```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
from plotly.offline import iplot , plot
from plotly.subplots import make_subplots
from sklearn.model_selection import train_test_split , GridSearchCV
from sklearn.metrics import ConfusionMatrixDisplay
from sklearn.preprocessing import MinMaxScaler
from sklearn.svm import SVC
from sklearn.ensemble import RandomForestClassifier
from sklearn.linear_model import LogisticRegression
import warnings
warnings.filterwarnings('ignore')
```

```
df = pd.read_csv("/content/train.csv")
```

```
df.sample(5)
```

	battery_power	blue	clock_speed	dual_sim	fc	four_g	int_memory	m_dep	mobile_wt	n_cores	...	px_height	px_width	ram	sc_h
822	839	0	2.0	1	0	0	14	0.4	175	7	...	564	1391	3835	15
1678	854	0	1.0	0	5	1	17	0.9	101	4	...	730	1148	3115	7
225	1634	1	1.4	0	1	1	17	0.2	200	2	...	964	1677	3031	11
1994	858	0	2.2	0	1	0	50	0.1	84	1	...	528	1416	3978	17
1682	1996	1	2.8	1	0	1	7	0.1	138	5	...	937	1083	1258	17

5 rows × 21 columns

```
print(f"Number of Row : {df.shape[0]}\nNumber of Columns : {df.shape[1]}")
```

```
Number of Row : 2000
Number of Columns : 21
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2000 entries, 0 to 1999
Data columns (total 21 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   battery_power  2000 non-null   int64
 1   blue           2000 non-null   int64
 2   clock_speed    2000 non-null   float64
 3   dual_sim       2000 non-null   int64
 4   fc             2000 non-null   int64
 5   four_g         2000 non-null   int64
 6   int_memory     2000 non-null   int64
 7   m_dep          2000 non-null   float64
 8   mobile_wt      2000 non-null   int64
 9   n_cores        2000 non-null   int64
 10  pc             2000 non-null   int64
 11  px_height      2000 non-null   int64
 12  px_width       2000 non-null   int64
 13  ram            2000 non-null   int64
 14  sc_h           2000 non-null   int64
 15  sc_w           2000 non-null   int64
 16  talk_time      2000 non-null   int64
 17  three_g        2000 non-null   int64
 18  touch_screen   2000 non-null   int64
 19  wifi           2000 non-null   int64
 20  price_range    2000 non-null   int64
dtypes: float64(2), int64(19)
memory usage: 328.2 KB
```

```
df.isna().sum()
```

```
battery_power    0
blue             0
clock_speed      0
dual_sim         0
```

```
fc              0
four_g          0
int_memory      0
m_dep           0
mobile_wt       0
n_cores         0
pc              0
px_height       0
px_width        0
ram             0
sc_h            0
sc_w            0
talk_time       0
three_g         0
touch_screen    0
wifi            0
price_range     0
dtype: int64
```

```
df.describe()
```

	battery_power	blue	clock_speed	dual_sim	fc	four_g	int_
count	2000.000000	2000.0000	2000.000000	2000.000000	2000.000000	2000.000000	2000.
mean	1238.518500	0.4950	1.522250	0.509500	4.309500	0.521500	32.
std	439.418206	0.5001	0.816004	0.500035	4.341444	0.499662	18.
min	501.000000	0.0000	0.500000	0.000000	0.000000	0.000000	2.
25%	851.750000	0.0000	0.700000	0.000000	1.000000	0.000000	16.
50%	1226.000000	0.0000	1.500000	1.000000	3.000000	1.000000	32.
75%	1615.250000	1.0000	2.200000	1.000000	7.000000	1.000000	48.
max	1998.000000	1.0000	3.000000	1.000000	19.000000	1.000000	64.

8 rows × 21 columns

```
pd.DataFrame({'Count':df.shape[0],
              'Null':df.isnull().sum(),
              'Null %':df.isnull().mean() * 100,
              'Cardinality':df.nunique()
})
```

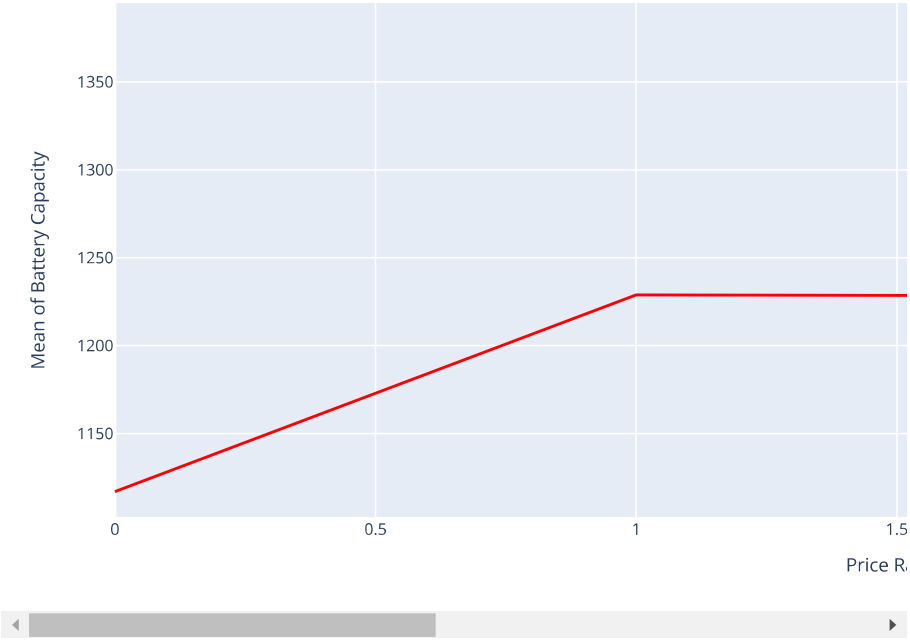
	Count	Null	Null %	Cardinality
battery_power	2000	0	0.0	1094
blue	2000	0	0.0	2
clock_speed	2000	0	0.0	26
dual_sim	2000	0	0.0	2
fc	2000	0	0.0	20
four_g	2000	0	0.0	2
int_memory	2000	0	0.0	63
m_dep	2000	0	0.0	10
mobile_wt	2000	0	0.0	121
n_cores	2000	0	0.0	8
pc	2000	0	0.0	21
px_height	2000	0	0.0	1137
px_width	2000	0	0.0	1109
ram	2000	0	0.0	1562
sc_h	2000	0	0.0	15
sc_w	2000	0	0.0	19
talk_time	2000	0	0.0	19
three_g	2000	0	0.0	2
touch_screen	2000	0	0.0	2
wifi	2000	0	0.0	2
price_range	2000	0	0.0	4

```
df.duplicated().any()
```

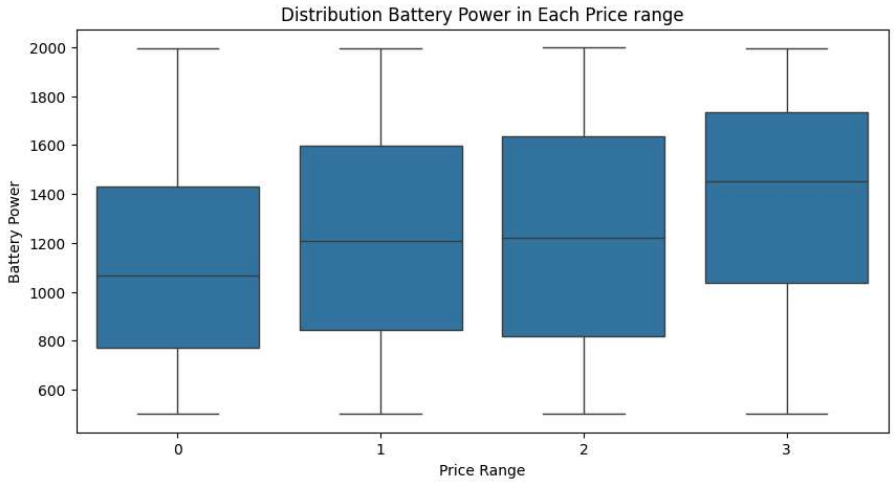
```
False
```

```
df_battery_price = df.groupby('price_range')['battery_power'].mean()
```

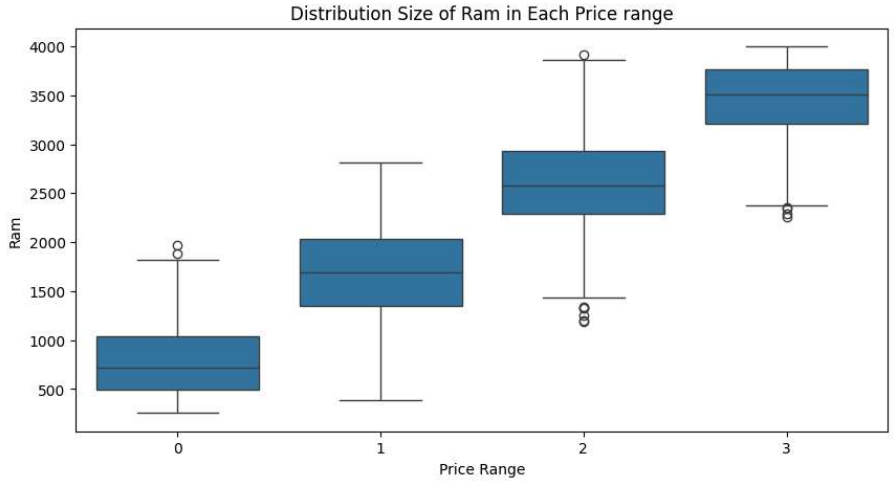
```
iplot(px.line(df_battery_price,
              labels={'value':'Mean of Battery Capacity','price_range':'Price Range'},
              color_discrete_sequence=['red']
              ))
```




```
plt.figure(figsize=(10,5))
plt.title('Distribution Battery Power in Each Price range')
sns.boxplot(x=df['price_range'],y=df['battery_power'])
plt.xlabel('Price Range')
plt.ylabel('Battery Power')
plt.show()
```




```
plt.figure(figsize=(10,5))
plt.title('Distribution Size of Ram in Each Price range')
sns.boxplot(x=df['price_range'],y=df['ram'])
plt.xlabel('Price Range')
plt.ylabel('Ram')
plt.show()
```

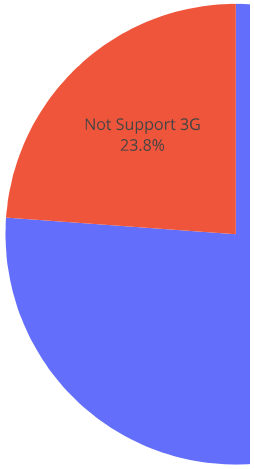


Generate 10 random numbers using numpy Close

```
df_4g = df['four_g'].value_counts()
iplot(px.pie(values=df_4g,
             names=['Support 4G','Not Support 4G'],
             template='plotly_dark',
             title='Is Support 4G ?'
             ).update_traces(textinfo='label+percent'))
```


```
df_3g = df['three_g'].value_counts()
iplot(px.pie(values=df_3g,
             names=['Support 3G','Not Support 3G'],
             template='plotly_dark',
             title='Is Support 3G ?'
             ).update_traces(textinfo='label+percent'))
```

Is Support 3G ?




```
x = df.drop(columns='price_range')
y = df.price_range


scaler = MinMaxScaler()
x = scaler.fit_transform(x)


x_train , x_test , y_train , y_test = train_test_split(x,y,test_size=0.2)


print(f'Shape of X_Train {x_train.shape}')
print(f'Shape of X_Test {x_test.shape}')
print(f'Shape of Y_Train {y_train.shape}')
print(f'Shape of Y_Test {y_test.shape}')
```

```
Shape of X_Train (1600, 20)
Shape of X_Test (400, 20)
Shape of Y_Train (1600,)
Shape of Y_Test (400,)
```

```
model_params = {
    'svm':{
        'model' : SVC(gamma='auto'),
        'params':{
            'C':[1,10,20],
            'kernel':['rbf','linear']
        }
    },
    'random_forest':{
        'model':RandomForestClassifier(),
        'params':{
            'n_estimators':[1,5,10]
        }
    },
    'logistic_regression':{
        'model':LogisticRegression(solver='liblinear',multi_class='auto'),
        'params':{
            'C':[1,5,10]
        }
    }
}
```

```
scores = []

for model_name , mp in model_params.items():
    clf = GridSearchCV(mp['model'],mp['params'],cv=5,return_train_score=False)
    clf.fit(x,y)
    scores.append({
            'model':model_name,
            'best_scores':clf.best_score_,
            'best_params':clf.best_params_
        }
    )
pd.DataFrame(scores,columns=['model','best_scores','best_params'])
```

	model	best_scores	best_params
0	svm	0.9675	{'C': 20, 'kernel': 'linear'}
1	random_forest	0.8210	{'n_estimators': 10}
2	logistic_regression	0.8375	{'C': 10}

```
model_svm = SVC(kernel='linear',C=20)
model_svm.fit(x_train,y_train)
```

```
SVC(C=20, kernel='linear')
```

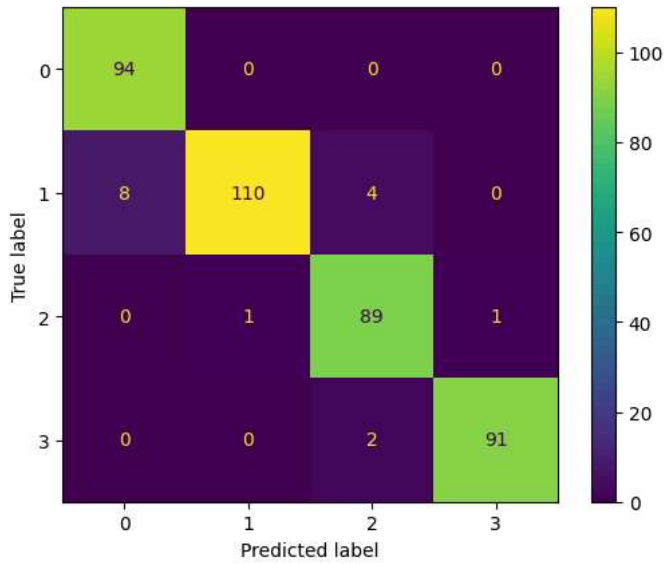
```
score_svm_train = model_svm.score(x_train,y_train)
print(f"Train accuracy: {score_svm_train}")
```

```
Train accuracy: 0.975625
```

```
score_svm_test = model_svm.score(x_test,y_test)
print(f"Test accuracy: {score_svm_test}")
```

```
Test accuracy: 0.96
```

```
ConfusionMatrixDisplay.from_estimator(model_svm,
                                      x_test,
                                      y_test);
```




```
model_LR = LogisticRegression(C=10)
model_LR.fit(x_train,y_train)
```

```
LogisticRegression(C=10)
```

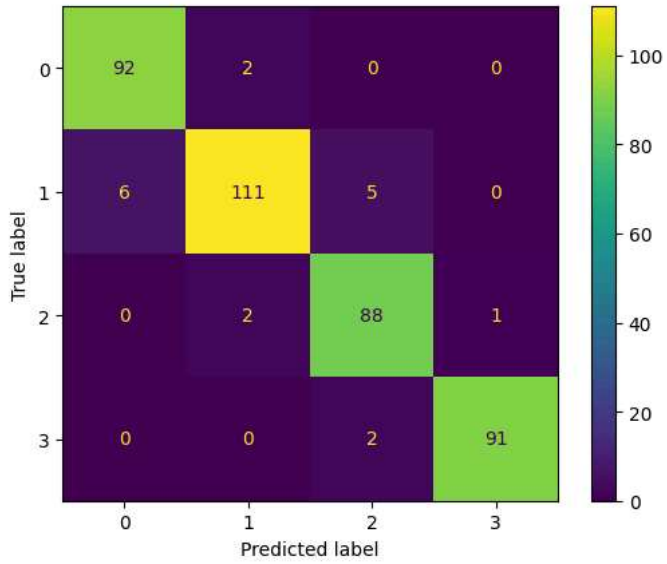
```
score_LR_train = model_LR.score(x_train,y_train)
print(f"Train accuracy: {score_LR_train}")
```

```
Train accuracy: 0.975625
```

```
score_LR_test = model_LR.score(x_test,y_test)
print(f"Test accuracy: {score_LR_test}")
```

```
Test accuracy: 0.955
```

```
ConfusionMatrixDisplay.from_estimator(model_LR,
                                      x_test,
                                      y_test);
```




```
model_RFC = RandomForestClassifier(n_estimators=10,random_state=42)
model_RFC.fit(x_train,y_train)
```

```
RandomForestClassifier
RandomForestClassifier(n_estimators=10, random_state=42)
```

Generate print hello world using rot13 Close

```
score_RFC_train = model_RFC.score(x_train,y_train)
print(f"Train accuracy: {score_RFC_train}")
```

```
Train accuracy: 0.9975
```

```
score_RFC_test = model_RFC.score(x_test,y_test)
print(f"Test accuracy: {score_RFC_test}")
```

```
Test accuracy: 0.75
```

```
from sklearn.model_selection import train_test_split
from sklearn.ensemble import GradientBoostingRegressor
import xgboost as xgb
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
```