20665, 11)
```

Columns with missing values in test

In [22]:

```
missing_meta_test = pd.DataFrame(test.isnull().sum(),columns=['missing values'])
missing_meta_test
```

Out[22]:

	missing values
user_name	4738
country	4
review_title	0
review_description	0
designation	5989
points	0
price	1394
province	4
region_1	3314
region_2	11751
winery	0

3. Exploratory data analysis

3.1 Univariate analysis

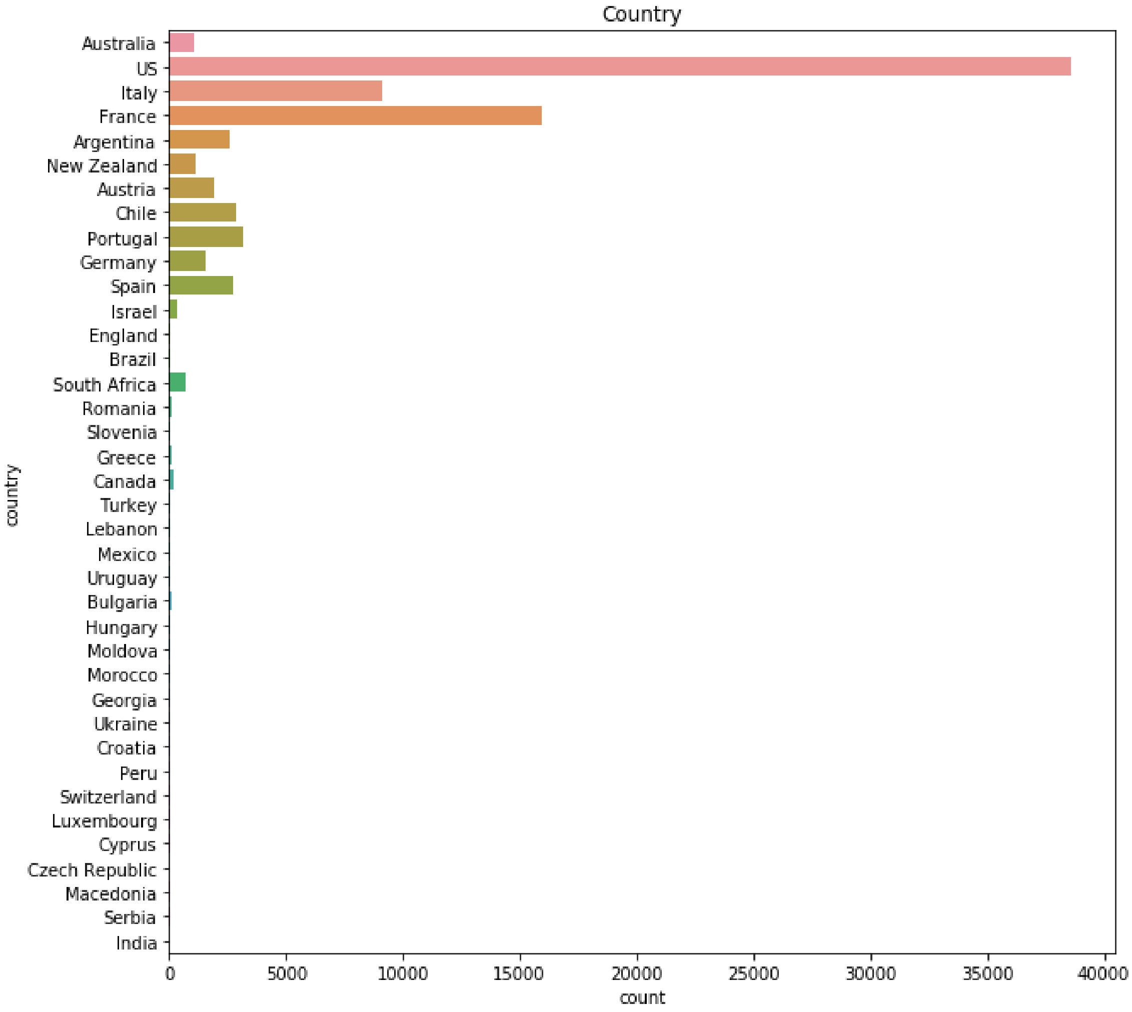
3.1.1 Analyzing country

In [34]:

```
plt.figure(figsize=(10,10))
plt.title("Country")
sns.countplot(y=train['country'])
```

Out[34]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c0bba1278>
```



In [120]:

```
train['country'].describe()
```

Out[120]:

```
count     82622
unique       38
top          US
freq      38573
Name: country, dtype: object
```

3.1.2 Analyzing Destination

In [35]:

```
train['designation'].describe()
```

Out[35]:

```
count       59010
unique      26424
top       Reserve
freq         1382
Name: designation, dtype: object
```

Top 20 designations with their frequency

In [37]:

```
train['designation'].value_counts()[:20]
```

Out[37]:

```
Reserve                   1382
Estate                     898
Reserva                    743
Estate Grown               425
Riserva                    415
Barrel sample              303
Dry                        287
Brut                       283
Brut Rosé                  226
Estate Bottled             224
Vieilles Vignes            217
Barrel Sample              198
Crianza                    184
Gran Reserva               161
Old Vine                   153
Tradition                  150
Rosé of                    119
Réserve                    103
Rosé                        97
Bien Nacido Vineyard        96
Name: designation, dtype: int64
```

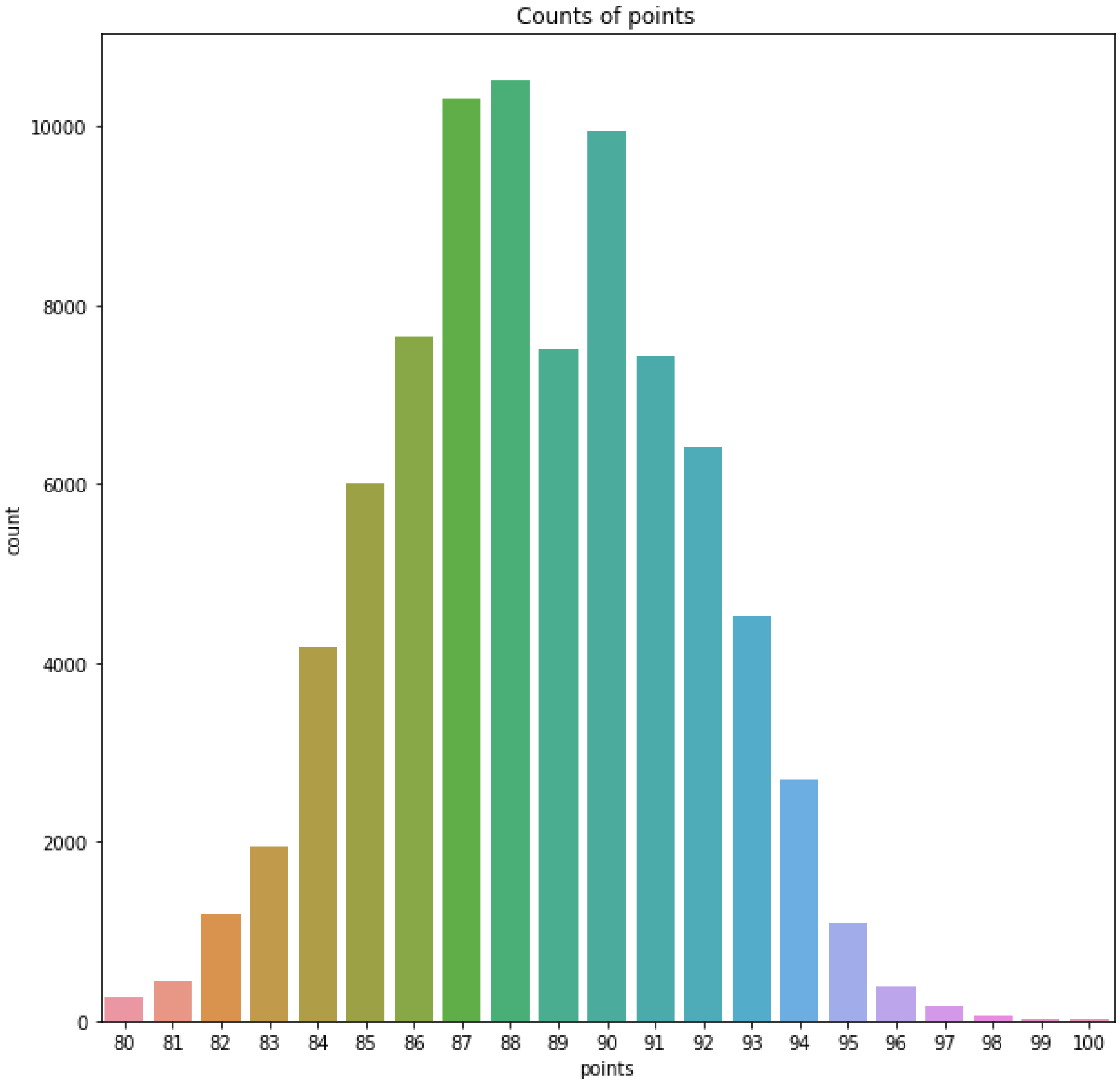
3.1.3 Analyzing points

In [81]:

```
plt.figure(figsize=(10,10))
plt.title("Counts of points")
sns.countplot(train['points'])
```

Out[81]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5bed9fe438>
```



In [41]:

```
train['points'].value_counts()
```

Out[41]:

```
88     10504
87     10306
90      9929
86      7641
89      7495
91      7421
92      6412
85      5999
93      4522
84      4174
94      2704
83      1951
82      1184
95      1094
81       433
96       382
80       254
97       166
98        49
99        25
100       12
Name: points, dtype: int64
```

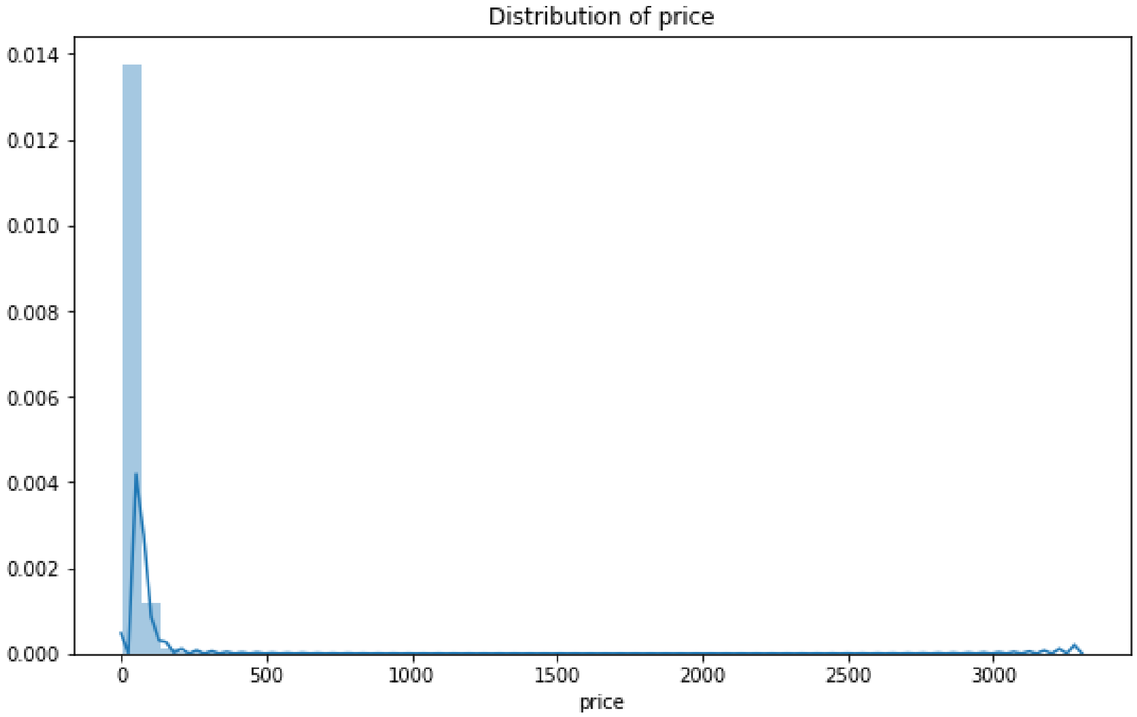
3.1.4 Analyzing price

In [80]:

```
plt.figure(figsize=(10,6))
plt.title("Distribution of price")
sns.distplot(train['price'])
```

Out[80]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5bec721fd0>
```



In [52]:

```
train['price'].describe().T
```

Out[52]:

```
count    77088.000000
mean        36.922232
std         43.698346
min          4.000000
25%         18.000000
50%         27.000000
75%         45.000000
max       3300.000000
Name: price, dtype: float64
```

3.1.5 Analyzing province

In [54]:

```
train['province'].describe()
```

Out[54]:

```
count          82622
unique           358
top       California
freq           25736
Name: province, dtype: object
```

Top 20 provinces with frequency

In [63]:

```
train['province'].value_counts()[:20]
```

Out[63]:

```
California            25736
Washington             6060
Bordeaux               4690
Oregon                 3900
Tuscany                3780
Burgundy               3179
Mendoza Province       2287
Piedmont               2226
New York               1978
Alsace                 1664
Northern Spain         1448
Champagne              1300
Loire Valley           1026
Provence                956
Douro                   951
Northeastern Italy      907
Southwest France        852
Mosel                   834
Beaujolais              834
Catalonia               794
Name: province, dtype: int64
```

3.1.6 Analyzing region_1

In [66]:

```
train['region_1'].describe()
```

Out[66]:

```
count           69903
unique           1019
top       Napa Valley
freq             3334
Name: region_1, dtype: object
```

Top 20 region_1 with thier frequency

In [67]:

```
train['region_1'].value_counts()[:20]
```

Out[67]:

```
Napa Valley                3334
Columbia Valley (WA)       2951
Russian River Valley       2362
California                 1902
Willamette Valley          1739
Mendoza                    1584
Alsace                     1445
Paso Robles                1376
Champagne                  1300
Barolo                     1293
Sonoma Coast               1188
Finger Lakes               1167
Sonoma County               917
Toscana                     860
Chianti Classico            836
Carneros                    796
Sta. Rita Hills             768
Walla Walla Valley (WA)     748
Brunello di Montalcino      663
Rioja                       663
Name: region_1, dtype: int64
```

3.1.7 Analyzing region_2

In [68]:

```
train['region_2'].describe()
```

Out[68]:

```
count             35949
unique               17
top       Central Coast
freq               7503
Name: region_2, dtype: object
```

region_1`s with thier frequency

In [70]:

```
train['region_2'].value_counts()
```

Out[70]:

```
Central Coast        7503
Sonoma               6776
Columbia Valley      5679
Napa                 5119
Willamette Valley    2605
California Other     1926
Finger Lakes         1314
Napa-Sonoma           919
Sierra Foothills      772
Central Valley        641
Southern Oregon       548
Oregon Other          519
Long Island           503
North Coast           411
Washington Other      380
South Coast           173
New York Other        161
Name: region_2, dtype: int64
```

3.1.8 Analyzing winery

In [72]:

```
train['winery'].describe()
```

Out[72]:

```
count          82657
unique         13786
top       Testarossa
freq             175
Name: winery, dtype: object
```

Top 20 winery with thier frequency

In [73]:

```
train['winery'].value_counts()[:20]
```

Out[73]:

```
Testarossa                    175
Louis Latour                  168
Williams Selyem               165
Georges Duboeuf               163
Chateau Ste. Michelle         163
Wines & Winemakers            142
DFJ Vinhos                    131
Columbia Crest                112
Concha y Toro                 112
Kendall-Jackson               100
Siduri                         99
Gary Farrell                   98
Lynmar                         98
Albert Bichot                  94
Jean-Luc and Paul Aegerter     92
Montes                         90
Chanson Père et Fils           89
Henri de Villamont             85
Martin Ray                     85
Fess Parker                    85
Name: winery, dtype: int64
```

3.1.9 Analyzing variety (target)

In [75]:

```
train['variety'].describe()
```

Out[75]:

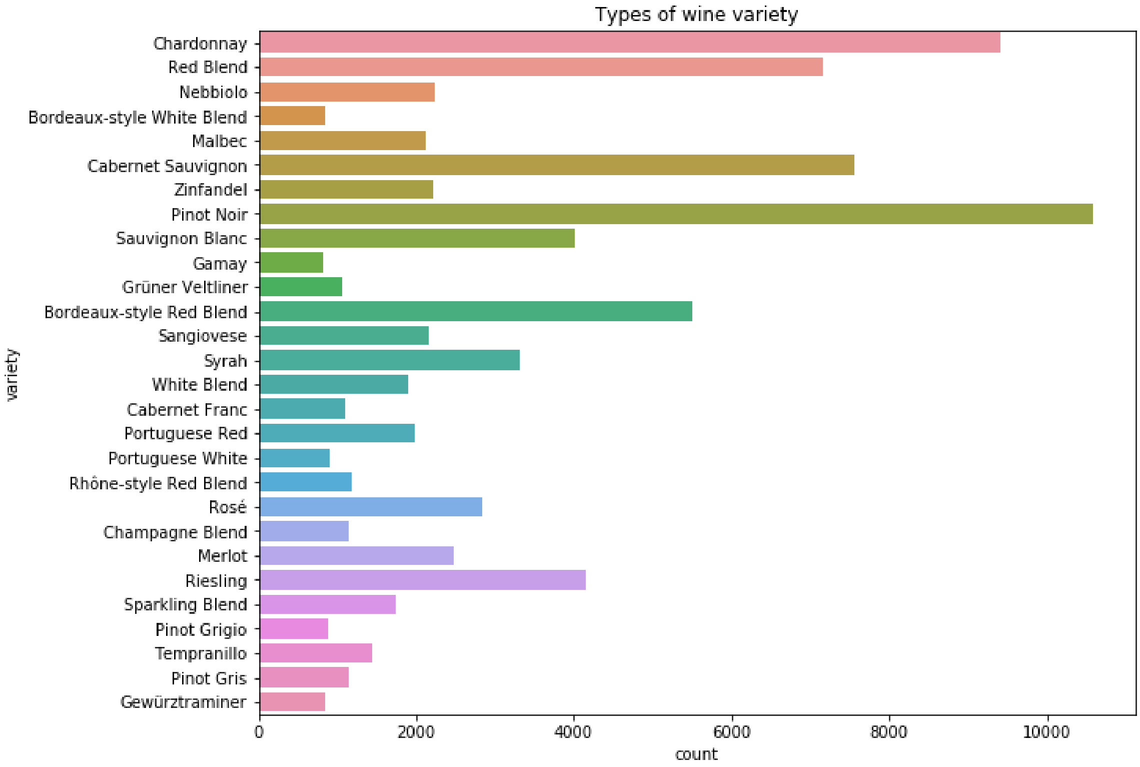
```
count          82657
unique            28
top       Pinot Noir
freq           10587
Name: variety, dtype: object
```

In [82]:

```
plt.figure(figsize=(10,8))
plt.title("Types of wine variety")
sns.countplot(y=train['variety'])
```

Out[82]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5bf0084eb8>
```

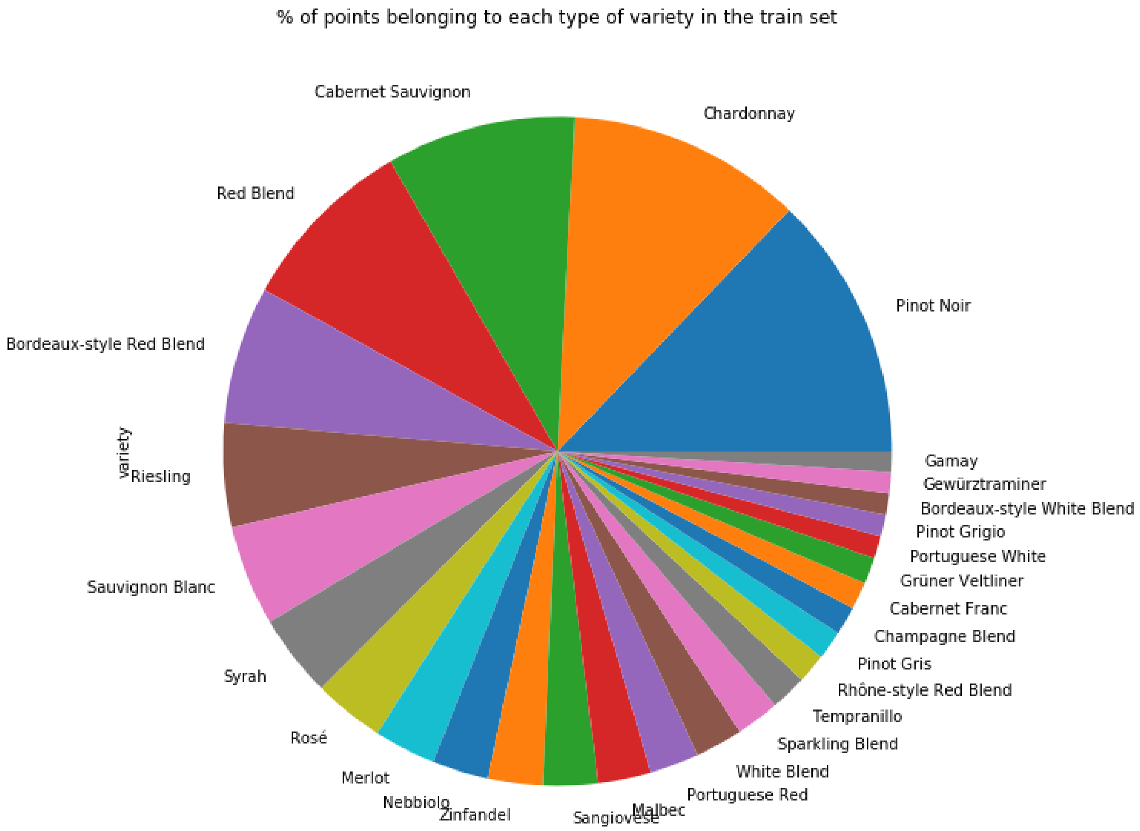


In [87]:

```
plt.figure(figsize=(10,10))
plt.title('% of points belonging to each type of variety in the train set')
train['variety'].value_counts().plot.pie()
```

Out[87]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5bec839048>
```



3.2 Multivariate analysis

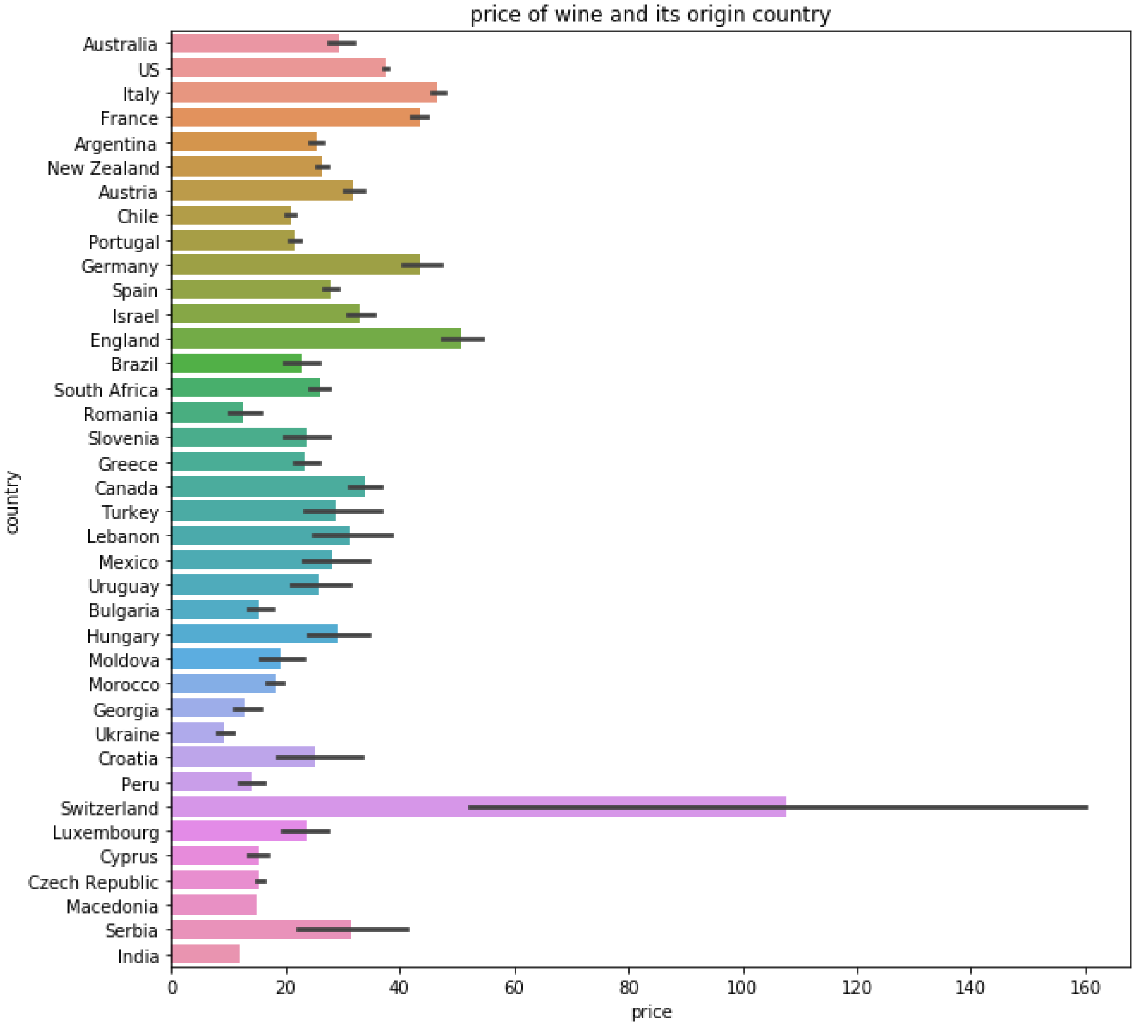
3.2.1 Price of wine and its origin country

```
In [111]:
```

```
plt.figure(figsize=(10,10))
plt.title('price of wine and its origin country')
sns.barplot(y=train['country'],x=train['price'])
```

```
Out[111]:

<matplotlib.axes._subplots.AxesSubplot at 0x7f5bef01ce80>
```



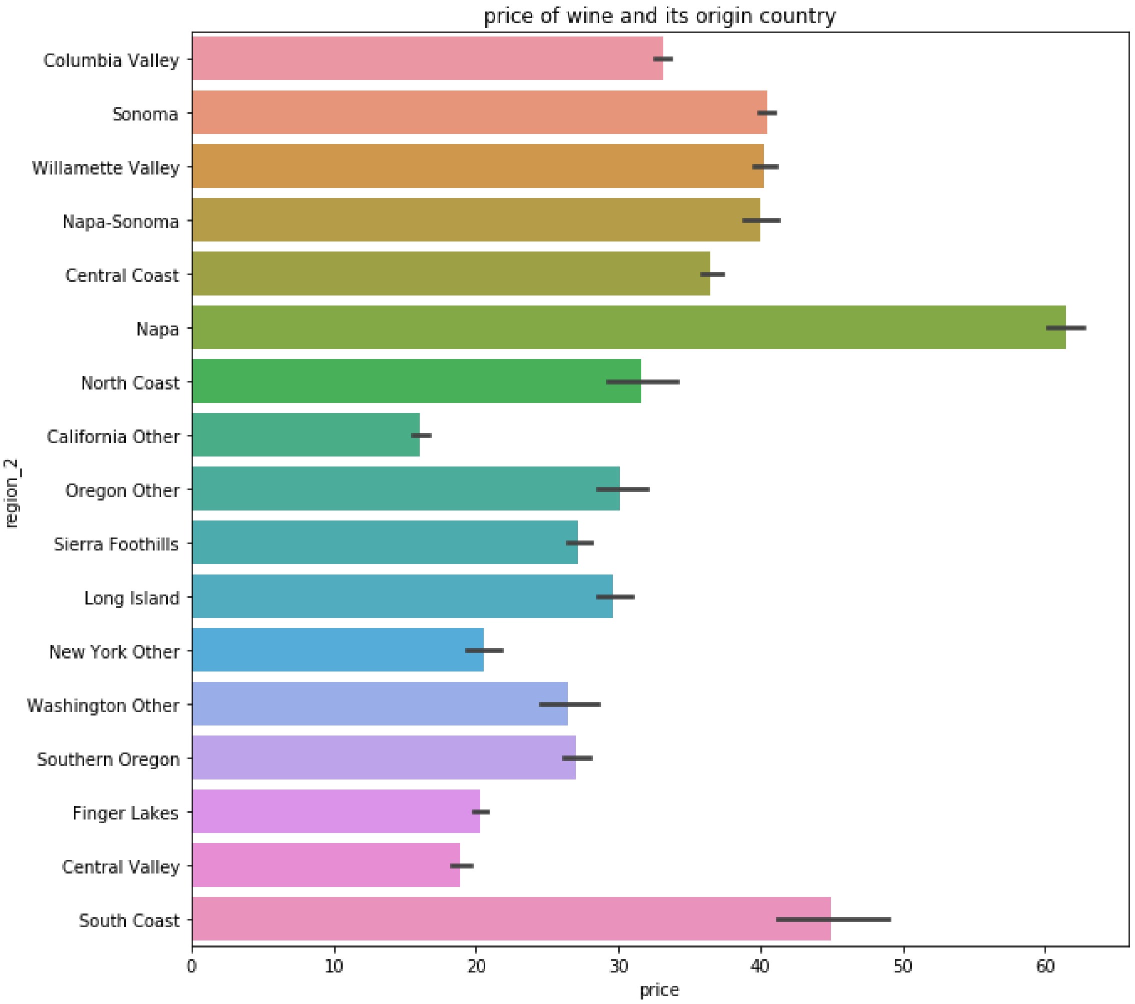
3.2.2 Price of wine and its specific growing place

In [112]:

```
plt.figure(figsize=(10,10))
plt.title('price of wine and its origin country')
sns.barplot(y=train['region_2'],x=train['price'])
```

Out[112]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5bedeb3978>
```



3.2.3 Countries and their wine exports

In [212]:

```
country_values = train['country'].unique()
temp={}
for i in country_values:
    temp[i] = list(np.unique(train[train.country==i].variety))
```

3.3 Analyzing text features

3.3.1 Analyzing review title

In [214]:

```
train['review_title'].describe()
```

Out[214]:

```
count                                                  82657
unique                                                 76983
top       Gloria Ferrer NV Sonoma Brut Sparkling (Sonoma...
freq                                                       8
Name: review_title, dtype: object
```

In [216]:

```
train['review_title'].value_counts()[:30]
```

Out[216]:

```
Gloria Ferrer NV Sonoma Brut Sparkling (Sonoma County)
8
Korbel NV Brut Sparkling (California)
8
Segura Viudas NV Extra Dry Sparkling (Cava)
7
Ruinart NV Brut Rosé  (Champagne)
7
Gloria Ferrer NV Blanc de Noirs Sparkling (Carneros)
7
Heidsieck & Co Monopole NV Blue Top Brut  (Champagne)
5
Jacquart NV Brut Mosaïque  (Champagne)
5
J. Dumangin Fils NV Le Rosé Premier Cru Brut  (Champagne)
5
J Vineyards & Winery NV Brut Rosé Sparkling (Russian River Valley)
5
Mailly Grand Cru NV Délice Demi-Sec  (Champagne)
5
Pierre Sparr NV Brut Réserve Sparkling (Crémant d'Alsace)
5
Mailly Grand Cru NV Blanc de Noirs Brut Pinot Noir (Champagne)
5
Bailly-Lapierre NV Brut  (Crémant de Bourgogne)
5
Boizel NV Brut Réserve  (Champagne)
5
Segura Viudas NV Aria Estate Extra Dry Sparkling (Cava)
5
Roederer Estate NV Brut Rosé Sparkling (Anderson Valley)
5
G. H. Mumm NV Cordon Rouge Brut  (Champagne)
5
Korbel NV Sweet Rosé Sparkling (California)
4
A.R. Lenoble  NV Intense Brut  (Champagne)
4
Nicolas Feuillatte NV Brut Rosé  (Champagne)
4
Charles Heidsieck NV Brut Réserve  (Champagne)
4
Breathless NV Brut Sparkling (North Coast)
4
Ferrari NV Rosé Sparkling (Trento)
4
Lanson NV Black Label Brut  (Champagne)
4
Henri Abele NV Brut  (Champagne)
4
Louis Roederer NV Brut Premier  (Champagne)
4
Segura Viudas NV Aria Estate Brut Sparkling (Cava)
4
Thiénot NV Brut  (Champagne)
4
Mumm Napa NV Brut Rosé Sparkling (Napa Valley)
4
Billecart-Salmon NV Brut Rosé  (Champagne)
```

```
4
Name: review_title, dtype: int64
```

3.3.1 Analyzing review description

In [217]:

```
train['review_description'].describe()
```

Out[217]:

```
count                                                  82657
unique                                                 77628
top       From the home estate of wine academic and guru...
freq                                                       2
Name: review_description, dtype: object
```

4. Data pre-prerocessing