

```
In [1]: import pandas as pd  
import numpy as np  
import plotly.express as px  
import plotly.graph_objects as go
```

```
In [2]: data = pd.read_csv("apple_products.csv")
```

In [3]: data

Out[3]:

	Product Name	Product URL	Brand	Sale Price	Mrp	Discount Percentage	Number Of Ratings	Number Of Reviews
0	APPLE iPhone 8 Plus (Gold, 64 GB)	https://www.flipkart.com/apple-iphone-8-plus-g...	Apple	49900	49900	0	3431	356
1	APPLE iPhone 8 Plus (Space Grey, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356
2	APPLE iPhone 8 Plus (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356
3	APPLE iPhone 8 (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-silver...	Apple	77000	77000	0	11202	794
4	APPLE iPhone 8 (Gold, 256 GB)	https://www.flipkart.com/apple-iphone-8-gold-2...	Apple	77000	77000	0	11202	794
...
57	APPLE iPhone SE (Black, 64 GB)	https://www.flipkart.com/apple-iphone-se-black...	Apple	29999	39900	24	95909	8161
58	APPLE iPhone 11 (Purple, 64 GB)	https://www.flipkart.com/apple-iphone-11-purpl...	Apple	46999	54900	14	43470	3331
59	APPLE iPhone 11 (White, 64 GB)	https://www.flipkart.com/apple-iphone-11-white...	Apple	46999	54900	14	43470	3331
60	APPLE iPhone 11 (Black, 64 GB)	https://www.flipkart.com/apple-iphone-11-black...	Apple	46999	54900	14	43470	3331
61	APPLE iPhone 11 (Red, 64 GB)	https://www.flipkart.com/apple-iphone-11-red-6...	Apple	46999	54900	14	43470	3331

62 rows × 11 columns



In [4]: `data.head()`

Out[4]:

	Product Name	Product URL	Brand	Sale Price	Mrp	Discount Percentage	Number Of Ratings	Number Of Reviews	
0	APPLE iPhone 8 Plus (Gold, 64 GB)	https://www.flipkart.com/apple-iphone-8-plus-g...	Apple	49900	49900	0	3431	356	N
1	APPLE iPhone 8 Plus (Space Grey, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	
2	APPLE iPhone 8 Plus (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	N
3	APPLE iPhone 8 (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-silver...	Apple	77000	77000	0	11202	794	M
4	APPLE iPhone 8 (Gold, 256 GB)	https://www.flipkart.com/apple-iphone-8-gold-2...	Apple	77000	77000	0	11202	794	

In [5]: `data.isnull().sum()`

Out[5]:

Product Name	0
Product URL	0
Brand	0
Sale Price	0
Mrp	0
Discount Percentage	0
Number Of Ratings	0
Number Of Reviews	0
Upc	0
Star Rating	0
Ram	0
dtype: int64	

In [6]: data.describe()

Out[6]:

	Sale Price	Mrp	Discount Percentage	Number Of Ratings	Number Of Reviews	Star Rating
count	62.000000	62.000000	62.000000	62.000000	62.000000	62.000000
mean	80073.887097	88058.064516	9.951613	22420.403226	1861.677419	4.575806
std	34310.446132	34728.825597	7.608079	33768.589550	2855.883830	0.059190
min	29999.000000	39900.000000	0.000000	542.000000	42.000000	4.500000
25%	49900.000000	54900.000000	6.000000	740.000000	64.000000	4.500000
50%	75900.000000	79900.000000	10.000000	2101.000000	180.000000	4.600000
75%	117100.000000	120950.000000	14.000000	43470.000000	3331.000000	4.600000
max	140900.000000	149900.000000	29.000000	95909.000000	8161.000000	4.700000

Top 10 highest-rated iPhones on Flipkart in Indea

In [7]: data.head()

Out[7]:

	Product Name	Product URL	Brand	Sale Price	Mrp	Discount Percentage	Number Of Ratings	Number Of Reviews	
0	APPLE iPhone 8 Plus (Gold, 64 GB)	https://www.flipkart.com/apple-iphone-8-plus-g...	Apple	49900	49900	0	3431	356	M
1	APPLE iPhone 8 Plus (Space Grey, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	
2	APPLE iPhone 8 Plus (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	M
3	APPLE iPhone 8 (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-silver...	Apple	77000	77000	0	11202	794	M
4	APPLE iPhone 8 (Gold, 256 GB)	https://www.flipkart.com/apple-iphone-8-gold-2...	Apple	77000	77000	0	11202	794	

```
In [9]: highest Rated = data.sort_values(by = ["Star Rating"], ascending = False)

highest Rated = highest Rated.head(10)
```

```
In [10]: print(highest Rated['Product Name'])
```

```
20    APPLE iPhone 11 Pro Max (Midnight Green, 64 GB)
17      APPLE iPhone 11 Pro Max (Space Grey, 64 GB)
16    APPLE iPhone 11 Pro Max (Midnight Green, 256 GB)
15      APPLE iPhone 11 Pro Max (Gold, 64 GB)
14      APPLE iPhone 11 Pro Max (Gold, 256 GB)
0      APPLE iPhone 8 Plus (Gold, 64 GB)
29      APPLE iPhone 12 (White, 128 GB)
32    APPLE iPhone 12 Pro Max (Graphite, 128 GB)
35      APPLE iPhone 12 (Black, 128 GB)
36      APPLE iPhone 12 (Blue, 128 GB)
Name: Product Name, dtype: object
```

```
In [11]: print(highest Rated)
```

	Product Name \
20	APPLE iPhone 11 Pro Max (Midnight Green, 64 GB)
17	APPLE iPhone 11 Pro Max (Space Grey, 64 GB)
16	APPLE iPhone 11 Pro Max (Midnight Green, 256 GB)
15	APPLE iPhone 11 Pro Max (Gold, 64 GB)
14	APPLE iPhone 11 Pro Max (Gold, 256 GB)
0	APPLE iPhone 8 Plus (Gold, 64 GB)
29	APPLE iPhone 12 (White, 128 GB)
32	APPLE iPhone 12 Pro Max (Graphite, 128 GB)
35	APPLE iPhone 12 (Black, 128 GB)
36	APPLE iPhone 12 (Blue, 128 GB)

	Product URL	Brand	Sale Price \
20	https://www.flipkart.com/apple-iphone-11-pro-m...	Apple	117100
17	https://www.flipkart.com/apple-iphone-11-pro-m...	Apple	117100
16	https://www.flipkart.com/apple-iphone-11-pro-m...	Apple	131900
15	https://www.flipkart.com/apple-iphone-11-pro-m...	Apple	117100
14	https://www.flipkart.com/apple-iphone-11-pro-m...	Apple	131900
0	https://www.flipkart.com/apple-iphone-8-plus-g...	Apple	49900
29	https://www.flipkart.com/apple-iphone-12-white...	Apple	75900
32	https://www.flipkart.com/apple-iphone-12-pro-m...	Apple	120900
35	https://www.flipkart.com/apple-iphone-12-black...	Apple	75900
36	https://www.flipkart.com/apple-iphone-12-blue-...	Apple	75900

	Mrp	Discount Percentage	Number Of Ratings	Number Of Reviews \
20	117100	0	1078	101
17	117100	0	1078	101
16	131900	0	1078	101
15	117100	0	1078	101
14	131900	0	1078	101
0	49900	0	3431	356
29	84900	10	2101	180
32	129900	6	580	45
35	84900	10	2101	180
36	84900	10	2101	180

	Upc	Star Rating	Ram
20	MOBFKCTSRYPQNYT	4.7	4 GB
17	MOBFKCTSKDMKCGQS	4.7	4 GB
16	MOBFKCTSCAAKGQV7	4.7	4 GB
15	MOBFKCTSAPAYNSGG	4.7	4 GB
14	MOBFKCTS7HCHSPFH	4.7	4 GB
0	MOBEXRGV7EHHTGUH	4.6	2 GB
29	MOBFWBYZBTZFGJF9	4.6	6 GB
32	MOBFWBYZFDGQSDWS	4.6	6 GB

35MOBFWBYZK3HACR724.66GB

36MOBFWBYZKPTZF9VG4.66GB

How many ratings do the highest-rated iPhones on the Flipkart have?

In [12]: data.head()

Out[12]:

	Product Name	Product URL	Brand	Sale Price	Mrp	Discount Percentage	Number Of Ratings	Number Of Reviews	
0	APPLE iPhone 8 Plus (Gold, 64 GB)	https://www.flipkart.com/apple-iphone-8-plus-g...	Apple	49900	49900	0	3431	356	M
1	APPLE iPhone 8 Plus (Space Grey, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	
2	APPLE iPhone 8 Plus (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	M
3	APPLE iPhone 8 (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-silver...	Apple	77000	77000	0	11202	794	M
4	APPLE iPhone 8 (Gold, 256 GB)	https://www.flipkart.com/apple-iphone-8-gold-2...	Apple	77000	77000	0	11202	794	

```
In [13]: iPhones = highest_rated['Product Name'].value_counts()  
label = iPhones.index  
counts = highest_rated["Number Of Ratings"]  
figure = px.bar(highest_rated, x=label, y=counts)  
figure.show()
```



Which iPhone has the highest number of reviews on Flipkart?

```
In [14]: data.head()
```

Out[14]:

	Product Name	Product URL	Brand	Sale Price	Mrp	Discount Percentage	Number Of Ratings	Number Of Reviews	
0	APPLE iPhone 8 Plus (Gold, 64 GB)	https://www.flipkart.com/apple-iphone-8-plus-g...	Apple	49900	49900	0	3431	356	N
1	APPLE iPhone 8 Plus (Space Grey, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	
2	APPLE iPhone 8 Plus (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	N
3	APPLE iPhone 8 (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-silver...	Apple	77000	77000	0	11202	794	M
4	APPLE iPhone 8 (Gold, 256 GB)	https://www.flipkart.com/apple-iphone-8-gold-2...	Apple	77000	77000	0	11202	794	

```
In [15]: iPhones = highest_rated['Product Name'].value_counts()
label = iPhones.index
counts = highest_rated["Number Of Reviews"]
figure = px.bar(highest_rated, x=label, y=counts, title = "number of reviews o
figure.show()
```

number of reviews of highest rated iPhones



What is the relationship between the sale price of iPhones and the number of ratings on Flipkart?

```
In [16]: data.head()
```

Out[16]:

	Product Name	Product URL	Brand	Sale Price	Mrp	Discount Percentage	Number Of Ratings	Number Of Reviews	
0	APPLE iPhone 8 Plus (Gold, 64 GB)	https://www.flipkart.com/apple-iphone-8-plus-g...	Apple	49900	49900	0	3431	356	N
1	APPLE iPhone 8 Plus (Space Grey, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	
2	APPLE iPhone 8 Plus (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	N
3	APPLE iPhone 8 (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-silver...	Apple	77000	77000	0	11202	794	M
4	APPLE iPhone 8 (Gold, 256 GB)	https://www.flipkart.com/apple-iphone-8-gold-2...	Apple	77000	77000	0	11202	794	

```
In [17]: # figure = px.scatter(data_frame = data, x = "Number Of Ratings", y = "Sale Price")  
figure.show()
```

number of reviews of highest rated iPhones



There is a negative linear relationship between the sales price of iPhones and the number of ratings. it means iPhones with lower sale prices are sold more in India

What is the relationship between the discount percentage and the number of ratings of Flipkart ?

```
In [20]: figure = px.scatter(data_frame = data, x="Number Of Ratings",  
                             y= "Discount Percentage", size="Sale Price",  
                             trendline="ols",  
                             title="Relationship between Discount and Number of Ratings"  
figure.show()
```

Relationship between Discount and Number of Ratings of iPhone



Most Expensive and Least Expensive

```
In [21]: data.head()
```

Out[21]:

	Product Name	Product URL	Brand	Sale Price	Mrp	Discount Percentage	Number Of Ratings	Number Of Reviews	
0	APPLE iPhone 8 Plus (Gold, 64 GB)	https://www.flipkart.com/apple-iphone-8-plus-g...	Apple	49900	49900	0	3431	356	N
1	APPLE iPhone 8 Plus (Space Grey, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	
2	APPLE iPhone 8 Plus (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-plus-s...	Apple	84900	84900	0	3431	356	N
3	APPLE iPhone 8 (Silver, 256 GB)	https://www.flipkart.com/apple-iphone-8-silver...	Apple	77000	77000	0	11202	794	M
4	APPLE iPhone 8 (Gold, 256 GB)	https://www.flipkart.com/apple-iphone-8-gold-2...	Apple	77000	77000	0	11202	794	


```
In [22]: most_expensive = data.loc[data['Sale Price'].idxmax()]
least_expensive = data.loc[data['Sale Price'].idxmin()]

#display the result
print("Most Expensive Product:")
print(most_expensive)

print("\nLeast Expensive Product:")
print(least_expensive)
```

Most Expensive Product:

Product Name	APPLE iPhone 12 Pro (Silver, 512 GB)
Product URL	https://www.flipkart.com/apple-iphone-12-pro-s... (https://www.flipkart.com/apple-iphone-12-pro-s...)
Brand	Apple
Sale Price	140900
Mrp	149900
Discount Percentage	6
Number Of Ratings	542
Number Of Reviews	42
Upc	MOBFWBYZ5UY6ZBVA
Star Rating	4.5
Ram	4 GB
Name: 24, dtype: object	

Least Expensive Product:

Product Name	APPLE iPhone SE (White, 64 GB)
Product URL	https://www.flipkart.com/apple-iphone-se-white... (https://www.flipkart.com/apple-iphone-se-white...)
Brand	Apple
Sale Price	29999
Mrp	39900
Discount Percentage	24
Number Of Ratings	95807
Number Of Reviews	8154
Upc	MOBFWQ6BGWDVGF3E
Star Rating	4.5
Ram	2 GB
Name: 52, dtype: object	

In []:

In []:

In []: