Data Loading and Initial Exploration

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings

warnings.filterwarnings("ignore")
%matplotlib inline
```

In [2]:
```
df=pd.read_csv('https://raw.githubusercontent.com/krishnaik06/playstore-Dataset/
df.head()
```

Out[2]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Cont Rat
0	Photo Editor & Candy Camera & Grid & ScrapBook	ART_AND_DESIGN	4.1	159	19M	10,000+	Free	0	Every
1	Coloring book moana	ART_AND_DESIGN	3.9	967	14M	500,000+	Free	0	Every
2	U Launcher Lite – FREE Live Cool Themes, Hide ...	ART_AND_DESIGN	4.7	87510	8.7M	5,000,000+	Free	0	Every
3	Sketch - Draw & Paint	ART_AND_DESIGN	4.5	215644	25M	50,000,000+	Free	0	T
4	Pixel Draw - Number Art Coloring Book	ART_AND_DESIGN	4.3	967	2.8M	100,000+	Free	0	Every

In [3]:
```
df.shape
```

Out[3]:
```
(10841, 13)
```

In [4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10841 entries, 0 to 10840
Data columns (total 13 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   App             10841 non-null  object 
 1   Category        10841 non-null  object 
 2   Rating          9367 non-null   float64
 3   Reviews         10841 non-null  object 
 4   Size            10841 non-null  object 
 5   Installs        10841 non-null  object 
 6   Type            10840 non-null  object 
 7   Price           10841 non-null  object 
 8   Content Rating  10840 non-null  object 
 9   Genres          10841 non-null  object 
 10  Last Updated    10841 non-null  object 
 11  Current Ver     10833 non-null  object 
 12  Android Ver     10838 non-null  object 
dtypes: float64(1), object(12)
memory usage: 1.1+ MB
```

In [5]:
```
# Summary of the Dataset
df.describe()
```

Out[5]:

	Rating
count	9367.000000
mean	4.193338
std	0.537431
min	1.000000
25%	4.000000
50%	4.300000
75%	4.500000
max	19.000000

In [6]:
```
# Missing Values in the Dataset
df.isnull().sum()
```

Out[6]:
```
App                0
Category           0
Rating          1474
Reviews            0
Size               0
Installs           0
Type               1
Price              0
Content Rating     1
Genres             0
Last Updated       0
Current Ver        8
Android Ver        3
dtype: int64
```

Insights and observation

The dataset has msising values

In [7]:
```
df.head(2)
```

Out[7]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Content Rating
0	Photo Editor & Candy Camera & Grid & ScrapBook	ART_AND_DESIGN	4.1	159	19M	10,000+	Free	0	Everyone
1	Coloring book moana	ART_AND_DESIGN	3.9	967	14M	500,000+	Free	0	Everyone

Data Cleaning

In [8]:
```
df['Reviews'].unique()
```

Out[8]:
```
array(['159', '967', '87510', ..., '603', '1195', '398307'],
      shape=(6002,), dtype=object)
```

In [9]:
```
df['Reviews'].str.isnumeric().sum()
```

Out[9]:
```
np.int64(10840)
```

In [10]:
```
df[~df['Reviews'].str.isnumeric()]
```

Out[10]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Conte Ratii
10472	Life Made WI-Fi Touchscreen Photo Frame	1.9	19.0	3.0M	1,000+	Free	0	Everyone	Na

In [11]:
```
df_copy = df.copy()
```

In [12]:
```
df_copy = df_copy.drop(df_copy.index[10472])
```

In [13]:
```
df_copy[~df_copy['Reviews'].str.isnumeric()]
```

Out[13]:

App	Category	Rating	Reviews	Size	Installs	Type	Price	Content Rating	Genres	La Updat

In [14]:
```
# Convert Review Datatype to int
df_copy['Reviews'] = df_copy['Reviews'].astype(int)
```

In [15]:
```
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 10840 entries, 0 to 10840
Data columns (total 13 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   App             10840 non-null  object 
 1   Category        10840 non-null  object 
 2   Rating          9366 non-null   float64
 3   Reviews         10840 non-null  int64  
 4   Size            10840 non-null  object 
 5   Installs        10840 non-null  object 
 6   Type            10839 non-null  object 
 7   Price           10840 non-null  object 
 8   Content Rating  10840 non-null  object 
 9   Genres          10840 non-null  object 
 10  Last Updated    10840 non-null  object 
 11  Current Ver     10832 non-null  object 
 12  Android Ver     10838 non-null  object 
dtypes: float64(1), int64(1), object(11)
memory usage: 1.2+ MB
```

In [16]:
```
df_copy['Size'].unique()
```

Out[16]:
```
array(['19M', '14M', '8.7M', '25M', '2.8M', '5.6M', '29M', '33M', '3.1M',
       '28M', '12M', '20M', '21M', '37M', '2.7M', '5.5M', '17M', '39M',
       '31M', '4.2M', '7.0M', '23M', '6.0M', '6.1M', '4.6M', '9.2M',
       '5.2M', '11M', '24M', 'Varies with device', '9.4M', '15M', '10M',
       '1.2M', '26M', '8.0M', '7.9M', '56M', '57M', '35M', '54M', '201k',
       '3.6M', '5.7M', '8.6M', '2.4M', '27M', '2.5M', '16M', '3.4M',
       '8.9M', '3.9M', '2.9M', '38M', '32M', '5.4M', '18M', '1.1M',
       '2.2M', '4.5M', '9.8M', '52M', '9.0M', '6.7M', '30M', '2.6M',
       '7.1M', '3.7M', '22M', '7.4M', '6.4M', '3.2M', '8.2M', '9.9M',
       '4.9M', '9.5M', '5.0M', '5.9M', '13M', '73M', '6.8M', '3.5M',
       '4.0M', '2.3M', '7.2M', '2.1M', '42M', '7.3M', '9.1M', '55M',
       '23k', '6.5M', '1.5M', '7.5M', '51M', '41M', '48M', '8.5M', '46M',
       '8.3M', '4.3M', '4.7M', '3.3M', '40M', '7.8M', '8.8M', '6.6M',
       '5.1M', '61M', '66M', '79k', '8.4M', '118k', '44M', '695k', '1.6M',
       '6.2M', '18k', '53M', '1.4M', '3.0M', '5.8M', '3.8M', '9.6M',
       '45M', '63M', '49M', '77M', '4.4M', '4.8M', '70M', '6.9M', '9.3M',
       '10.0M', '8.1M', '36M', '84M', '97M', '2.0M', '1.9M', '1.8M',
       '5.3M', '47M', '556k', '526k', '76M', '7.6M', '59M', '9.7M', '78M',
       '72M', '43M', '7.7M', '6.3M', '334k', '34M', '93M', '65M', '79M',
       '100M', '58M', '50M', '68M', '64M', '67M', '60M', '94M', '232k',
       '99M', '624k', '95M', '8.5k', '41k', '292k', '11k', '80M', '1.7M',
       '74M', '62M', '69M', '75M', '98M', '85M', '82M', '96M', '87M',
       '71M', '86M', '91M', '81M', '92M', '83M', '88M', '704k', '862k',
       '899k', '378k', '266k', '375k', '1.3M', '975k', '980k', '4.1M',
       '89M', '696k', '544k', '525k', '920k', '779k', '853k', '720k',
       '713k', '772k', '318k', '58k', '241k', '196k', '857k', '51k',
       '953k', '865k', '251k', '930k', '540k', '313k', '746k', '203k',
       '26k', '314k', '239k', '371k', '220k', '730k', '756k', '91k',
       '293k', '17k', '74k', '14k', '317k', '78k', '924k', '902k', '818k',
       '81k', '939k', '169k', '45k', '475k', '965k', '90M', '545k', '61k',
       '283k', '655k', '714k', '93k', '872k', '121k', '322k', '1.0M',
       '976k', '172k', '238k', '549k', '206k', '954k', '444k', '717k',
       '210k', '609k', '308k', '705k', '306k', '904k', '473k', '175k',
       '350k', '383k', '454k', '421k', '70k', '812k', '442k', '842k',
       '417k', '412k', '459k', '478k', '335k', '782k', '721k', '430k',
       '429k', '192k', '200k', '460k', '728k', '496k', '816k', '414k',
       '506k', '887k', '613k', '243k', '569k', '778k', '683k', '592k',
       '319k', '186k', '840k', '647k', '191k', '373k', '437k', '598k',
       '716k', '585k', '982k', '222k', '219k', '55k', '948k', '323k',
       '691k', '511k', '951k', '963k', '25k', '554k', '351k', '27k',
       '82k', '208k', '913k', '514k', '551k', '29k', '103k', '898k',
       '743k', '116k', '153k', '209k', '353k', '499k', '173k', '597k',
       '809k', '122k', '411k', '400k', '801k', '787k', '237k', '50k',
       '643k', '986k', '97k', '516k', '837k', '780k', '961k', '269k',
       '20k', '498k', '600k', '749k', '642k', '881k', '72k', '656k',
       '601k', '221k', '228k', '108k', '940k', '176k', '33k', '663k',
       '34k', '942k', '259k', '164k', '458k', '245k', '629k', '28k',
       '288k', '775k', '785k', '636k', '916k', '994k', '309k', '485k',
       '914k', '903k', '608k', '500k', '54k', '562k', '847k', '957k',
       '688k', '811k', '270k', '48k', '329k', '523k', '921k', '874k',
       '981k', '784k', '280k', '24k', '518k', '754k', '892k', '154k',
       '860k', '364k', '387k', '626k', '161k', '879k', '39k', '970k',
       '170k', '141k', '160k', '144k', '143k', '190k', '376k', '193k',
       '246k', '73k', '658k', '992k', '253k', '420k', '404k', '470k',
       '226k', '240k', '89k', '234k', '257k', '861k', '467k', '157k',
       '44k', '676k', '67k', '552k', '885k', '1020k', '582k', '619k'],
      dtype=object)
```

In [17]:
```
# 19000K = 19M
```

In [18]:
```
df_copy['Size'].isnull().sum()
```

Out[18]:
```
np.int64(0)
```

In [19]:
```
df_copy['Size'] = df_copy['Size'].str.replace('M', '000')
df_copy['Size'] = df_copy['Size'].str.replace('k', '')
df_copy['Size'] = df_copy['Size'].replace('Varies with device', np.nan)
df_copy['Size'] = df_copy['Size'].astype(float)
```

In [20]:
```
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 10840 entries, 0 to 10840
Data columns (total 13 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   App             10840 non-null  object 
 1   Category        10840 non-null  object 
 2   Rating          9366 non-null   float64
 3   Reviews         10840 non-null  int64  
 4   Size            9145 non-null   float64
 5   Installs        10840 non-null  object 
 6   Type            10839 non-null  object 
 7   Price           10840 non-null  object 
 8   Content Rating  10840 non-null  object 
 9   Genres          10840 non-null  object 
 10  Last Updated    10840 non-null  object 
 11  Current Ver     10832 non-null  object 
 12  Android Ver     10838 non-null  object 
dtypes: float64(2), int64(1), object(10)
memory usage: 1.2+ MB
```

In [21]:
```
df_copy['Size']
```

Out[21]:
```
0        19000.0
1        14000.0
2            8.7
3        25000.0
4            2.8
          ...   
10836    53000.0
10837        3.6
10838        9.5
10839        NaN
10840    19000.0
Name: Size, Length: 10840, dtype: float64
```

In [22]:
```
df_copy.head()
```

Out[22]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Co I
0	Photo Editor & Candy Camera & Grid & ScrapBook	ART_AND_DESIGN	4.1	159	19000.0	10,000+	Free	0	Eve
1	Coloring book moana	ART_AND_DESIGN	3.9	967	14000.0	500,000+	Free	0	Eve
2	U Launcher Lite – FREE Live Cool Themes, Hide ...	ART_AND_DESIGN	4.7	87510	8.7	5,000,000+	Free	0	Eve
3	Sketch - Draw & Paint	ART_AND_DESIGN	4.5	215644	25000.0	50,000,000+	Free	0	
4	Pixel Draw - Number Art Coloring Book	ART_AND_DESIGN	4.3	967	2.8	100,000+	Free	0	Eve

In [23]:
```
df_copy['Installs'].unique()
```

Out[23]:
```
array(['10,000+', '500,000+', '5,000,000+', '50,000,000+', '100,000+',
       '50,000+', '1,000,000+', '10,000,000+', '5,000+', '100,000,000+',
       '1,000,000,000+', '1,000+', '500,000,000+', '50+', '100+', '500+',
       '10+', '1+', '5+', '0+', '0'], dtype=object)
```

In [24]:
```
df_copy['Price'].unique()
```

Out[24]:
```
array(['0', '$4.99', '$3.99', '$6.99', '$1.49', '$2.99', '$7.99', '$5.99',
       '$3.49', '$1.99', '$9.99', '$7.49', '$0.99', '$9.00', '$5.49',
       '$10.00', '$24.99', '$11.99', '$79.99', '$16.99', '$14.99',
       '$1.00', '$29.99', '$12.99', '$2.49', '$10.99', '$1.50', '$19.99',
       '$15.99', '$33.99', '$74.99', '$39.99', '$3.95', '$4.49', '$1.70',
       '$8.99', '$2.00', '$3.88', '$25.99', '$399.99', '$17.99',
       '$400.00', '$3.02', '$1.76', '$4.84', '$4.77', '$1.61', '$2.50',
       '$1.59', '$6.49', '$1.29', '$5.00', '$13.99', '$299.99', '$379.99',
       '$37.99', '$18.99', '$389.99', '$19.90', '$8.49', '$1.75',
       '$14.00', '$4.85', '$46.99', '$109.99', '$154.99', '$3.08',
       '$2.59', '$4.80', '$1.96', '$19.40', '$3.90', '$4.59', '$15.46',
       '$3.04', '$4.29', '$2.60', '$3.28', '$4.60', '$28.99', '$2.95',
       '$2.90', '$1.97', '$200.00', '$89.99', '$2.56', '$30.99', '$3.61',
       '$394.99', '$1.26', '$1.20', '$1.04'], dtype=object)
```

In [25]:
```
chars_to_remove = ['+', ',', '$']
cols_to_clean = ['Installs', 'Price']
for item in chars_to_remove:
```

```
    for cols in cols_to_clean:
        df_copy[cols] = df_copy[cols].str.replace(item, '')
```

In [26]:
```
df_copy['Price'].unique()
```

Out[26]:
```
array(['0', '4.99', '3.99', '6.99', '1.49', '2.99', '7.99', '5.99',
       '3.49', '1.99', '9.99', '7.49', '0.99', '9.00', '5.49', '10.00',
       '24.99', '11.99', '79.99', '16.99', '14.99', '1.00', '29.99',
       '12.99', '2.49', '10.99', '1.50', '19.99', '15.99', '33.99',
       '74.99', '39.99', '3.95', '4.49', '1.70', '8.99', '2.00', '3.88',
       '25.99', '399.99', '17.99', '400.00', '3.02', '1.76', '4.84',
       '4.77', '1.61', '2.50', '1.59', '6.49', '1.29', '5.00', '13.99',
       '299.99', '379.99', '37.99', '18.99', '389.99', '19.90', '8.49',
       '1.75', '14.00', '4.85', '46.99', '109.99', '154.99', '3.08',
       '2.59', '4.80', '1.96', '19.40', '3.90', '4.59', '15.46', '3.04',
       '4.29', '2.60', '3.28', '4.60', '28.99', '2.95', '2.90', '1.97',
       '200.00', '89.99', '2.56', '30.99', '3.61', '394.99', '1.26',
       '1.20', '1.04'], dtype=object)
```

In [27]:
```
df_copy['Installs'].unique()
```

Out[27]:
```
array(['10000', '500000', '5000000', '50000000', '100000', '50000',
       '1000000', '10000000', '5000', '100000000', '1000000000', '1000',
       '500000000', '50', '100', '500', '10', '1', '5', '0'], dtype=object)
```

In [28]:
```
df_copy['Installs'] = df_copy['Installs'].astype(int)
df_copy['Price'] = df_copy['Price'].astype(float)
```

In [29]:
```
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 10840 entries, 0 to 10840
Data columns (total 13 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   App             10840 non-null  object 
 1   Category        10840 non-null  object 
 2   Rating          9366 non-null   float64
 3   Reviews         10840 non-null  int64  
 4   Size            9145 non-null   float64
 5   Installs        10840 non-null  int64  
 6   Type            10839 non-null  object 
 7   Price           10840 non-null  float64
 8   Content Rating  10840 non-null  object 
 9   Genres          10840 non-null  object 
 10  Last Updated    10840 non-null  object 
 11  Current Ver     10832 non-null  object 
 12  Android Ver     10838 non-null  object 
dtypes: float64(3), int64(2), object(8)
memory usage: 1.2+ MB
```

In [30]:
```
# handling the last updat feature
df_copy['Last Updated'].unique()
```

Out[30]:
```
array(['January 7, 2018', 'January 15, 2018', 'August 1, 2018', ...,
       'January 20, 2014', 'February 16, 2014', 'March 23, 2014'],
      shape=(1377,), dtype=object)
```

In [31]:
```
df_copy['Last Updated'] = pd.to_datetime(df_copy['Last Updated'])
df_copy['Day'] = df_copy['Last Updated'].dt.day
```

```
df_copy['Month'] = df_copy['Last Updated'].dt.month
df_copy['Year'] = df_copy['Last Updated'].dt.year
```

In [32]:
```
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 10840 entries, 0 to 10840
Data columns (total 16 columns):
 #   Column          Non-Null Count  Dtype         
---  ------          --------------  -----         
 0   App             10840 non-null  object        
 1   Category        10840 non-null  object        
 2   Rating          9366 non-null   float64       
 3   Reviews         10840 non-null  int64         
 4   Size            9145 non-null   float64       
 5   Installs        10840 non-null  int64         
 6   Type            10839 non-null  object        
 7   Price           10840 non-null  float64       
 8   Content Rating  10840 non-null  object        
 9   Genres          10840 non-null  object        
 10  Last Updated    10840 non-null  datetime64[ns]
 11  Current Ver     10832 non-null  object        
 12  Android Ver     10838 non-null  object        
 13  Day             10840 non-null  int32         
 14  Month           10840 non-null  int32         
 15  Year            10840 non-null  int32         
dtypes: datetime64[ns](1), float64(3), int32(3), int64(2), object(7)
memory usage: 1.3+ MB
```

In [33]:
```
df_copy.head()
```

Out[33]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Cont Rat
0	Photo Editor & Candy Camera & Grid & ScrapBook	ART_AND_DESIGN	4.1	159	19000.0	10000	Free	0.0	Every
1	Coloring book moana	ART_AND_DESIGN	3.9	967	14000.0	500000	Free	0.0	Every
2	U Launcher Lite – FREE Live Cool Themes, Hide ...	ART_AND_DESIGN	4.7	87510	8.7	5000000	Free	0.0	Every
3	Sketch - Draw & Paint	ART_AND_DESIGN	4.5	215644	25000.0	50000000	Free	0.0	T
4	Pixel Draw - Number Art Coloring Book	ART_AND_DESIGN	4.3	967	2.8	100000	Free	0.0	Every

In [34]:
```
df_copy.to_csv('googleplaystore_cleaned.csv')
```

EDA

In [35]:
```
df_copy.head()
```

Out[35]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Cont Rat
0	Photo Editor & Candy Camera & Grid & ScrapBook	ART_AND_DESIGN	4.1	159	19000.0	10000	Free	0.0	Every
1	Coloring book moana	ART_AND_DESIGN	3.9	967	14000.0	500000	Free	0.0	Every
2	U Launcher Lite – FREE Live Cool Themes, Hide ...	ART_AND_DESIGN	4.7	87510	8.7	5000000	Free	0.0	Every
3	Sketch - Draw & Paint	ART_AND_DESIGN	4.5	215644	25000.0	50000000	Free	0.0	T
4	Pixel Draw - Number Art Coloring Book	ART_AND_DESIGN	4.3	967	2.8	100000	Free	0.0	Every

In [36]:
```
df_copy[df_copy.duplicated('App')].shape
```

Out[36]:
```
(1181, 16)
```

Observation

- The dataset has duplicate records for some apps. We will remove those duplicates keeping the first occurrence.

In [37]:
```
df_copy = df_copy.drop_duplicates(subset=['App'], keep='first')
```

In [38]:
```
df_copy.shape
```

Out[38]:
```
(9659, 16)
```

Explore Data

In [39]:
```
numeric_features = [feature for feature in df_copy.columns if df_copy[feature].d
categorical_features = [feature for feature in df_copy.columns if df_copy[featur

print('We have {} numerical features : {}'.format(len(numeric_features), numeric
print('We have {} categorical features : {}'.format(len(categorical_features), c
```

```
We have 9 numerical features : ['Rating', 'Reviews', 'Size', 'Installs', 'Price',
'Last Updated', 'Day', 'Month', 'Year']
We have 7 categorical features : ['App', 'Category', 'Type', 'Content Rating', 'G
enres', 'Current Ver', 'Android Ver']
```

3.2 Feature Information

1. App :- Name of the App
2. Category :- Category under which the App falls.
3. Rating :- Application's rating on playstore
4. Reviews :- Number of reviews of the App.
5. Size :- Size of the App.
6. Install :- Number of Installs of the App
7. Type :- If the App is free/paid
8. Price :- Price of the app (0 if it is Free)
9. Content Rating :- Appropiate Target Audience of the App.
10. Genres:- Genre under which the App falls.
11. Last Updated :- Date when the App was last updated
12. Current Ver :- Current Version of the Application
13. Android Ver :- Minimum Android Version required to run the App

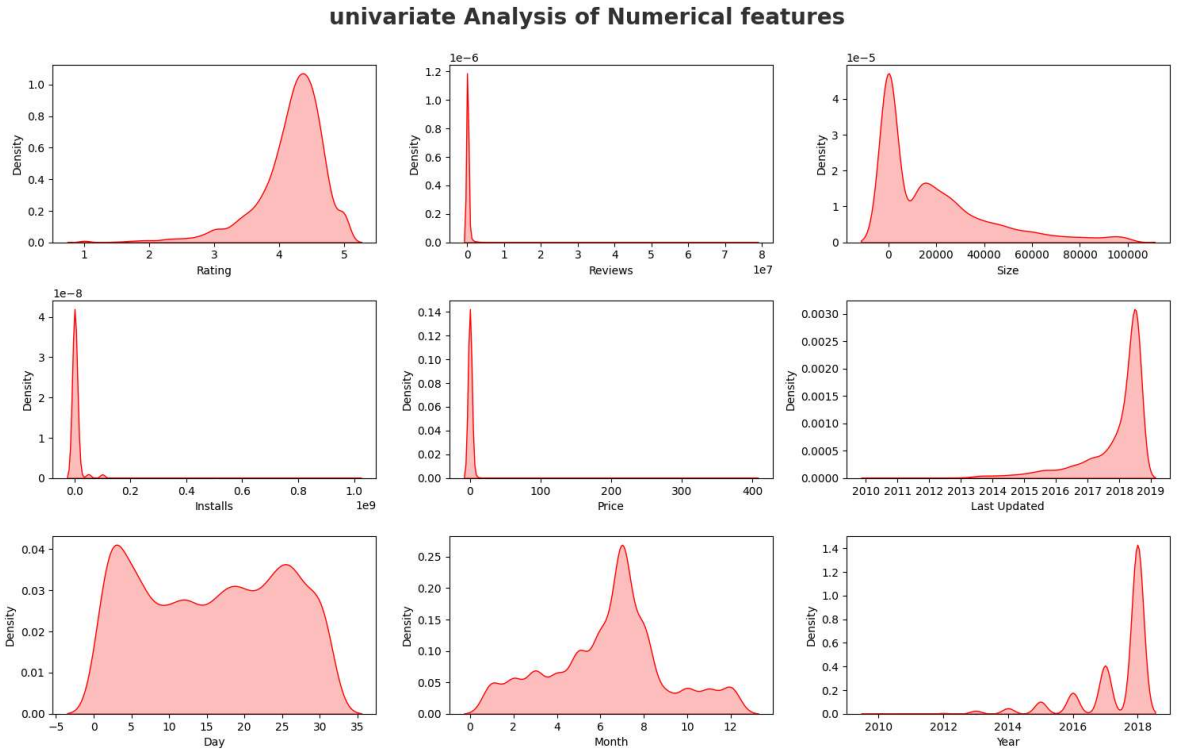
In [40]:
```
# Proportion of count data on categorical columns
for col in categorical_features:
    print(df_copy[col].value_counts(normalize=True)*100)
    print('--------------------------------')
```

```
App
Photo Editor & Candy Camera & Grid & ScrapBook        0.010353
Coloring book moana                                   0.010353
U Launcher Lite – FREE Live Cool Themes, Hide Apps    0.010353
Sketch - Draw & Paint                                 0.010353
Pixel Draw - Number Art Coloring Book                 0.010353
                                                        ...
Sya9a Maroc - FR                                      0.010353
Fr. Mike Schmitz Audio Teachings                      0.010353
Parkinson Exercices FR                                0.010353
The SCP Foundation DB fr nn5n                         0.010353
iHoroscope - 2018 Daily Horoscope & Astrology         0.010353
Name: proportion, Length: 9659, dtype: float64
--------------------------------
Category
FAMILY                18.966767
GAME                   9.928564
TOOLS                  8.561963
BUSINESS               4.348276
MEDICAL                4.089450
PERSONALIZATION        3.892743
PRODUCTIVITY           3.872036
LIFESTYLE              3.820271
FINANCE                3.571798
SPORTS                 3.364738
COMMUNICATION          3.261207
HEALTH_AND_FITNESS     2.981675
PHOTOGRAPHY            2.909204
NEWS_AND_MAGAZINES     2.629672
SOCIAL                 2.474376
BOOKS_AND_REFERENCE    2.298375
TRAVEL_AND_LOCAL       2.267315
SHOPPING               2.091314
DATING                 1.770370
VIDEO_PLAYERS          1.687545
MAPS_AND_NAVIGATION    1.356248
EDUCATION              1.232012
FOOD_AND_DRINK         1.159540
ENTERTAINMENT          1.056010
AUTO_AND_VEHICLES      0.880008
LIBRARIES_AND_DEMO     0.869655
WEATHER                0.817890
HOUSE_AND_HOME         0.766125
ART_AND_DESIGN         0.662594
EVENTS                 0.662594
PARENTING              0.621182
COMICS                 0.579770
BEAUTY                 0.548711
Name: proportion, dtype: float64
--------------------------------
Type
Free    92.172292
Paid     7.827708
Name: proportion, dtype: float64
--------------------------------
Content Rating
Everyone           81.820064
Teen               10.725748
Mature 17+          4.068744
Everyone 10+        3.333678
```

```
Adults only 18+     0.031059
Unrated             0.020706
Name: proportion, dtype: float64
--------------------------------
Genres
Tools                        8.551610
Entertainment                5.808055
Education                    5.280050
Business                     4.348276
Medical                      4.089450
                               ...
Role Playing;Brain Games     0.010353
Strategy;Education           0.010353
Racing;Pretend Play          0.010353
Communication;Creativity     0.010353
Strategy;Creativity          0.010353
Name: proportion, Length: 118, dtype: float64
--------------------------------
Current Ver
Varies with device    10.931510
1.0                    8.278935
1.1                    2.694021
1.2                    1.823645
2.0                    1.543881
                         ...
0.7.1                  0.010362
4.6.71                 0.010362
2.0.148.0              0.010362
1.0.0.96               0.010362
1.022                  0.010362
Name: proportion, Length: 2817, dtype: float64
--------------------------------
Android Ver
4.1 and up            22.802112
4.0.3 and up          14.445480
4.0 and up            13.306410
Varies with device    10.251631
4.4 and up             8.470540
2.3 and up             6.378793
5.0 and up             5.301854
4.2 and up             3.852128
2.3.3 and up           2.826965
2.2 and up             2.474889
3.0 and up             2.392047
4.3 and up             2.288495
2.1 and up             1.377239
1.6 and up             1.201201
6.0 and up             0.559180
7.0 and up             0.434918
3.2 and up             0.372787
2.0 and up             0.331366
5.1 and up             0.227814
1.5 and up             0.207104
4.4W and up            0.113907
3.1 and up             0.103552
2.0.1 and up           0.072486
8.0 and up             0.062131
7.1 and up             0.031066
5.0 - 8.0              0.020710
4.0.3 - 7.1.1          0.020710
```

```
1.0 and up             0.020710
7.0 - 7.1.1            0.010355
4.1 - 7.1.1            0.010355
5.0 - 6.0              0.010355
2.2 - 7.1.1            0.010355
5.0 - 7.1.1            0.010355
Name: proportion, dtype: float64
--------------------------------
```

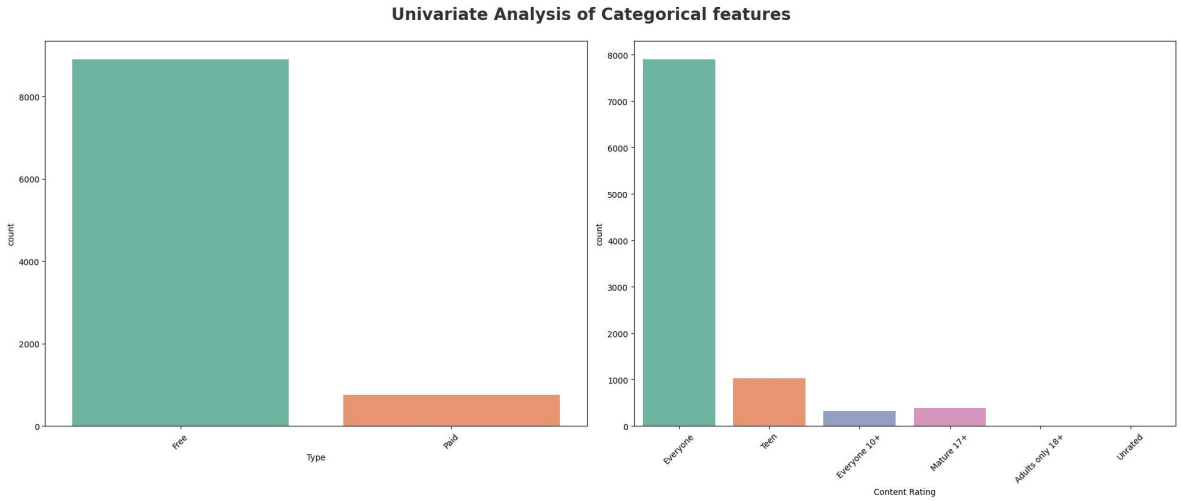
In [41]:
```
# Proportion of count data on Numerical columns
plt.figure(figsize=(15, 15))
plt.suptitle('univariate Analysis of Numerical features', fontsize=20, fontweigh

for i in range(0, len(numeric_features)):
    plt.subplot(5, 3, i+1)
    sns.kdeplot(x=df_copy[numeric_features[i]], shade = True, color = 'r')
    plt.xlabel(numeric_features[i])
    plt.tight_layout()
```



Observations

- Rating and Year are left skewed while Reviews, Size, Installs and Price are right skewed.

In [42]:
```
# categorical columns
plt.figure(figsize=(20, 15))
plt.suptitle('Univariate Analysis of Categorical features', fontsize=20, fontwei
category = ['Type', 'Content Rating']
for i in range(0, len(category)):
    plt.subplot(2, 2, i+1)
    sns.countplot(x=df_copy[category[i]], palette='Set2')
    plt.xlabel(category[i])
    plt.xticks(rotation=45)
    plt.tight_layout()
```



Which is the most popular app category?

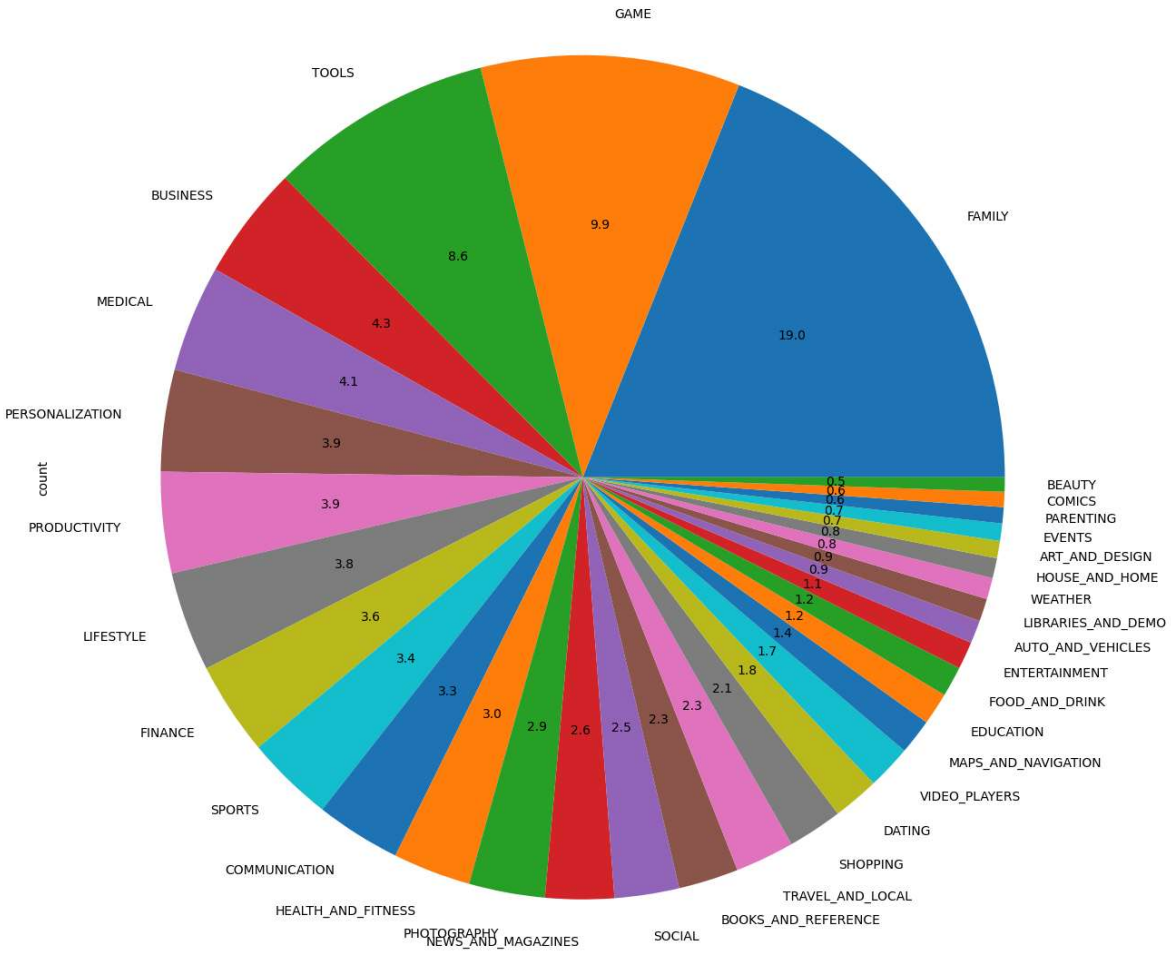
In [43]:
```
df_copy.head(2)
```

Out[43]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Conter Ratin
0	Photo Editor & Candy Camera & Grid & ScrapBook	ART_AND_DESIGN	4.1	159	19000.0	10000	Free	0.0	Everyor
1	Coloring book moana	ART_AND_DESIGN	3.9	967	14000.0	500000	Free	0.0	Everyor

In [45]:
```
df_copy['Category'].value_counts().plot.pie(y=df_copy['Category'],figsize=(15,16
```

Out[45]:
```
<Axes: ylabel='count'>
```



Observations

1. There are more kinds of apps in playstore which are under category of family, games & tools
2. Beatuty,comics,arts and weather kinds of apps are very less in playstore

Top 10 App Categories

In [46]:
```
category = pd.DataFrame(df_copy['Category'].value_counts())          #Dataframe of
category.rename(columns = {'Category':'count'},inplace=True)
```

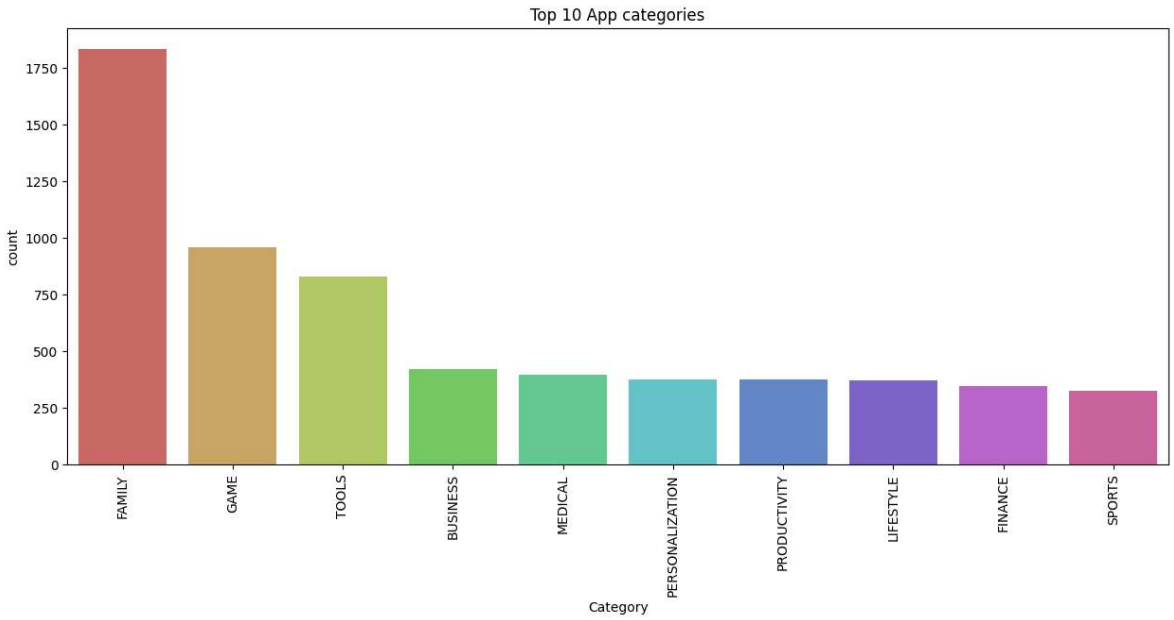
In [47]:
```
category
```

Out[47]:

Category	count
FAMILY	1832
GAME	959
TOOLS	827
BUSINESS	420
MEDICAL	395
PERSONALIZATION	376
PRODUCTIVITY	374
LIFESTYLE	369
FINANCE	345
SPORTS	325
COMMUNICATION	315
HEALTH_AND_FITNESS	288
PHOTOGRAPHY	281
NEWS_AND_MAGAZINES	254
SOCIAL	239
BOOKS_AND_REFERENCE	222
TRAVEL_AND_LOCAL	219
SHOPPING	202
DATING	171
VIDEO_PLAYERS	163
MAPS_AND_NAVIGATION	131
EDUCATION	119
FOOD_AND_DRINK	112
ENTERTAINMENT	102
AUTO_AND_VEHICLES	85
LIBRARIES_AND_DEMO	84
WEATHER	79
HOUSE_AND_HOME	74
ART_AND_DESIGN	64
EVENTS	64
PARENTING	60
COMICS	56

Category	count
BEAUTY	53

In [48]:
```
## top 10 app
plt.figure(figsize=(15,6))
sns.barplot(x=category.index[:10], y ='count',data = category[:10],palette='hls'
plt.title('Top 10 App categories')
plt.xticks(rotation=90)
plt.show()
```



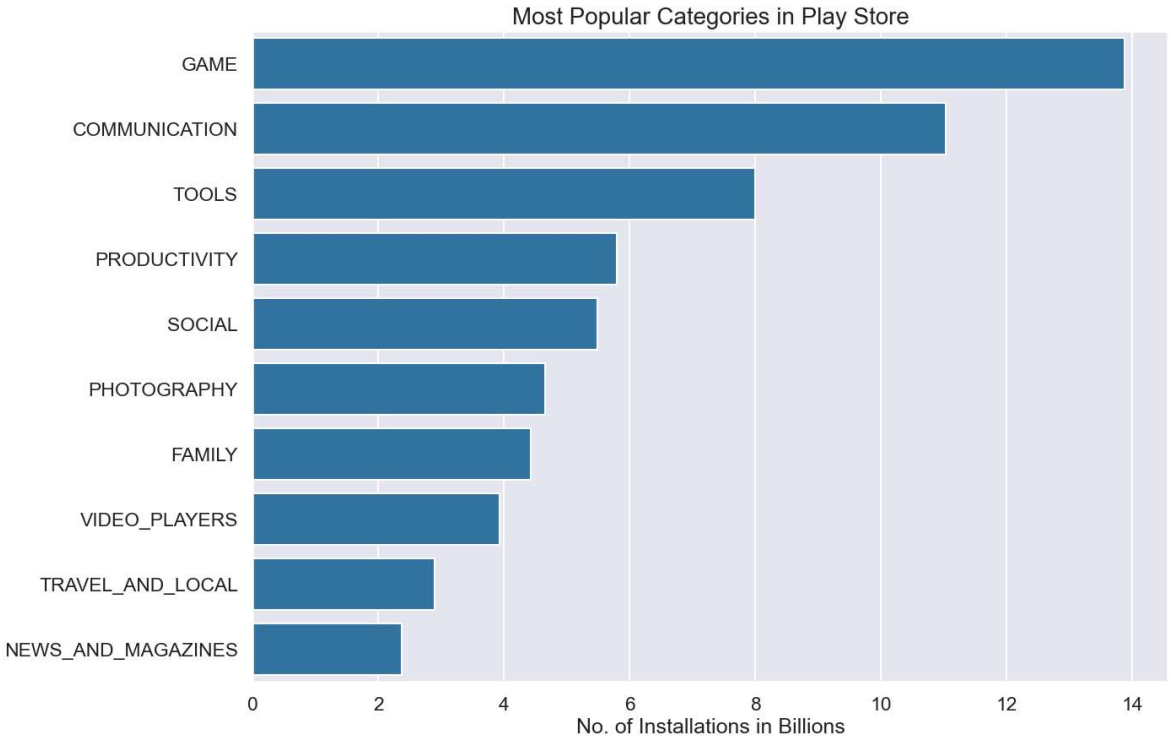
Insights

1. Family category has the most number of apps with 18% of apps belonging to it, followed by Games category which has 11% of the apps.
2. Least number of apps belong to the Beauty category with less than 1% of the total apps belonging to it.

Which Category has largest number of installations??

In [49]:
```
df_cat_installs = df_copy.groupby(['Category'])['Installs'].sum().sort_values(as
df_cat_installs.Installs = df_cat_installs.Installs/1000000000# converting into
df2 = df_cat_installs.head(10)
plt.figure(figsize = (14,10))
sns.set_context("talk")
sns.set_style("darkgrid")

ax = sns.barplot(x = 'Installs' , y = 'Category' , data = df2 )
ax.set_xlabel('No. of Installations in Billions')
ax.set_ylabel('')
ax.set_title("Most Popular Categories in Play Store", size = 20)
```

Out[49]: Text(0.5, 1.0, 'Most Popular Categories in Play Store')

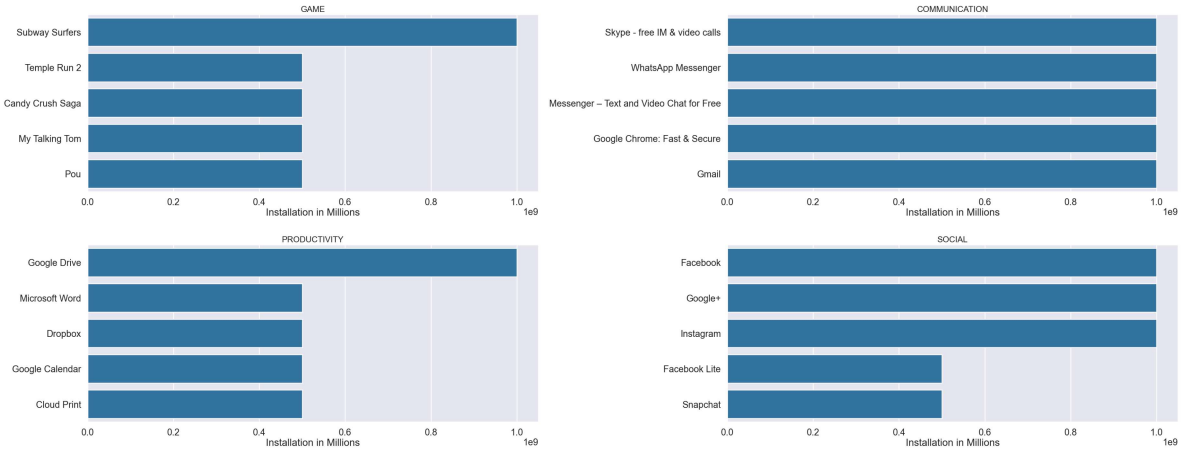


Insights

1. Out of all the categories "GAME" has the most number of Installations.
2. With almost 35 Billion Installations GAME is the most popular Category in Google App store

What are the Top 5 most installed Apps in Each popular Categories ??

In [50]:
```
dfa = df_copy.groupby(['Category' ,'App'])['Installs'].sum().reset_index()
dfa = dfa.sort_values('Installs', ascending = False)
apps = ['GAME', 'COMMUNICATION', 'PRODUCTIVITY', 'SOCIAL' ]
sns.set_context("poster")
sns.set_style("darkgrid")

plt.figure(figsize=(40,30))

for i,app in enumerate(apps):
    df2 = dfa[dfa.Category == app]
    df3 = df2.head(5)
    plt.subplot(4,2,i+1)
    sns.barplot(data= df3,x= 'Installs' ,y='App' )
    plt.xlabel('Installation in Millions')
    plt.ylabel('')
    plt.title(app,size = 20)

plt.tight_layout()
plt.subplots_adjust(hspace= .3)
plt.show()
```



Insights

- Most popular game is Subway Surfers.
- Most popular communication app is Hangouts.
- Most popular productivity app is Google Drive.
- Most popular social app is Instagram.

How many apps are there on Google Play Store which get 5 ratings??

In [51]:
```
rating = df_copy.groupby(['Category','Installs', 'App'])['Rating'].sum().sort_va

toprating_apps = rating[rating.Rating == 5.0]
print("Number of 5 rated apps",toprating_apps.shape[0])
toprating_apps.head(1)
```

```
Number of 5 rated apps 271
```

Out[51]:

	Category	Installs	App	Rating
0	FAMILY	10	DN Employee	5.0

Result

- There are 271 five rated apps on Google Play store
- Top most is 'CT Brain Interpretation' from 'Family' Category

In [52]:
```
df_copy.head()
```

Out[52]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Cont Rat
0	Photo Editor & Candy Camera & Grid & ScrapBook	ART_AND_DESIGN	4.1	159	19000.0	10000	Free	0.0	Every
1	Coloring book moana	ART_AND_DESIGN	3.9	967	14000.0	500000	Free	0.0	Every
2	U Launcher Lite – FREE Live Cool Themes, Hide ...	ART_AND_DESIGN	4.7	87510	8.7	5000000	Free	0.0	Every
3	Sketch - Draw & Paint	ART_AND_DESIGN	4.5	215644	25000.0	50000000	Free	0.0	T
4	Pixel Draw - Number Art Coloring Book	ART_AND_DESIGN	4.3	967	2.8	100000	Free	0.0	Every

In [ ]: