In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import math
V = 39
```

Считываем данные

In [2]:

```
data = pd.read_csv('data_2.csv',index_col='no')
delta_x1 = [V,-V,V,V,V,V,-V,V,V,-V]
delta_x2 = [V,-V,V,V,-V,V,-V,V,-V,-V]
data['x1'] = data['x1'] + delta_x1
data['x2'] += delta_x2
```

In [3]:

```
y = data['class']
X = data.drop('class',axis=1)
```

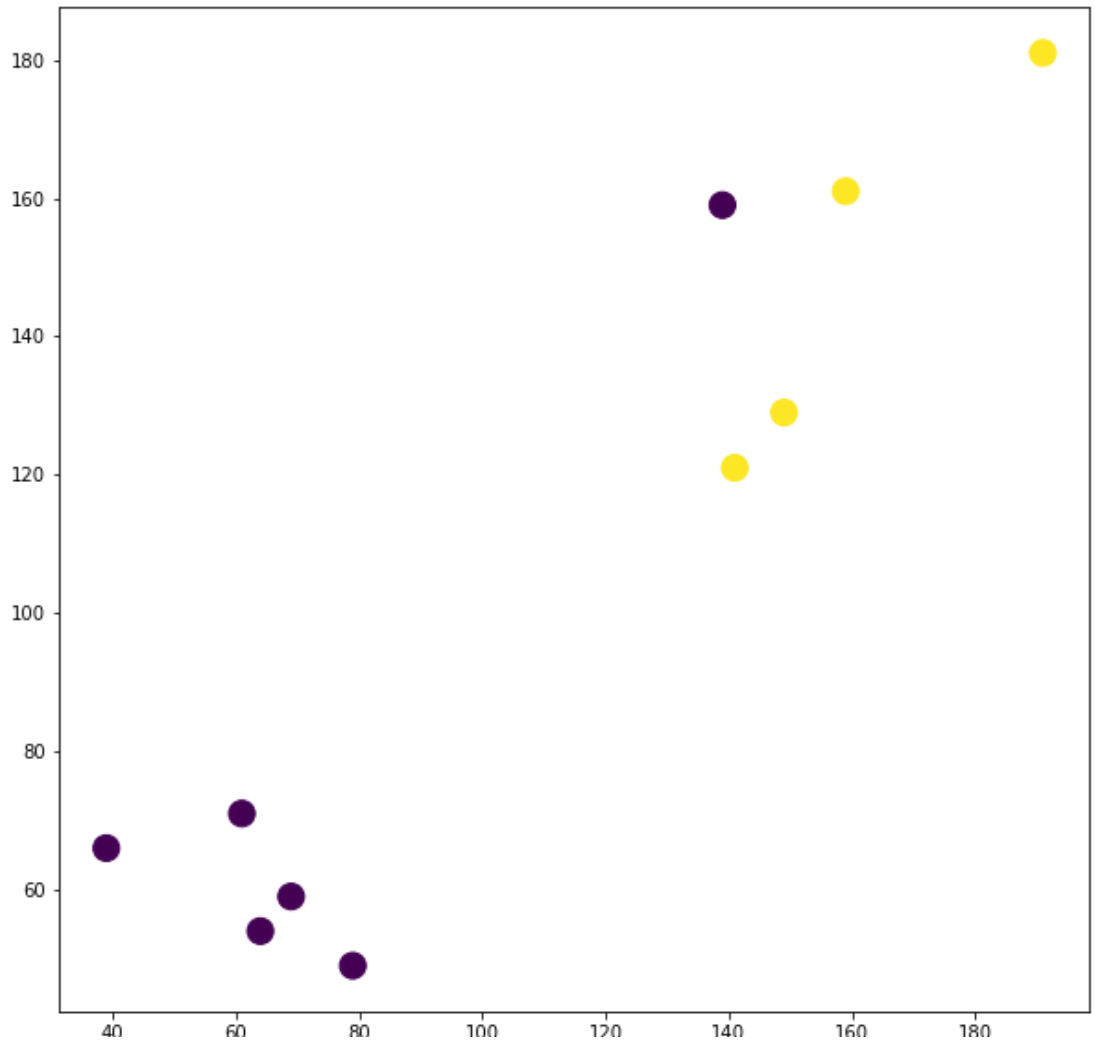
Визуализируем данные без разделяющей прямой

In [4]:

```
plt.figure(figsize=(10,10))
plt.scatter(X['x1'],X['x2'],c=y,s=200)
```

Out[4]:

```
<matplotlib.collections.PathCollection at 0x7efbd5acb400>
```



In [5]:

```
p1 = 0.6 # вероятность первого класса
p2 = 0.4 # вероятность второго класса
```

$$\mu_1 = \frac{1}{6}\sum_{i=1}^{6} x_1^{(i)}$$
$$\mu_2 = \frac{1}{6}\sum_{i=1}^{6} x_2^{(i)}$$
$$\nu_1 = \frac{1}{4}\sum_{i=7}^{10} x_1^{(i)}$$
$$\nu_2 = \frac{1}{4}\sum_{i=7}^{10} x_2^{(i)}$$

In [6]:

```
mu_1 = data[0:6]['x1'].mean()
mu_2 = data[0:6]['x2'].mean()
mu = [mu_1,mu_2]

nu_1 = data[6:]['x1'].mean()
nu_2 = data[6:]['x2'].mean()
nu = [nu_1,nu_2]
X = X.values.T
mu,nu
```

Out[6]:

```
([75.16666666666667, 76.33333333333333], [160.0, 148.0])
```

In [7]:

```
X
```

Out[7]:

```
array([[ 79,  61,  69,  64,  39, 139, 191, 149, 159, 141],
       [ 49,  71,  59,  54,  66, 159, 181, 129, 161, 121]])
```

$$x_2 = \frac{\mu_1 - \nu_1}{\nu_2 - \mu_2}x_1 - \frac{\sigma^2}{\nu_2 - \mu_2} ln\left(\frac{p(2)}{p(1)} + \frac{\nu_1^2 + \nu_2^2 - \mu_1^2 - \mu_2^2}{2(\nu_2 - \mu_2)}\right) = a \cdot x_1 + b$$
$$a = \frac{\mu_1 - \nu_1}{\nu_2 - \mu_2}$$
$$b = \frac{\sigma^2}{\nu_2 - \mu_2} \cdot ln\left(\frac{p(2)}{p(1)}\right) + \frac{\nu_1^2 + \nu_2^2 - \mu_1^2 - \mu_2^2}{2(\nu_2 - \mu_2)}$$
$$\sigma^2 = \frac{1}{20}\sum_{j=1}^{2}\left[\sum_{i=1}^{6}(x_j^{(i)} - \mu_j)^2 + \sum_{i=7}^{10}(x_j^{(i)} - \nu_j)^2\right]$$

In [8]:

```
sigma2 = 1/20 * sum(
    [sum(
        [(X[j][i] - mu[j])**2 for i in range(6)]
         ) +
            sum(
                [(X[j][i] - nu[j])**2 for i in range(6,10)]

            ) for j in range(2)])
```

In [9]:

```
a = (mu[0] - nu[0]) / (nu[1] - mu[1])
b = (sigma2 / (nu[1] - mu[1])) * math.log((p2/p1))+((nu[0]**2 + nu[1]**2 - mu[0]**2 - m
u[1]**2) / (2*(nu[1]-mu[1])))

a,b
```

Out[9]:

```
(-1.183720930232558, 246.2413488095079)
```

Построим график разделяющей кривой и визуализируем данные на нём

In [10]:

```
f = lambda x: a * x + b
```

In [12]:

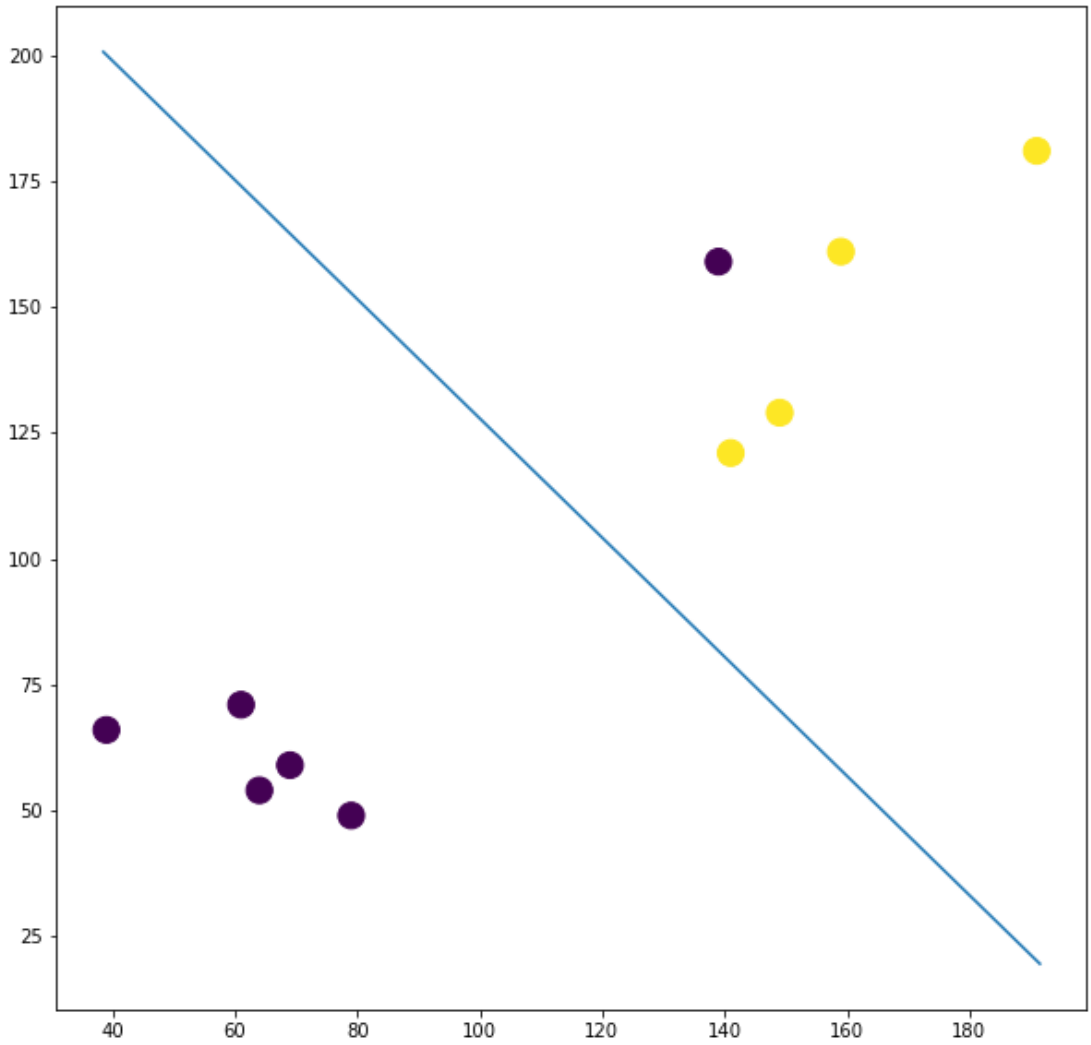
```
x1_grid = np.linspace(X[0].min() - 0.5, X[0].max() + 0.5, 1000)
line = f(x1_grid)
```

In [14]:

```
plt.figure(figsize=(10,10))
plt.scatter(X[0],X[1],c=y,s=200)
plt.plot(x1_grid,line)
```

Out[14]:

```
[<matplotlib.lines.Line2D at 0x7efbd4c74340>]
```



In [ ]:

```

```

In [ ]: