What is Pandas

Pandas is a fast, powerful, flexible and easy to use open source data analysis and manipulation tool,built on top of the Python programming language.

- Prudhvi Vardhan Notes

Pandas Series

A Pandas Series is like a column in a table. It is a 1-D array holding data of any type.

Importing Pandas

In [4]:
```
import numpy as np
import pandas as pd
```

Series using String

In [6]:
```
# string
country = ['India','Pakistan','USA','Nepal','Srilanka']
pd.Series(country)
```

Out[6]:
```
0       India
1    Pakistan
2         USA
3       Nepal
4    Srilanka
dtype: object
```

In [7]:
```
# integers
marks= [13,24,56,78,100]
pd.Series(marks)
```

Out[7]:
```
0     13
1     24
2     56
3     78
4    100
dtype: int64
```

In [8]:
```
# custom index
marks = [67,57,89,100]
subjects = ['maths','english','science','hindi']

pd.Series(marks,index=subjects)
```

Out[8]:
```
maths       67
english     57
science     89
hindi      100
dtype: int64
```

In [10]:
```
# setting a name
marks = pd.Series(marks , index=subjects , name="Jack Marks")
marks
```

Out[10]:
```
maths       67
english     57
science     89
hindi      100
Name: Jack Marks, dtype: int64
```

Series from dictionary

When a Pandas Series is converted to a dictionary using the to_dict() method, the resulting dictionary has the same keys and values as the Series. The index values of the Series become the keys in the dictionary, and the corresponding values become the values in the dictionary.

In [11]:
```
marks = {
    'maths':67,
    'english':57,
    'science':89,
    'hindi':100
}
marks_series = pd.Series(marks,name="jack Marks")
```

In [12]:
```
marks_series
```

Out[12]:
```
maths       67
english     57
science     89
hindi      100
Name: jack Marks, dtype: int64
```

Series Attributes

size: Returns the number of elements in the Series.

In [13]:
```
# size
marks_series.size
```

Out[13]:
```
4
```

dtype: Returns the data type of the values in the Series.

In [14]:
```
# dtype
marks_series.dtype
```

Out[14]:
```
dtype('int64')
```

name: Returns the name of the Series.

In [15]:
```
# name
marks_series.name
```

Out[15]:
```
'jack Marks'
```

unique is an attribute of a Pandas Series that returns an array of the unique values in the Series.

In [16]:
```
# is_unique
marks_series.is_unique
```

Out[16]:
```
True
```

In [17]:
```
pd.Series([1,1,2,3,4,44,2]).is_unique #It gives false because of repetation
```

Out[17]:
```
False
```

index: Returns the index labels of the Series.

In [18]:
```
# index
marks_series.index
```

Out[18]:
```
Index(['maths', 'english', 'science', 'hindi'], dtype='object')
```

values: Returns the data contained in the Series as a NumPy array.

In [19]:
```
# values
marks_series.values
```

Out[19]:
```
array([ 67,  57,  89, 100], dtype=int64)
```

In [20]:
```
type(marks_series.values)
```

Out[20]:
```
numpy.ndarray
```

Series using read_csv

In [21]:
```
# with one col
sub = pd.read_csv("D:\\datascience\\Nitish isr\\Pandas\\subs.csv")
```

Pandas.read_csv

Automatically converts everything into data frames not in series.

In [23]:
```
type(sub)
```
Out[23]:
```
pandas.core.frame.DataFrame
```

In [30]:
```
sub.head(5)
```
Out[30]:

	Subscribers gained
0	48
1	57
2	40
3	43
4	44

To convert data into series,

we have to apply a parameter called as"Squeeze" is equals to True.

In [31]:
```
sub = pd.read_csv("subs.csv",squeeze=True)
```

In [32]:
```
type(sub)
```
Out[32]:
```
pandas.core.series.Series
```

In [33]:
```
sub
```
Out[33]:
```
0       48
1       57
2       40
3       43
4       44
      ...
360    231
361    226
362    155
363    144
364    172
Name: Subscribers gained, Length: 365, dtype: int64
```

In [56]:
```
#With 2 col
kl=pd.read_csv("kohli_ipl.csv",index_col="match_no",squeeze=True)
```

In [57]:
```
kl
```

Out[57]:
```
match_no
1       1
2      23
3      13
4      12
5       1
       ..
211     0
212    20
213    73
214    25
215     7
Name: runs, Length: 215, dtype: int64
```

In [37]:
```
movies=pd.read_csv( "bollywood.csv", index_col="movie",squeeze=True)
```

In [38]:
```
movies
```

Out[38]:
```
movie
Uri: The Surgical Strike                   Vicky Kaushal
Battalion 609                                Vicky Ahuja
The Accidental Prime Minister (film)         Anupam Kher
Why Cheat India                            Emraan Hashmi
Evening Shadows                         Mona Ambegaonkar
                                              ...
Hum Tumhare Hain Sanam                    Shah Rukh Khan
Aankhen (2002 film)                     Amitabh Bachchan
Saathiya (film)                             Vivek Oberoi
Company (film)                                Ajay Devgn
Awara Paagal Deewana                        Akshay Kumar
Name: lead, Length: 1500, dtype: object
```

Series Methods

head(n): Returns the first n elements of the Series.

In [40]:
```
# Head
sub.head()
```

Out[40]:
```
0    48
1    57
2    40
3    43
4    44
Name: Subscribers gained, dtype: int64
```

tail(n): Returns the last n elements of the Series.

In [41]:
```
# tail
kl.tail()
```

Out[41]:
```
match_no
211     0
212    20
213    73
214    25
215     7
Name: runs, dtype: int64
```

In [43]:
```
# sample - Gives random data
movies.sample()
```

Out[43]:
```
movie
Enemmy    Sunil Shetty
Name: lead, dtype: object
```

value_counts(): Returns a Series containing the counts of unique values in the Series.

In [44]:
```
# Value Counts
movies.value_counts()
```

Out[44]:
```
Akshay Kumar        48
Amitabh Bachchan    45
Ajay Devgn          38
Salman Khan         31
Sanjay Dutt         26
                    ..
Diganth              1
Parveen Kaur         1
Seema Azmi           1
Akanksha Puri        1
Edwin Fernandes      1
Name: lead, Length: 566, dtype: int64
```

In [45]:
```
#sort_values - temperory changes #### sort_values(): Returns a sorted Series by the values
kl.sort_values()
```

Out[45]:
```
match_no
87       0
211      0
207      0
206      0
91       0
      ...
164    100
120    100
123    108
126    109
128    113
Name: runs, Length: 215, dtype: int64
```

In [50]:
```
# method chaining
kl.sort_values(ascending=False).head(1).values[0]
```

Out[50]:
```
113
```

In [55]:
```
# For permanent Changes use Inplace
kl.sort_values(inplace=True)
kl
```

Out[55]:
```
match_no
87       0
211      0
207      0
206      0
91       0
      ... 
164    100
120    100
123    108
126    109
128    113
Name: runs, Length: 215, dtype: int64
```

In [60]:
```
# sort_index -> inplace -> movies

movies.sort_index()
```

Out[60]:
```
movie
1920 (film)                   Rajniesh Duggall
1920: London                     Sharman Joshi
1920: The Evil Returns             Vicky Ahuja
1971 (2007 film)                Manoj Bajpayee
2 States (2014 film)              Arjun Kapoor
                                     ...      
Zindagi 50-50                      Veena Malik
Zindagi Na Milegi Dobara        Hrithik Roshan
Zindagi Tere Naam           Mithun Chakraborty
Zokkomon                       Darsheel Safary
Zor Lagaa Ke...Haiya!            Meghan Jadhav
Name: lead, Length: 1500, dtype: object
```

In [61]:
```
movies.sort_index(ascending=False)
```

Out[61]:
```
movie
Zor Lagaa Ke...Haiya!            Meghan Jadhav
Zokkomon                       Darsheel Safary
Zindagi Tere Naam           Mithun Chakraborty
Zindagi Na Milegi Dobara        Hrithik Roshan
Zindagi 50-50                      Veena Malik
                                     ...      
2 States (2014 film)              Arjun Kapoor
1971 (2007 film)                Manoj Bajpayee
1920: The Evil Returns             Vicky Ahuja
1920: London                     Sharman Joshi
1920 (film)                   Rajniesh Duggall
Name: lead, Length: 1500, dtype: object
```

Series Maths Methods

Diffence between Count And Size

Count gives the total number of items present in the series. But only NON missing values but, if we have missing values ,it doesnt count them . But, size gives the total item including missing values

In [62]:
```
# count
kl.count()
```
Out[62]:
```
215
```

sum(): Returns the sum of the values in the Series.

In [66]:
```
# sum -> Product
sub.sum()
```
Out[66]:
```
49510
```

In [67]:
```
sub.product() # Multiply the items
```
Out[67]:
```
0
```

Statical Methods

mean(): Returns the mean value of the Series.

In [68]:
```
# mean


sub.mean()
```
Out[68]:
```
135.64383561643837
```

median(): Returns the median value of the Series.

In [72]:
```
# median
kl.median()
```
Out[72]:
```
24.0
```

mode(): The mode is the value that appears most frequently in the Series.

In [74]:
```
# mode
print(movies.mode())
```
```
0    Akshay Kumar
dtype: object
```

std(): Returns the standard deviation of the values in the Series.

In [71]:
```
# std -> Standard deviation
sub.std()
```
Out[71]:
```
62.67502303725269
```

In [75]:
```
# var -> varience
sub.var()
```
Out[75]:
```
3928.1585127201556
```

min(): Returns the minimum value of the Series.

In [76]:
```
# min
sub.min()
```
Out[76]:
```
33
```

max(): Returns the maximum value of the Series.

In [77]:
```
# max
sub.max()
```
Out[77]:
```
396
```

describe(): Generates descriptive statistics of the Series.

In [79]:
```
# describe
movies.describe()
```
Out[79]:
```
count              1500
unique              566
top        Akshay Kumar
freq                 48
Name: lead, dtype: object
```

In [80]:
```
kl.describe()
```
Out[80]:
```
count    215.000000
mean      30.855814
std       26.229801
min        0.000000
25%        9.000000
50%       24.000000
75%       48.000000
max      113.000000
Name: runs, dtype: float64
```

In [81]:
```
sub.describe()
```
Out[81]:
```
count    365.000000
mean     135.643836
std       62.675023
min       33.000000
25%       88.000000
50%      123.000000
75%      177.000000
max      396.000000
Name: Subscribers gained, dtype: float64
```

Series Indexing

In [83]:
```
# integer indexing
x = pd.Series([12,13,14,35,46,57,58,79,9])
x[1]
```

Out[83]:
```
13
```

In [85]:
```
# negative indexing
movies[-1]
```

Out[85]:
```
'Akshay Kumar'
```

In [86]:
```
movies[0]
```

Out[86]:
```
'Vicky Kaushal'
```

In [87]:
```
sub[0]
```

Out[87]:
```
48
```

In [90]:
```
# slicing
kl[4:10]
```

Out[90]:
```
match_no
5      1
6      9
7     34
8      0
9     21
10     3
Name: runs, dtype: int64
```

In [95]:
```
#Negative slicing

sub[-5:]
```

Out[95]:
```
360    231
361    226
362    155
363    144
364    172
Name: Subscribers gained, dtype: int64
```

In [96]:
```
movies[-5:]
```

Out[96]:
```
movie
Hum Tumhare Hain Sanam      Shah Rukh Khan
Aankhen (2002 film)       Amitabh Bachchan
Saathiya (film)               Vivek Oberoi
Company (film)                 Ajay Devgn
Awara Paagal Deewana          Akshay Kumar
Name: lead, dtype: object
```

In [97]:
```
movies[::2]
```

Out[97]:
```
movie
Uri: The Surgical Strike                       Vicky Kaushal
The Accidental Prime Minister (film)             Anupam Kher
Evening Shadows                             Mona Ambegaonkar
Fraud Saiyaan                                   Arshad Warsi
Manikarnika: The Queen of Jhansi              Kangana Ranaut
                                                  ...
Raaz (2002 film)                                  Dino Morea
Waisa Bhi Hota Hai Part II                      Arshad Warsi
Kaante                                      Amitabh Bachchan
Aankhen (2002 film)                         Amitabh Bachchan
Company (film)                                    Ajay Devgn
Name: lead, Length: 750, dtype: object
```

In [98]:
```
# Fancy indexing
kl[[1,8,22,11,2]]
```

Out[98]:
```
match_no
1      1
8      0
22    38
11    10
2     23
Name: runs, dtype: int64
```

In [99]:
```
# Fancy indexing -> indexing with labels
movies
```

Out[99]:
```
movie
Uri: The Surgical Strike                       Vicky Kaushal
Battalion 609                                    Vicky Ahuja
The Accidental Prime Minister (film)             Anupam Kher
Why Cheat India                                Emraan Hashmi
Evening Shadows                             Mona Ambegaonkar
                                                  ...
Hum Tumhare Hain Sanam                        Shah Rukh Khan
Aankhen (2002 film)                         Amitabh Bachchan
Saathiya (film)                                 Vivek Oberoi
Company (film)                                    Ajay Devgn
Awara Paagal Deewana                            Akshay Kumar
Name: lead, Length: 1500, dtype: object
```

In [100]:
```
movies['Evening Shadows']
```

Out[100]:
```
'Mona Ambegaonkar'
```

Editing the series

In [101]:
```
# using the index number
marks_series
```

Out[101]:
```
maths       67
english     57
science     89
hindi      100
Name: jack Marks, dtype: int64
```

In [102]:
```
marks_series[1]=88
marks_series
```

Out[102]:
```
maths       67
english     88
science     89
hindi      100
Name: jack Marks, dtype: int64
```

In [103]:
```
# we can add data , if it doesnt exist
marks_series['social']=90
marks_series
```

Out[103]:
```
maths       67
english     88
science     89
hindi      100
social      90
Name: jack Marks, dtype: int64
```

In [111]:
```
# using index label
movies
```

Out[111]:
```
movie
Uri: The Surgical Strike                   Vicky Kaushal
Battalion 609                                Vicky Ahuja
The Accidental Prime Minister (film)         Anupam Kher
Why Cheat India                            Emraan Hashmi
Evening Shadows                         Mona Ambegaonkar
                                              ...
Hum Tumhare Hain Sanam                    Shah Rukh Khan
Aankhen (2002 film)                     Amitabh Bachchan
Saathiya (film)                             Vivek Oberoi
Company (film)                                Ajay Devgn
Awara Paagal Deewana                        Akshay Kumar
Name: lead, Length: 1500, dtype: object
```

In [114]:
```
movies['Hum Tumhare Hain Sanam'] = 'Jack'
```

In [115]:
```
movies
```

Out[115]:
```
movie
Uri: The Surgical Strike                   Vicky Kaushal
Battalion 609                                Vicky Ahuja
The Accidental Prime Minister (film)         Anupam Kher
Why Cheat India                            Emraan Hashmi
Evening Shadows                         Mona Ambegaonkar
                                              ...
Hum Tumhare Hain Sanam                              Jack
Aankhen (2002 film)                     Amitabh Bachchan
Saathiya (film)                             Vivek Oberoi
Company (film)                                Ajay Devgn
Awara Paagal Deewana                        Akshay Kumar
Name: lead, Length: 1500, dtype: object
```

Series with Python Functionalities

In [117]:
```
# len/type/dir/sorted/max/min
print(len(sub))
print(type(sub))
```

```
365
<class 'pandas.core.series.Series'>
```

In [122]:
```
print(dir(sub))
print(sorted(sub))
```

```
nplace', '_validate_dtype', '_values', '_where', 'abs', 'add', 'add_prefix', 'add_suff
ix', 'agg', 'aggregate', 'align', 'all', 'any', 'append', 'apply', 'argmax', 'argmin',
'argsort', 'array', 'asfreq', 'asof', 'astype', 'at', 'at_time', 'attrs', 'autocorr',
'axes', 'backfill', 'between', 'between_time', 'bfill', 'bool', 'clip', 'combine', 'co
mbine_first', 'compare', 'convert_dtypes', 'copy', 'corr', 'count', 'cov', 'cummax',
'cummin', 'cumprod', 'cumsum', 'describe', 'diff', 'div', 'divide', 'divmod', 'dot',
'drop', 'drop_duplicates', 'droplevel', 'dropna', 'dtype', 'dtypes', 'duplicated', 'em
pty', 'eq', 'equals', 'ewm', 'expanding', 'explode', 'factorize', 'ffill', 'fillna',
'filter', 'first', 'first_valid_index', 'flags', 'floordiv', 'ge', 'get', 'groupby',
'gt', 'hasnans', 'head', 'hist', 'iat', 'idxmax', 'idxmin', 'iloc', 'index', 'infer_ob
jects', 'interpolate', 'is_monotonic', 'is_monotonic_decreasing', 'is_monotonic_increa
sing', 'is_unique', 'isin', 'isna', 'isnull', 'item', 'items', 'iteritems', 'keys', 'k
urt', 'kurtosis', 'last', 'last_valid_index', 'le', 'loc', 'lt', 'mad', 'map', 'mask',
'max', 'mean', 'median', 'memory_usage', 'min', 'mod', 'mode', 'mul', 'multiply', 'nam
e', 'nbytes', 'ndim', 'ne', 'nlargest', 'notna', 'notnull', 'nsmallest', 'nunique', 'p
ad', 'pct_change', 'pipe', 'plot', 'pop', 'pow', 'prod', 'product', 'quantile', 'rad
d', 'rank', 'ravel', 'rdiv', 'rdivmod', 'reindex', 'reindex_like', 'rename', 'rename_a
xis', 'reorder_levels', 'repeat', 'replace', 'resample', 'reset_index', 'rfloordiv',
'rmod', 'rmul', 'rolling', 'round', 'rpow', 'rsub', 'rtruediv', 'sample', 'searchsorte
d', 'sem', 'set_axis', 'set_flags', 'shape', 'shift', 'size', 'skew', 'slice_shift',
```

In [123]:
```
print(min(sub))
print(max(sub))
```

```
33
396
```

In [125]:
```
# type conversion
list(marks_series)
```

Out[125]:
```
[67, 88, 89, 100, 90]
```

In [126]:
```
dict(marks_series)
```

Out[126]:
```
{'maths': 67, 'english': 88, 'science': 89, 'hindi': 100, 'social': 90}
```

In [129]:
```
# membership operator
'Hum Tumhare Hain Sanam' in movies # In oprator only searches in index values
```

Out[129]:
```
True
```

In [133]:
```
"Jack" in movies.values
```

Out[133]:
```
True
```

In [138]:
```
# Looping
for i in movies:
    print(i)
```

```
Vicky Kaushal
Vicky Ahuja
Anupam Kher
Emraan Hashmi
Mona Ambegaonkar
Geetika Vidya Ohlyan
Arshad Warsi
Radhika Apte
Kangana Ranaut
Nawazuddin Siddiqui
Ali Asgar
Ranveer Singh
Prit Kamani
Ajay Devgn
Sushant Singh Rajput
Amitabh Bachchan
Abhimanyu Dasani
Talha Arshad Reshi
Nawazuddin Siddiqui
```

In [139]:
```
for i in movies.index:
    print(i)
```

```
Uri: The Surgical Strike
Battalion 609
The Accidental Prime Minister (film)
Why Cheat India
Evening Shadows
Soni (film)
Fraud Saiyaan
Bombairiya
Manikarnika: The Queen of Jhansi
Thackeray (film)
Amavas
Gully Boy
Hum Chaar
Total Dhamaal
Sonchiriya
Badla (2019 film)
Mard Ko Dard Nahi Hota
Hamid (film)
Photograph (film)
```

In [140]:
```
# Arthematic Operators (Broadcasting)
100-marks_series
```

Out[140]:
```
maths      33
english    12
science    11
hindi       0
social     10
Name: jack Marks, dtype: int64
```

```
In [141]: 100+marks_series

Out[141]: maths      167
          english    188
          science    189
          hindi      200
          social     190
          Name: jack Marks, dtype: int64
```

```
In [143]: # Relational operators
          kl>=50

Out[143]: match_no
          1      False
          2      False
          3      False
          4      False
          5      False
                 ...
          211    False
          212    False
          213     True
          214    False
          215    False
          Name: runs, Length: 215, dtype: bool
```

Boolean Indexing on Series

```
In [146]: # Find no of 50's and 100's scored by kohli
          kl[kl>=50].size

Out[146]: 50
```

```
In [148]: # find number of ducks
          kl[kl == 0].size

Out[148]: 9
```

```
In [149]: # Count number of day when I had more than 200 subs a day
          sub[sub>=200].size

Out[149]: 59
```

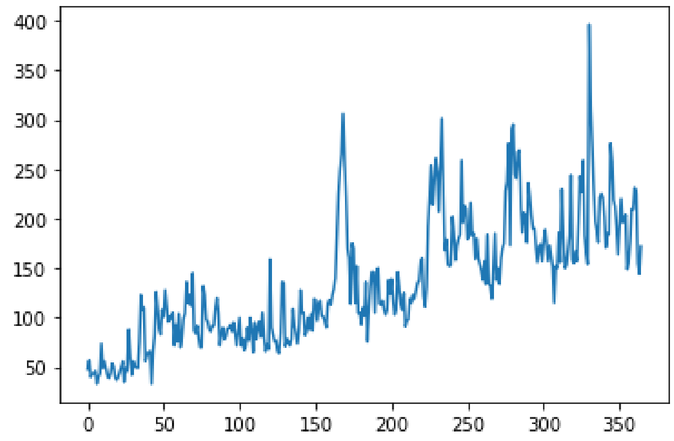
```
In [159]: # find actors who have done more than 20 movies
          num_mov=movies.value_counts()
          num_mov[num_mov>=20]

Out[159]: Akshay Kumar        48
          Amitabh Bachchan    45
          Ajay Devgn          38
          Salman Khan         31
          Sanjay Dutt         26
          Shah Rukh Khan      21
          Emraan Hashmi       21
          Name: lead, dtype: int64
```

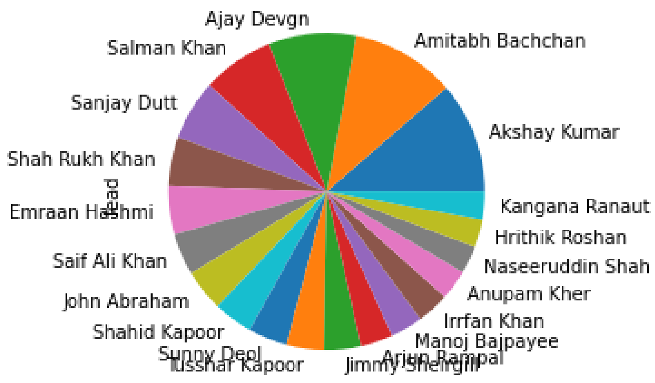
In [160]:
```
num_mov[num_mov>=20].size
```
Out[160]:
```
7
```

Plotting Graphs on Series

In [162]:
```
sub.plot()
```
Out[162]:
```
<AxesSubplot:>
```

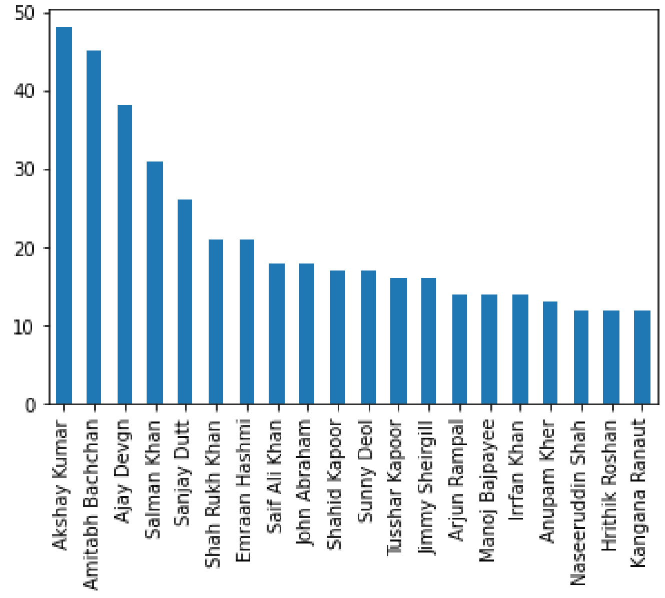


In [164]:
```
movies.value_counts().head(20).plot(kind="pie")
```
Out[164]:
```
<AxesSubplot:ylabel='lead'>
```



In [165]:
```
movies.value_counts().head(20).plot(kind="bar")
```

Out[165]:
```
<AxesSubplot:>
```



Some Important Series Methods

In [166]:
```
# astype
# between
# clip
# drop_duplicates
# isnull
# dropna
# fillna
# isin
# apply
# copy
```

In [175]:
```
# astype
import sys
sys.getsizeof(kl)
```

Out[175]:
```
11752
```

In [176]:
```
kl
```

Out[176]:
```
match_no
1       1
2      23
3      13
4      12
5       1
       ..
211     0
212    20
213    73
214    25
215     7
Name: runs, Length: 215, dtype: int64
```

In [177]:
```
(kl.astype("int16"))
```

Out[177]:
```
match_no
1       1
2      23
3      13
4      12
5       1
       ..
211     0
212    20
213    73
214    25
215     7
Name: runs, Length: 215, dtype: int16
```

In [178]:
```
sys.getsizeof(kl.astype("int16"))
```

Out[178]:
```
10462
```

In [181]:
```
# between
kl[kl.between(50,60)]
```

Out[181]:
```
match_no
15     50
34     58
44     56
57     57
71     51
73     58
80     57
85     56
103    51
122    52
129    54
131    54
137    55
141    58
144    57
182    50
197    51
198    53
209    58
Name: runs, dtype: int64
```

In [182]:
```
kl[kl.between(50,60)].size
```

Out[182]:
```
19
```

In [183]:
```
# clip
sub.clip(100,200)
```

Out[183]:
```
0      100
1      100
2      100
3      100
4      100
      ...
360    200
361    200
362    155
363    144
364    172
Name: Subscribers gained, Length: 365, dtype: int64
```

In [186]:
```
# drop duplicates #### drop_duplicates(): Returns a Series with duplicates removed.

dele = pd.Series([1,2,33,3,3,3,1,23,33,22,33,11])
dele
```

Out[186]:
```
0      1
1      2
2     33
3      3
4      3
5      3
6      1
7     23
8     33
9     22
10    33
11    11
dtype: int64
```

In [188]:
```
dele.drop_duplicates()
```

Out[188]:
```
0      1
1      2
2     33
3      3
7     23
9     22
11    11
dtype: int64
```

In [189]:
```
dele.drop_duplicates(keep='last')
```

Out[189]:
```
1      2
5      3
6      1
7     23
9     22
10    33
11    11
dtype: int64
```

In [190]:
```
movies.drop_duplicates()
```

Out[190]:
```
movie
Uri: The Surgical Strike                     Vicky Kaushal
Battalion 609                                  Vicky Ahuja
The Accidental Prime Minister (film)           Anupam Kher
Why Cheat India                              Emraan Hashmi
Evening Shadows                           Mona Ambegaonkar
                                               ...
Rules: Pyaar Ka Superhit Formula                    Tanuja
Right Here Right Now (film)                          Ankit
Talaash: The Hunt Begins...                  Rakhee Gulzar
The Pink Mirror                            Edwin Fernandes
Hum Tumhare Hain Sanam                                Jack
Name: lead, Length: 567, dtype: object
```

In [191]:
```
dele.duplicated().sum()
```

Out[191]:
```
5
```

In [193]:
```
kl.duplicated().sum()
```

Out[193]:
```
137
```

In [194]:
```
dele.count()
```

Out[194]:
```
12
```

isin(values): Returns a boolean Series indicating whether each element in the Series is in the provided values

In [198]:
```
# isnull

kl.isnull().sum()
```

Out[198]:
```
0
```

In [199]:
```
dele.isnull().sum()
```

Out[199]:
```
0
```

In [200]:
```
# dropna

dele.dropna()
```

Out[200]:
```
0      1
1      2
2     33
3      3
4      3
5      3
6      1
7     23
8     33
9     22
10    33
11    11
dtype: int64
```

In [202]:
```
# fillna

dele.fillna(0)
dele.fillna(dele.mean())
```

Out[202]:
```
0      1
1      2
2     33
3      3
4      3
5      3
6      1
7     23
8     33
9     22
10    33
11    11
dtype: int64
```

In [205]:
```
# isin

kl
```

Out[205]:
```
match_no
1       1
2      23
3      13
4      12
5       1
       ..
211     0
212    20
213    73
214    25
215     7
Name: runs, Length: 215, dtype: int64
```

In [207]:
```
kl[(kl==49) | (kl==99)]
```

Out[207]:
```
match_no
82    99
86    49
Name: runs, dtype: int64
```

In [209]:
```
kl[kl.isin([49,99])]
```

Out[209]:
```
match_no
82    99
86    49
Name: runs, dtype: int64
```

In [210]:
```
# apply

movies
```

Out[210]:
```
movie
Uri: The Surgical Strike                      Vicky Kaushal
Battalion 609                                   Vicky Ahuja
The Accidental Prime Minister (film)            Anupam Kher
Why Cheat India                               Emraan Hashmi
Evening Shadows                            Mona Ambegaonkar
                                                ...
Hum Tumhare Hain Sanam                                 Jack
Aankhen (2002 film)                        Amitabh Bachchan
Saathiya (film)                                Vivek Oberoi
Company (film)                                   Ajay Devgn
Awara Paagal Deewana                           Akshay Kumar
Name: lead, Length: 1500, dtype: object
```

In [212]:
```
movies.apply(lambda x:x.split()) # split name in to two using Lambda function
```

Out[212]:
```
movie
Uri: The Surgical Strike                      [Vicky, Kaushal]
Battalion 609                                   [Vicky, Ahuja]
The Accidental Prime Minister (film)            [Anupam, Kher]
Why Cheat India                               [Emraan, Hashmi]
Evening Shadows                            [Mona, Ambegaonkar]
                                                  ...
Hum Tumhare Hain Sanam                                  [Jack]
Aankhen (2002 film)                        [Amitabh, Bachchan]
Saathiya (film)                                [Vivek, Oberoi]
Company (film)                                   [Ajay, Devgn]
Awara Paagal Deewana                           [Akshay, Kumar]
Name: lead, Length: 1500, dtype: object
```

In [213]:
```
movies.apply(lambda x:x.split()[0]) # select first word
```

Out[213]:
```
movie
Uri: The Surgical Strike                  Vicky
Battalion 609                             Vicky
The Accidental Prime Minister (film)     Anupam
Why Cheat India                          Emraan
Evening Shadows                            Mona
                                        ...
Hum Tumhare Hain Sanam                     Jack
Aankhen (2002 film)                     Amitabh
Saathiya (film)                           Vivek
Company (film)                             Ajay
Awara Paagal Deewana                     Akshay
Name: lead, Length: 1500, dtype: object
```

In [214]:
```
movies.apply(lambda x:x.split()[0].upper()) # Upper case
```

Out[214]:
```
movie
Uri: The Surgical Strike                   VICKY
Battalion 609                              VICKY
The Accidental Prime Minister (film)      ANUPAM
Why Cheat India                           EMRAAN
Evening Shadows                             MONA
                                          ...
Hum Tumhare Hain Sanam                      JACK
Aankhen (2002 film)                      AMITABH
Saathiya (film)                            VIVEK
Company (film)                              AJAY
Awara Paagal Deewana                      AKSHAY
Name: lead, Length: 1500, dtype: object
```

In [215]:
```
sub
```

Out[215]:
```
0       48
1       57
2       40
3       43
4       44
      ...
360    231
361    226
362    155
363    144
364    172
Name: Subscribers gained, Length: 365, dtype: int64
```

In [216]:
```
sub.mean()
```

Out[216]:
```
135.64383561643837
```

In [217]:
```
sub.apply(lambda x:'good day' if x > sub.mean() else 'bad day')
```

Out[217]:
```
0       bad day
1       bad day
2       bad day
3       bad day
4       bad day
         ...
360    good day
361    good day
362    good day
363    good day
364    good day
Name: Subscribers gained, Length: 365, dtype: object
```

In [229]:
```
# Copy

kl
```

Out[229]:
```
match_no
1       1
2      23
3      13
4      12
5       1
       ..
211     0
212    20
213    73
214    25
215     7
Name: runs, Length: 215, dtype: int64
```

In [230]:
```
new = kl.head()
```

In [231]:
```
new[1]=100
```

In [232]:
```
new
```

Out[232]:
```
match_no
1    100
2     23
3     13
4     12
5      1
Name: runs, dtype: int64
```

In [233]:
```
kl
```

Out[233]:
```
match_no
1      100
2       23
3       13
4       12
5        1
      ...
211      0
212     20
213     73
214     25
215      7
Name: runs, Length: 215, dtype: int64
```

In [240]:
```
new = kl.head(5).copy()
```

In [241]:
```
new[1]=20
```

In [242]:
```
new
```

Out[242]:
```
match_no
1    20
2    23
3    13
4    12
5     1
Name: runs, dtype: int64
```

In [250]:
```
kl
```

Out[250]:
```
match_no
1      100
2       23
3       13
4       12
5        1
      ... 
211      0
212     20
213     73
214     25
215      7
Name: runs, Length: 215, dtype: int64
```

In [ ]:

In [ ]:

In [1]:
```
import numpy as np
import pandas as pd
```

Creating DataFrame

In [2]:
```
# Using the lists
student_data = [
    [100,80,10],
    [90,70,7],
    [120,100,14],
    [80,50,2]
]

pd.DataFrame(student_data,columns=['iq','marks','package'])
```

Out[2]:

	iq	marks	package
0	100	80	10
1	90	70	7
2	120	100	14
3	80	50	2

In [3]:
```
# using dicts

student_dict = {
    'name':['peter','saint','noeum','parle','samme','dave'],
    'iq':[100,90,120,80,13,90],
    'marks':[80,70,100,50,11,80],
    'package':[10,7,14,2,15,100]
}
students=pd.DataFrame(student_dict)
students
```

Out[3]:

	name	iq	marks	package
0	peter	100	80	10
1	saint	90	70	7
2	noeum	120	100	14
3	parle	80	50	2
4	samme	13	11	15
5	dave	90	80	100

In [4]:
```
students.set_index('name',inplace=True)
students
```

Out[4]:

	iq	marks	package
name			
peter	100	80	10
saint	90	70	7
noeum	120	100	14
parle	80	50	2
samme	13	11	15
dave	90	80	100

In [5]:
```python
# Read csv
movies = pd.read_csv("movies.csv")
movies.head()
```

Out[5]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult	year_
0	Uri: The Surgical Strike	tt8291224	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Uri:_The_Surgica...	Uri: The Surgical Strike	Uri: The Surgical Strike	0	
1	Battalion 609	tt9472208	NaN	https://en.wikipedia.org/wiki/Battalion_609	Battalion 609	Battalion 609	0	
2	The Accidental Prime Minister (film)	tt6986710	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/The_Accidental_P...	The Accidental Prime Minister	The Accidental Prime Minister	0	
3	Why Cheat India	tt8108208	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Why_Cheat_India	Why Cheat India	Why Cheat India	0	
4	Evening Shadows	tt6028796	NaN	https://en.wikipedia.org/wiki/Evening_Shadows	Evening Shadows	Evening Shadows	0	

In [6]:
```python
ipl = pd.read_csv("ipl-matches.csv")
ipl.head()
```

Out[6]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	SuperOver	WinningTeam	W
0	1312200	Ahmedabad	2022-05-29	2022	Final	Rajasthan Royals	Gujarat Titans	Narendra Modi Stadium, Ahmedabad	Rajasthan Royals	bat	N	Gujarat Titans	Wi
1	1312199	Ahmedabad	2022-05-27	2022	Qualifier 2	Royal Challengers Bangalore	Rajasthan Royals	Narendra Modi Stadium, Ahmedabad	Rajasthan Royals	field	N	Rajasthan Royals	Wi
2	1312198	Kolkata	2022-05-25	2022	Eliminator	Royal Challengers Bangalore	Lucknow Super Giants	Eden Gardens, Kolkata	Lucknow Super Giants	field	N	Royal Challengers Bangalore	
3	1312197	Kolkata	2022-05-24	2022	Qualifier 1	Rajasthan Royals	Gujarat Titans	Eden Gardens,	Gujarat Titans	field	N	Gujarat Titans	Wi

DataFrame Attributes and Methods

In [7]:
```python
# shape
movies.shape
```

Out[7]:
```
(1629, 18)
```

In [8]:
```python
ipl.shape
```

Out[8]:
```
(950, 20)
```

In [9]:
```
# dtype
movies.dtypes
```

Out[9]:
```
title_x              object
imdb_id              object
poster_path          object
wiki_link            object
title_y              object
original_title       object
is_adult              int64
year_of_release       int64
runtime              object
genres               object
imdb_rating         float64
imdb_votes            int64
story                object
summary              object
tagline              object
actors               object
wins_nominations     object
release_date         object
dtype: object
```

In [10]:
```
ipl.dtypes
```

Out[10]:
```
ID                   int64
City                object
Date                object
Season              object
MatchNumber         object
Team1               object
Team2               object
Venue               object
TossWinner          object
TossDecision        object
SuperOver           object
WinningTeam         object
WonBy               object
Margin             float64
method              object
Player_of_Match     object
Team1Players        object
Team2Players        object
Umpire1             object
Umpire2             object
dtype: object
```

In [11]:
```
# index
movies.index
```

Out[11]:
```
RangeIndex(start=0, stop=1629, step=1)
```

In [12]:
```
ipl.index
```

Out[12]:
```
RangeIndex(start=0, stop=950, step=1)
```

In [13]:
```
# Columns
movies.columns
```

Out[13]:
```
Index(['title_x', 'imdb_id', 'poster_path', 'wiki_link', 'title_y',
       'original_title', 'is_adult', 'year_of_release', 'runtime', 'genres',
       'imdb_rating', 'imdb_votes', 'story', 'summary', 'tagline', 'actors',
       'wins_nominations', 'release_date'],
      dtype='object')
```

In [14]:
```
ipl.columns
```

Out[14]:
```
Index(['ID', 'City', 'Date', 'Season', 'MatchNumber', 'Team1', 'Team2',
       'Venue', 'TossWinner', 'TossDecision', 'SuperOver', 'WinningTeam',
       'WonBy', 'Margin', 'method', 'Player_of_Match', 'Team1Players',
       'Team2Players', 'Umpire1', 'Umpire2'],
      dtype='object')
```

In [15]:
```
# Values
students.values
```

Out[15]:
```
array([[100,  80,  10],
       [ 90,  70,   7],
       [120, 100,  14],
       [ 80,  50,   2],
       [ 13,  11,  15],
       [ 90,  80, 100]], dtype=int64)
```

In [16]:
```
ipl.values
```

Out[16]:
```
array([[1312200, 'Ahmedabad', '2022-05-29', ...,
        "['WP Saha', 'Shubman Gill', 'MS Wade', 'HH Pandya', 'DA Miller', 'R Tewatia', 'Rashid Khan', 'R Sai Kishore',
'LH Ferguson', 'Yash Dayal', 'Mohammed Shami']",
        'CB Gaffaney', 'Nitin Menon'],
       [1312199, 'Ahmedabad', '2022-05-27', ...,
        "['YBK Jaiswal', 'JC Buttler', 'SV Samson', 'D Padikkal', 'SO Hetmyer', 'R Parag', 'R Ashwin', 'TA Boult', 'YS C
hahal', 'M Prasidh Krishna', 'OC McCoy']",
        'CB Gaffaney', 'Nitin Menon'],
       [1312198, 'Kolkata', '2022-05-25', ...,
        "['Q de Kock', 'KL Rahul', 'M Vohra', 'DJ Hooda', 'MP Stoinis', 'E Lewis', 'KH Pandya', 'PVD Chameera', 'Mohsin
Khan', 'Avesh Khan', 'Ravi Bishnoi']",
        'J Madanagopal', 'MA Gough'],
       ...,
       [335984, 'Delhi', '2008-04-19', ...,
        "['T Kohli', 'YK Pathan', 'SR Watson', 'M Kaif', 'DS Lehmann', 'RA Jadeja', 'M Rawat', 'D Salunkhe', 'SK Warne',
'SK Trivedi', 'MM Patel']",
        'Aleem Dar', 'GA Pratapkumar'],
       [335983, 'Chandigarh', '2008-04-19', ...,
        "['PA Patel', 'ML Hayden', 'MEK Hussey', 'MS Dhoni', 'SK Raina', 'JDP Oram', 'S Badrinath', 'Joginder Sharma',
'P Amarnath', 'MS Gony', 'M Muralitharan']",
        'MR Benson', 'SL Shastri'],
       [335982, 'Bangalore', '2008-04-18', ...,
        "['SC Ganguly', 'BB McCullum', 'RT Ponting', 'DJ Hussey', 'Mohammad Hafeez', 'LR Shukla', 'WP Saha', 'AB Agarka
r', 'AB Dinda', 'M Kartik', 'I Sharma']",
        'Asad Rauf', 'RE Koertzen']], dtype=object)
```

In [17]:
```
# Sample -> to reduce bias
ipl.sample(2)
```

Out[17]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	SuperOver	WinningTeam	WonBy	Ma
226	1178402	Mumbai	2019-04-13	2019	27	Mumbai Indians	Rajasthan Royals	Wankhede Stadium	Rajasthan Royals	field	N	Rajasthan Royals	Wickets	
63	1304057	Mumbai	2022-04-03	2022	11	Punjab Kings	Chennai Super Kings	Brabourne Stadium, Mumbai	Chennai Super Kings	field	N	Punjab Kings	Runs	

In [18]:
```
# info
movies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1629 entries, 0 to 1628
Data columns (total 18 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   title_x           1629 non-null   object 
 1   imdb_id           1629 non-null   object 
 2   poster_path       1526 non-null   object 
 3   wiki_link         1629 non-null   object 
 4   title_y           1629 non-null   object 
 5   original_title    1629 non-null   object 
 6   is_adult          1629 non-null   int64  
 7   year_of_release   1629 non-null   int64  
 8   runtime           1629 non-null   object 
 9   genres            1629 non-null   object 
 10  imdb_rating       1629 non-null   float64
 11  imdb_votes        1629 non-null   int64  
 12  story             1609 non-null   object 
 13  summary           1629 non-null   object 
 14  tagline           557 non-null    object 
 15  actors            1624 non-null   object 
 16  wins_nominations  707 non-null    object 
 17  release_date      1522 non-null   object 
dtypes: float64(1), int64(3), object(14)
memory usage: 229.2+ KB
```

In [19]:
```
ipl.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 950 entries, 0 to 949
Data columns (total 20 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   ID               950 non-null    int64  
 1   City             899 non-null    object 
 2   Date             950 non-null    object 
 3   Season           950 non-null    object 
 4   MatchNumber      950 non-null    object 
 5   Team1            950 non-null    object 
 6   Team2            950 non-null    object 
 7   Venue            950 non-null    object 
 8   TossWinner       950 non-null    object 
 9   TossDecision     950 non-null    object 
 10  SuperOver        946 non-null    object 
 11  WinningTeam      946 non-null    object 
 12  WonBy            950 non-null    object 
 13  Margin           932 non-null    float64
 14  method           19 non-null     object 
 15  Player_of_Match  946 non-null    object 
 16  Team1Players     950 non-null    object 
 17  Team2Players     950 non-null    object 
 18  Umpire1          950 non-null    object 
 19  Umpire2          950 non-null    object 
dtypes: float64(1), int64(1), object(18)
memory usage: 148.6+ KB
```

In [20]:
```
# describe
movies.describe()
```

Out[20]:

	is_adult	year_of_release	imdb_rating	imdb_votes
count	1629.0	1629.000000	1629.000000	1629.000000
mean	0.0	2010.263966	5.557459	5384.263352
std	0.0	5.381542	1.567609	14552.103231
min	0.0	2001.000000	0.000000	0.000000
25%	0.0	2005.000000	4.400000	233.000000
50%	0.0	2011.000000	5.600000	1000.000000
75%	0.0	2015.000000	6.800000	4287.000000
max	0.0	2019.000000	9.400000	310481.000000

In [21]:
```
ipl.describe()
```

Out[21]:

	ID	Margin
count	9.500000e+02	932.000000
mean	8.304852e+05	17.056867
std	3.375678e+05	21.633109
min	3.359820e+05	1.000000
25%	5.012612e+05	6.000000
50%	8.297380e+05	8.000000
75%	1.175372e+06	19.000000
max	1.312200e+06	146.000000

In [22]:
```
# isnull
movies.isnull()
```

Out[22]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult	year_of_release	runtime	genres	imdb_rating	imdb_votes	story	summa
0	False	False	False	False	False	False	False	False	False	False	False	False	False	Fals
1	False	False	True	False	False	False	False	False	False	False	False	False	False	Fals
2	False	False	False	False	False	False	False	False	False	False	False	False	False	Fals
3	False	False	False	False	False	False	False	False	False	False	False	False	False	Fals
4	False	False	True	False	False	False	False	False	False	False	False	False	False	Fals
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
1624	False	False	False	False	False	False	False	False	False	False	False	False	False	Fals
1625	False	False	False	False	False	False	False	False	False	False	False	False	False	Fals
1626	False	False	True	False	False	False	False	False	False	False	False	False	False	Fals
1627	False	False	False	False	False	False	False	False	False	False	False	False	False	Fals
1628	False	False	False	False	False	False	False	False	False	False	False	False	False	Fals

1629 rows × 18 columns

In [23]:
```
movies.isnull().sum()
```

Out[23]:
```
title_x              0
imdb_id              0
poster_path        103
wiki_link            0
title_y              0
original_title       0
is_adult             0
year_of_release      0
runtime              0
genres               0
imdb_rating          0
imdb_votes           0
story               20
summary              0
tagline           1072
actors               5
wins_nominations   922
release_date       107
dtype: int64
```

In [24]:
```
# duplicated
movies.duplicated().sum()
```

Out[24]:
```
0
```

In [25]:
```
# rename
students
```

Out[25]:

name	iq	marks	package
peter	100	80	10
saint	90	70	7
noeum	120	100	14
parle	80	50	2
samme	13	11	15
dave	90	80	100

In [26]:
```
students.rename(columns={'marks':'percent','package':'lpa'},inplace=True)
```

In [ ]:
```
students.drop(columns='name',inplace=True)
```

Maths Method

In [28]:
```
# sum -> Axis Argument
students.sum(axis=1)
```

Out[28]:
```
name
peter    190
saint    167
noeum    234
parle    132
samme     39
dave     270
dtype: int64
```

In [29]:
```
# mean
students.mean()
```

Out[29]:
```
iq         82.166667
percent    65.166667
lpa        24.666667
dtype: float64
```

In [30]:
```
students.min(axis=1)
```

Out[30]:
```
name
peter    10
saint     7
noeum    14
parle     2
samme    11
dave     80
dtype: int64
```

In [31]:
```
students.var()
```

Out[31]:
```
iq         1332.166667
percent     968.166667
lpa        1384.666667
dtype: float64
```

Selecting cols from a DataFrame

In [32]:
```
# single cols
movies['title_x']
```

Out[32]:
```
0                   Uri: The Surgical Strike
1                              Battalion 609
2       The Accidental Prime Minister (film)
3                            Why Cheat India
4                            Evening Shadows
                        ...                 
1624                   Tera Mera Saath Rahen
1625                    Yeh Zindagi Ka Safar
1626                         Sabse Bada Sukh
1627                                   Daaka
1628                                Humsafar
Name: title_x, Length: 1629, dtype: object
```

In [33]:
```
type(movies['title_x'])
```

Out[33]:
```
pandas.core.series.Series
```

In [137]:
```
# multiple columns
movies[['year_of_release',' actors','title_x']].head(2)
```

In [35]:
```
type(movies[['year_of_release','actors','title_x']].head(2))
```

Out[35]:
```
pandas.core.frame.DataFrame
```

In [36]:
```
ipl[['City','Team1','Team2' ]]
```

Out[36]:

	City	Team1	Team2
0	Ahmedabad	Rajasthan Royals	Gujarat Titans
1	Ahmedabad	Royal Challengers Bangalore	Rajasthan Royals
2	Kolkata	Royal Challengers Bangalore	Lucknow Super Giants
3	Kolkata	Rajasthan Royals	Gujarat Titans
4	Mumbai	Sunrisers Hyderabad	Punjab Kings
...	...	...	...
945	Kolkata	Kolkata Knight Riders	Deccan Chargers
946	Mumbai	Mumbai Indians	Royal Challengers Bangalore
947	Delhi	Delhi Daredevils	Rajasthan Royals
948	Chandigarh	Kings XI Punjab	Chennai Super Kings
949	Bangalore	Royal Challengers Bangalore	Kolkata Knight Riders

950 rows × 3 columns

In [37]:
```
student_dict = {
    'name':['peter','saint','noeum','parle','samme','dave'],
    'iq':[100,90,120,80,13,90],
    'marks':[80,70,100,50,11,80],
    'package':[10,7,14,2,15,100]
}
students=pd.DataFrame(student_dict)
students.set_index('name',inplace=True)
```

In [38]:
```
students
```

Out[38]:

	iq	marks	package
name			
peter	100	80	10
saint	90	70	7
noeum	120	100	14
parle	80	50	2
samme	13	11	15
dave	90	80	100

Selecting rows from a DataFrame

- **iloc** - searches using index positions
- **loc** - searches using index labels

In [39]:
```
# single_row
movies.iloc[1]
```

Out[39]:
```
title_x                                                Battalion 609
imdb_id                                                    tt9472208
poster_path                                                      NaN
wiki_link          https://en.wikipedia.org/wiki/Battalion_609 (https://en.wikipedia.org/wiki/Battalion_609)
title_y                                                Battalion 609
original_title                                         Battalion 609
is_adult                                                           0
year_of_release                                                 2019
runtime                                                          131
genres                                                           War
imdb_rating                                                      4.1
imdb_votes                                                        73
story                    The story revolves around a cricket match betw...
summary                  The story of Battalion 609 revolves around a c...
tagline                                                          NaN
actors                   Vicky Ahuja|Shoaib Ibrahim|Shrikant Kamat|Elen...
wins_nominations                                                 NaN
release_date                                   11 January 2019 (India)
Name: 1, dtype: object
```

In [40]:
```
# Multiple rows
movies.iloc[5:10]
```

Out[40]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult	y
5	Soni (film)	tt6078866	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Soni_(film)	Soni	Soni	0	
6	Fraud Saiyaan	tt5013008	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Fraud_Saiyaan	Fraud Saiyaan	Fraud Saiyyan	0	
7	Bombairiya	tt4971258	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Bombairiya	Bombairiya	Bombairiya	0	
8	Manikarnika: The Queen of Jhansi	tt6903440	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Manikarnika:_The...	Manikarnika: The Queen of Jhansi	Manikarnika: The Queen of Jhansi	0	
9	Thackeray (film)	tt7777196	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Thackeray_(film)	Thackeray	Thackeray	0	

In [41]:
```
movies.iloc[5:12:2]
```

Out[41]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult	year_
5	Soni (film)	tt6078866	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Soni_(film)	Soni	Soni	0	
7	Bombairiya	tt4971258	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Bombairiya	Bombairiya	Bombairiya	0	
9	Thackeray (film)	tt7777196	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Thackeray_(film)	Thackeray	Thackeray	0	
11	Gully Boy	tt2395469	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Gully_Boy	Gully Boy	Gully Boy	0	

In [42]:
```
# Fancy indexing
ipl.iloc[[0,4,5]]
```

Out[42]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	SuperOver	WinningTeam	WonBy
0	1312200	Ahmedabad	2022-05-29	2022	Final	Rajasthan Royals	Gujarat Titans	Narendra Modi Stadium, Ahmedabad	Rajasthan Royals	bat	N	Gujarat Titans	Wickets
4	1304116	Mumbai	2022-05-22	2022	70	Sunrisers Hyderabad	Punjab Kings	Wankhede Stadium, Mumbai	Sunrisers Hyderabad	bat	N	Punjab Kings	Wickets
5	1304115	Mumbai	2022-05-21	2022	69	Delhi Capitals	Mumbai Indians	Wankhede Stadium, Mumbai	Mumbai Indians	field	N	Mumbai Indians	Wickets

In [43]:
```
# loc ( Location)
students
```

Out[43]:

	iq	marks	package
name			
peter	100	80	10
saint	90	70	7
noeum	120	100	14
parle	80	50	2
samme	13	11	15
dave	90	80	100

In [44]:
```
students.loc['parle']
```

Out[44]:
```
iq          80
marks       50
package      2
Name: parle, dtype: int64
```

In [45]:
```
students.loc['saint':'samme':2]
```
Out[45]:

name	iq	marks	package
saint	90	70	7
parle	80	50	2

In [46]:
```
# Fancy indexing
students.loc[['saint','dave']]
```
Out[46]:

name	iq	marks	package
saint	90	70	7
dave	90	80	100

In [47]:
```
students.iloc[[0,4,3]]
```
Out[47]:

name	iq	marks	package
peter	100	80	10
samme	13	11	15
parle	80	50	2

Selecting both rows and cols

In [48]:
```
movies.iloc[0:3,0:3]
```
Out[48]:

	title_x	imdb_id	poster_path
0	Uri: The Surgical Strike	tt8291224	https://upload.wikimedia.org/wikipedia/en/thum...
1	Battalion 609	tt9472208	NaN
2	The Accidental Prime Minister (film)	tt6986710	https://upload.wikimedia.org/wikipedia/en/thum...

In [49]:
```
movies.loc[0:2,'title_x':'poster_path']
```
Out[49]:

	title_x	imdb_id	poster_path
0	Uri: The Surgical Strike	tt8291224	https://upload.wikimedia.org/wikipedia/en/thum...
1	Battalion 609	tt9472208	NaN
2	The Accidental Prime Minister (film)	tt6986710	https://upload.wikimedia.org/wikipedia/en/thum...

Filtering a DataFrame

In [50]:
```
ipl.head(2)
```
Out[50]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	SuperOver	WinningTeam	WonB
0	1312200	Ahmedabad	2022-05-29	2022	Final	Rajasthan Royals	Gujarat Titans	Narendra Modi Stadium, Ahmedabad	Rajasthan Royals	bat	N	Gujarat Titans	Wicke
1	1312199	Ahmedabad	2022-05-27	2022	Qualifier 2	Royal Challengers Bangalore	Rajasthan Royals	Narendra Modi Stadium, Ahmedabad	Rajasthan Royals	field	N	Rajasthan Royals	Wicke

In [51]:
```
# find all the final winners

mask=ipl['MatchNumber'] == 'Final'
new_df= ipl[mask]
new_df[['Season','WinningTeam']]
```

Out[51]:

	Season	WinningTeam
0	2022	Gujarat Titans
74	2021	Chennai Super Kings
134	2020/21	Mumbai Indians
194	2019	Mumbai Indians
254	2018	Chennai Super Kings
314	2017	Mumbai Indians
373	2016	Sunrisers Hyderabad
433	2015	Mumbai Indians
492	2014	Kolkata Knight Riders
552	2013	Mumbai Indians
628	2012	Kolkata Knight Riders
702	2011	Chennai Super Kings
775	2009/10	Chennai Super Kings
835	2009	Deccan Chargers
892	2007/08	Rajasthan Royals

In [52]:
```
# In one line
ipl[ipl['MatchNumber']=='Final'][['Season','WinningTeam']]
```

Out[52]:

	Season	WinningTeam
0	2022	Gujarat Titans
74	2021	Chennai Super Kings
134	2020/21	Mumbai Indians
194	2019	Mumbai Indians
254	2018	Chennai Super Kings
314	2017	Mumbai Indians
373	2016	Sunrisers Hyderabad
433	2015	Mumbai Indians
492	2014	Kolkata Knight Riders
552	2013	Mumbai Indians
628	2012	Kolkata Knight Riders
702	2011	Chennai Super Kings
775	2009/10	Chennai Super Kings
835	2009	Deccan Chargers
892	2007/08	Rajasthan Royals

In [53]:
```
# how many super over finishes have occured
ipl.head(2)
```

Out[53]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	SuperOver	WinningTeam	WonB
0	1312200	Ahmedabad	2022-05-29	2022	Final	Rajasthan Royals	Gujarat Titans	Narendra Modi Stadium, Ahmedabad	Rajasthan Royals	bat	N	Gujarat Titans	Wicke
1	1312199	Ahmedabad	2022-05-27	2022	Qualifier 2	Royal Challengers Bangalore	Rajasthan Royals	Narendra Modi Stadium, Ahmedabad	Rajasthan Royals	field	N	Rajasthan Royals	Wicke

In [54]:
```
ipl[ipl['SuperOver']=='Y'].shape[0]
```
Out[54]:
```
14
```

In [55]:
```
# how many matches has csk won in kolkata
ipl.sample(2)
```
Out[55]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	SuperOver	WinningTeam	Wo
364	1082599	Pune	2017-04-11	2017	9	Rising Pune Supergiant	Delhi Daredevils	Maharashtra Cricket Association Stadium	Rising Pune Supergiant	field	N	Delhi Daredevils	I
376	981013	Bangalore	2016-05-24	2016	Qualifier 1	Gujarat Lions	Royal Challengers Bangalore	M Chinnaswamy Stadium	Royal Challengers Bangalore	field	N	Royal Challengers Bangalore	Wi

In [56]:
```
ipl[(ipl['City'] == 'Kolkata') & (ipl['WinningTeam'] == 'Chennai Super Kings')].shape[0]
```
Out[56]:
```
5
```

In [57]:
```
# toss winner is match winner in percentage
ipl.sample(2)
```
Out[57]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	SuperOver	WinningTeam	WonBy	Ma
168	1216529	Abu Dhabi	2020-10-11	2020/21	27	Delhi Capitals	Mumbai Indians	Sheikh Zayed Stadium	Delhi Capitals	bat	N	Mumbai Indians	Wickets	
127	1254064	Mumbai	2021-04-15	2021	7	Delhi Capitals	Rajasthan Royals	Wankhede Stadium, Mumbai	Rajasthan Royals	field	N	Rajasthan Royals	Wickets	

In [58]:
```
(ipl[(ipl['TossWinner']== ipl['WinningTeam'])].shape[0]/ipl.shape[0])*100
```
Out[58]:
```
51.473684210526315
```

In [59]:
```
# movies with rating higher than 8 and votes>10000
movies.sample(2)
```
Out[59]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult	year_of
24	Junglee (2019 film)	tt7463730	https://upload.wikimedia.org/wikipedia/en/e/e2...	https://en.wikipedia.org/wiki/Junglee_(2019_film)	Junglee	Junglee	0	
390	Hey Bro	tt4512230	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Hey_Bro	Hey Bro	Hey Bro	0	

In [60]:
```
movies[(movies['imdb_rating'] > 8) & (movies['imdb_votes'] > 10000)].shape[0]
```
Out[60]:
```
43
```

In [61]:
```
# Action movies with rating higher than 7.5
#mask1=movies['genres'].str.split('|').apply(lambda x:'Action' in x)
mask1=movies['genres'].str.contains('Action')
mask2=movies['imdb_rating']>7.5
movies[mask1 & mask2]
```

Out[61]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_titl
0	Uri: The Surgical Strike	tt8291224	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Uri:_The_Surgica...	Uri: The Surgical Strike	Uri: Th Surgical Strik
41	Family of Thakurganj	tt8897986	https://upload.wikimedia.org/wikipedia/en/9/99...	https://en.wikipedia.org/wiki/Family_of_Thakur...	Family of Thakurganj	Family Thakurga
84	Mukkabaaz	tt7180544	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Mukkabaaz	The Brawler	Mukkabaa
106	Raazi	tt7098658	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Raazi	Raazi	Raa

Adding new cols

In [62]:
```
movies['country']='India'
movies.sample(2)
```

Out[62]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult	year_of
915	Wanted (2009 film)	tt1084972	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Wanted_(2009_film)	Wanted	Wanted	0	
241	Shaadi Mein Zaroor Aana	tt7469726	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Shaadi_Mein_Zaro...	Shaadi Mein Zaroor Aana	Shaadi Mein Zaroor Aana	0	

In [63]:
```
movies.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1629 entries, 0 to 1628
Data columns (total 19 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   title_x          1629 non-null   object 
 1   imdb_id          1629 non-null   object 
 2   poster_path      1526 non-null   object 
 3   wiki_link        1629 non-null   object 
 4   title_y          1629 non-null   object 
 5   original_title   1629 non-null   object 
 6   is_adult         1629 non-null   int64  
 7   year_of_release  1629 non-null   int64  
 8   runtime          1629 non-null   object 
 9   genres           1629 non-null   object 
 10  imdb_rating      1629 non-null   float64
 11  imdb_votes       1629 non-null   int64  
 12  story            1609 non-null   object 
 13  summary          1629 non-null   object 
 14  tagline          557 non-null    object 
 15  actors           1624 non-null   object 
 16  wins_nominations 707 non-null    object 
 17  release_date     1522 non-null   object 
 18  country          1629 non-null   object 
dtypes: float64(1), int64(3), object(15)
memory usage: 241.9+ KB
```

In [138]:
```
# From Existing ones
movies['actors'].str.split('|').apply(lambda x:x[0])
```

In [139]:
```
 # From Existing ones
movies['lead actor']= movies['actors'].str.split('|').apply(lambda x:x[0])
movies
```

Important DataFrame Functions

In [68]:
```
ipl.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 950 entries, 0 to 949
Data columns (total 20 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   ID               950 non-null    int64  
 1   City             899 non-null    object 
 2   Date             950 non-null    object 
 3   Season           950 non-null    object 
 4   MatchNumber      950 non-null    object 
 5   Team1            950 non-null    object 
 6   Team2            950 non-null    object 
 7   Venue            950 non-null    object 
 8   TossWinner       950 non-null    object 
 9   TossDecision     950 non-null    object 
 10  SuperOver        946 non-null    object 
 11  WinningTeam      946 non-null    object 
 12  WonBy            950 non-null    object 
 13  Margin           932 non-null    float64
 14  method           19 non-null     object 
 15  Player_of_Match  946 non-null    object 
 16  Team1Players     950 non-null    object 
 17  Team2Players     950 non-null    object 
 18  Umpire1          950 non-null    object 
 19  Umpire2          950 non-null    object 
dtypes: float64(1), int64(1), object(18)
memory usage: 148.6+ KB
```

In [69]:
```
ipl['ID']=ipl['ID'].astype('int32')
```

In [70]:
```
ipl.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 950 entries, 0 to 949
Data columns (total 20 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   ID               950 non-null    int32  
 1   City             899 non-null    object 
 2   Date             950 non-null    object 
 3   Season           950 non-null    object 
 4   MatchNumber      950 non-null    object 
 5   Team1            950 non-null    object 
 6   Team2            950 non-null    object 
 7   Venue            950 non-null    object 
 8   TossWinner       950 non-null    object 
 9   TossDecision     950 non-null    object 
 10  SuperOver        946 non-null    object 
 11  WinningTeam      946 non-null    object 
 12  WonBy            950 non-null    object 
 13  Margin           932 non-null    float64
 14  method           19 non-null     object 
 15  Player_of_Match  946 non-null    object 
 16  Team1Players     950 non-null    object 
 17  Team2Players     950 non-null    object 
 18  Umpire1          950 non-null    object 
 19  Umpire2          950 non-null    object 
dtypes: float64(1), int32(1), object(18)
memory usage: 144.9+ KB
```

In [71]:
```
ipl['Season'] = ipl['Season'].astype('category')
```

In [72]:
```
ipl.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 950 entries, 0 to 949
Data columns (total 20 columns):
 #   Column           Non-Null Count  Dtype   
---  ------           --------------  -----   
 0   ID               950 non-null    int32   
 1   City             899 non-null    object  
 2   Date             950 non-null    object  
 3   Season           950 non-null    category
 4   MatchNumber      950 non-null    object  
 5   Team1            950 non-null    object  
 6   Team2            950 non-null    object  
 7   Venue            950 non-null    object  
 8   TossWinner       950 non-null    object  
 9   TossDecision     950 non-null    object  
 10  SuperOver        946 non-null    object  
 11  WinningTeam      946 non-null    object  
 12  WonBy            950 non-null    object  
 13  Margin           932 non-null    float64 
 14  method           19 non-null     object  
 15  Player_of_Match  946 non-null    object  
 16  Team1Players     950 non-null    object  
 17  Team2Players     950 non-null    object  
 18  Umpire1          950 non-null    object  
 19  Umpire2          950 non-null    object  
dtypes: category(1), float64(1), int32(1), object(17)
memory usage: 139.0+ KB
```

In [73]:
```
ipl['Team1'] = ipl['Team1'].astype('category')
ipl['Team2'] = ipl['Team2'].astype('category')
```

In [74]:
```
ipl.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 950 entries, 0 to 949
Data columns (total 20 columns):
 #   Column           Non-Null Count  Dtype   
---  ------           --------------  -----   
 0   ID               950 non-null    int32   
 1   City             899 non-null    object  
 2   Date             950 non-null    object  
 3   Season           950 non-null    category
 4   MatchNumber      950 non-null    object  
 5   Team1            950 non-null    category
 6   Team2            950 non-null    category
 7   Venue            950 non-null    object  
 8   TossWinner       950 non-null    object  
 9   TossDecision     950 non-null    object  
 10  SuperOver        946 non-null    object  
 11  WinningTeam      946 non-null    object  
 12  WonBy            950 non-null    object  
 13  Margin           932 non-null    float64 
 14  method           19 non-null     object  
 15  Player_of_Match  946 non-null    object  
 16  Team1Players     950 non-null    object  
 17  Team2Players     950 non-null    object  
 18  Umpire1          950 non-null    object  
 19  Umpire2          950 non-null    object  
dtypes: category(3), float64(1), int32(1), object(15)
memory usage: 127.4+ KB
```

More Important Functions

Value Counts

In [143]:
```
# value_counts(series and dataframe)


marks = pd.DataFrame([
    [100,80,10],
    [90,70,7],
    [120,100,14],
    [80,70,14],
    [80,70,14]
],columns=['iq','marks','package'])

marks
```

Out[143]:

	iq	marks	package
0	100	80	10
1	90	70	7
2	120	100	14
3	80	70	14
4	80	70	14

In [76]:
```
marks.value_counts()
```

Out[76]:
```
iq   marks  package
80   70     14         2
90   70     7          1
100  80     10         1
120  100    14         1
dtype: int64
```

In [77]:
```
# find which player has won most potm -> in finals and qualifiers
ipl.sample(2)
```

Out[77]:

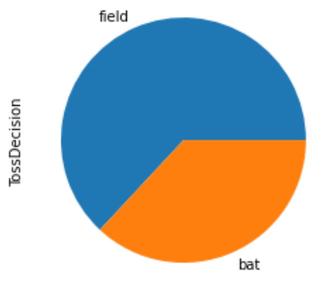
	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	SuperOver	WinningTeam	WonBy
304	1136570	Kolkata	2018-04-14	2018	10	Kolkata Knight Riders	Sunrisers Hyderabad	Eden Gardens	Sunrisers Hyderabad	field	N	Sunrisers Hyderabad	Wickets
561	598028	Dharamsala	2013-05-16	2013	67	Kings XI Punjab	Delhi Daredevils	Himachal Pradesh Cricket Association Stadium	Delhi Daredevils	field	N	Kings XI Punjab	Runs

In [78]:
```
ipl[~ipl['MatchNumber'].str.isdigit()]['Player_of_Match'].value_counts() # To reverse the contet use tilt ~
```

Out[78]:
```
KA Pollard           3
F du Plessis         3
SK Raina             3
A Kumble             2
MK Pandey            2
YK Pathan            2
M Vijay              2
JJ Bumrah            2
AB de Villiers       2
SR Watson            2
HH Pandya            1
Harbhajan Singh      1
A Nehra              1
V Sehwag             1
UT Yadav             1
MS Bisla             1
BJ Hodge             1
MEK Hussey           1
MS Dhoni             1
CH Gayle             1
MM Patel             1
DE Bollinger         1
AC Gilchrist         1
RG Sharma            1
DA Warner            1
MC Henriques         1
JC Buttler           1
RM Patidar           1
DA Miller            1
VR Iyer              1
SP Narine            1
RD Gaikwad           1
TA Boult             1
MP Stoinis           1
KS Williamson        1
RR Pant              1
SA Yadav             1
Rashid Khan          1
AD Russell           1
KH Pandya            1
KV Sharma            1
NM Coulter-Nile      1
Washington Sundar    1
BCJ Cutting          1
M Ntini              1
Name: Player_of_Match, dtype: int64
```

In [79]:
```
# Toss decision plot
ipl['TossDecision'].value_counts().plot(kind='pie')
```

Out[79]:
```
<AxesSubplot:ylabel='TossDecision'>
```



In [80]:
```
# No.of matches each team has played
(ipl['Team1'].value_counts() + ipl['Team2'].value_counts()).sort_values(ascending=False)
```

Out[80]:
```
Mumbai Indians                 231
Royal Challengers Bangalore    226
Kolkata Knight Riders          223
Chennai Super Kings            208
Rajasthan Royals               192
Kings XI Punjab                190
Delhi Daredevils               161
Sunrisers Hyderabad            152
Deccan Chargers                 75
Delhi Capitals                  63
Pune Warriors                   46
Gujarat Lions                   30
Punjab Kings                    28
Gujarat Titans                  16
Rising Pune Supergiant          16
Lucknow Super Giants            15
Kochi Tuskers Kerala            14
Rising Pune Supergiants         14
dtype: int64
```

Sort values

In [81]:
```
x = pd.Series([12,14,1,56,89])
x
```

Out[81]:
```
0    12
1    14
2     1
3    56
4    89
dtype: int64
```

In [82]:
```
x.sort_values(ascending=True)
```

Out[82]:
```
2     1
0    12
1    14
3    56
4    89
dtype: int64
```

In [83]:
```
movies.sample(2)
```

Out[83]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult	year_of_ı
107	Hope Aur Hum	tt8324474	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Hope_Aur_Hum	Hope Aur Hum	Hope Aur Hum	0	
666	Tere Naal Love Ho Gaya	tt2130242	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Tere_Naal_Love_H...	Tere Naal Love Ho Gaya	Tere Naal Love Ho Gaya	0	

```
In [84]: movies.sort_values('title_x', ascending=False)
```

Out[84]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult
1623	Zubeidaa	tt0255713	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Zubeidaa	Zubeidaa	Zubeidaa	0
939	Zor Lagaa Ke...Haiya!	tt1479857	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Zor_Lagaa_Ke...H...	Zor Lagaa Ke... Haiya!	Zor Lagaa Ke... Haiya!	0
756	Zokkomon	tt1605790	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Zokkomon	Zokkomon	Zokkomon	0
670	Zindagi Tere Naam	tt2164702	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Zindagi_Tere_Naam	Zindagi Tere Naam	Zindagi Tere Naam	0
778	Zindagi Na Milegi Dobara	tt1562872	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Zindagi_Na_Mileg...	Zindagi Na Milegi Dobara	Zindagi Na Milegi Dobara	0
...	...	...	...	...	...	...	...
1039	1971 (2007 film)	tt0983990	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/1971_(2007_film)	1971	1971	0
723	1920: The Evil Returns	tt2222550	https://upload.wikimedia.org/wikipedia/en/e/e7...	https://en.wikipedia.org/wiki/1920:_The_Evil_R...	1920: Evil Returns	1920: Evil Returns	0
287	1920: London	tt5638500	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/1920_London	1920 London	1920 London	0
1021	1920 (film)	tt1301698	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/1920_(film)	1920	1920	0
1498	16 December (film)	tt0313844	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/16_December_(film)	16-Dec	16-Dec	0

1629 rows × 19 columns

In [85]:
```
students = pd.DataFrame(
    {
        'name':['nitish','ankit','rupesh',np.nan,'mrityunjay',np.nan,'rishabh',np.nan,'aditya',np.nan],
        'college':['bit','iit','vit',np.nan,np.nan,'vlsi','ssit',np.nan,np.nan,'git'],
        'branch':['eee','it','cse',np.nan,'me','ce','civ','cse','bio',np.nan],
        'cgpa':[6.66,8.25,6.41,np.nan,5.6,9.0,7.4,10,7.4,np.nan],
        'package':[4,5,6,np.nan,6,7,8,9,np.nan,np.nan]

    }
)

students
```

Out[85]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
3	NaN	NaN	NaN	NaN	NaN
4	mrityunjay	NaN	me	5.60	6.0
5	NaN	vlsi	ce	9.00	7.0
6	rishabh	ssit	civ	7.40	8.0
7	NaN	NaN	cse	10.00	9.0
8	aditya	NaN	bio	7.40	NaN
9	NaN	git	NaN	NaN	NaN

In [86]:
```
students.sort_values('name', ascending=False, na_position='first') # inplace=True ( for Permanent Changes)
```

Out[86]:

	name	college	branch	cgpa	package
3	NaN	NaN	NaN	NaN	NaN
5	NaN	vlsi	ce	9.00	7.0
7	NaN	NaN	cse	10.00	9.0
9	NaN	git	NaN	NaN	NaN
2	rupesh	vit	cse	6.41	6.0
6	rishabh	ssit	civ	7.40	8.0
0	nitish	bit	eee	6.66	4.0
4	mrityunjay	NaN	me	5.60	6.0
1	ankit	iit	it	8.25	5.0
8	aditya	NaN	bio	7.40	NaN

In [87]:
```
students
```

Out[87]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
3	NaN	NaN	NaN	NaN	NaN
4	mrityunjay	NaN	me	5.60	6.0
5	NaN	vlsi	ce	9.00	7.0
6	rishabh	ssit	civ	7.40	8.0
7	NaN	NaN	cse	10.00	9.0
8	aditya	NaN	bio	7.40	NaN
9	NaN	git	NaN	NaN	NaN

In [88]:
```
movies.sort_values(['year_of_release','title_x'], ascending=[True,False]).head(2)
```

Out[88]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult	yea
1623	Zubeidaa	tt0255713	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Zubeidaa	Zubeidaa	Zubeidaa	0	
1625	Yeh Zindagi Ka Safar	tt0298607	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Yeh_Zindagi_Ka_S...	Yeh Zindagi Ka Safar	Yeh Zindagi Ka Safar	0	

rank(Series)

In [89]:
```
batsman=pd.read_csv("batsman_runs_ipl.csv")
```

In [90]:
```
batsman.head(2)
```

Out[90]:

	batter	batsman_run
0	A Ashish Reddy	280
1	A Badoni	161

In [91]:
```
batsman['batsman_run'].rank(ascending=False)
```

Out[91]:
```
0      166.5
1      226.0
2      535.0
3      329.0
4      402.5
       ...
600    594.0
601    343.0
602    547.5
603     27.0
604    256.0
Name: batsman_run, Length: 605, dtype: float64
```

In [92]:
```
batsman['batsman_rank'] = batsman['batsman_run'].rank(ascending=False)
batsman.sort_values('batsman_rank')
```

Out[92]:

	batter	batsman_run	batsman_rank
569	V Kohli	6634	1.0
462	S Dhawan	6244	2.0
130	DA Warner	5883	3.0
430	RG Sharma	5881	4.0
493	SK Raina	5536	5.0
...	...	...	...
512	SS Cottrell	0	594.0
466	S Kaushik	0	594.0
203	IC Pandey	0	594.0
467	S Ladda	0	594.0
468	S Lamichhane	0	594.0

605 rows × 3 columns

sort_index (Series and dataframe)

In [93]:
```
marks = {
    'maths':67,
    'english':57,
    'science':89,
    'hindi':100
}

marks_series = pd.Series(marks)
marks_series
```

Out[93]:
```
maths       67
english     57
science     89
hindi      100
dtype: int64
```

In [94]:
```
marks_series.sort_index()
```

Out[94]:
```
english     57
hindi      100
maths       67
science     89
dtype: int64
```

In [95]:
```
movies.sort_index(ascending=False)
```

Out[95]:

	title_x	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult
1628	Humsafar	tt2403201	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Humsafar	Humsafar	Humsafar	0
1627	Daaka	tt10833860	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Daaka	Daaka	Daaka	0
1626	Sabse Bada Sukh	tt0069204	NaN	https://en.wikipedia.org/wiki/Sabse_Bada_Sukh	Sabse Bada Sukh	Sabse Bada Sukh	0
1625	Yeh Zindagi Ka Safar	tt0298607	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Yeh_Zindagi_Ka_S...	Yeh Zindagi Ka Safar	Yeh Zindagi Ka Safar	0
1624	Tera Mera Saath Rahen	tt0301250	https://upload.wikimedia.org/wikipedia/en/2/2b...	https://en.wikipedia.org/wiki/Tera_Mera_Saath_...	Tera Mera Saath Rahen	Tera Mera Saath Rahen	0
...	...	...	...	...	...	...	...
4	Evening Shadows	tt6028796	NaN	https://en.wikipedia.org/wiki/Evening_Shadows	Evening Shadows	Evening Shadows	0
3	Why Cheat India	tt8108208	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Why_Cheat_India	Why Cheat India	Why Cheat India	0
2	The Accidental Prime Minister (film)	tt6986710	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/The_Accidental_P...	The Accidental Prime Minister	The Accidental Prime Minister	0
1	Battalion 609	tt9472208	NaN	https://en.wikipedia.org/wiki/Battalion_609	Battalion 609	Battalion 609	0
0	Uri: The Surgical Strike	tt8291224	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Uri:_The_Surgica...	Uri: The Surgical Strike	Uri: The Surgical Strike	0

1629 rows × 19 columns

In [96]:
```
# set_index(dataframe) -> inplace
batsman.set_index('batter',inplace=True)
```

In [99]:
```
how to delete columns
```

```
  File "C:\Users\user\AppData\Local\Temp/ipykernel_17496/2400687195.py", line 1
    how to delete columns
        ^
SyntaxError: invalid syntax
```

In [140]:
```
# This code drops two columns from the 'batsman' dataframe: 'level_0' and 'index'.
# The 'inplace=True' parameter ensures that the original dataframe is modified instead of creating a new one.

batsman.drop(['index'], axis=1, inplace=True)
```

In [101]:
```
# reset_index(series + dataframe) -> drop parameter
batsman.reset_index(inplace=True)
```

In [102]:
```
batsman
```

Out[102]:

	batter	batsman_run	batsman_rank
0	A Ashish Reddy	280	166.5
1	A Badoni	161	226.0
2	A Chandila	4	535.0
3	A Chopra	53	329.0
4	A Choudhary	25	402.5
...	...	...	...
600	Yash Dayal	0	594.0
601	Yashpal Singh	47	343.0
602	Younis Khan	3	547.5
603	Yuvraj Singh	2754	27.0
604	Z Khan	117	256.0

605 rows × 3 columns

In [103]:
```
# how to replace existing index without loosing
batsman.reset_index().set_index('batsman_rank')
```

Out[103]:

	index	batter	batsman_run
batsman_rank			
166.5	0	A Ashish Reddy	280
226.0	1	A Badoni	161
535.0	2	A Chandila	4
329.0	3	A Chopra	53
402.5	4	A Choudhary	25
...	...	...	...
594.0	600	Yash Dayal	0
343.0	601	Yashpal Singh	47
547.5	602	Younis Khan	3
27.0	603	Yuvraj Singh	2754
256.0	604	Z Khan	117

605 rows × 3 columns

In [104]:
```
batsman
```

Out[104]:

	batter	batsman_run	batsman_rank
0	A Ashish Reddy	280	166.5
1	A Badoni	161	226.0
2	A Chandila	4	535.0
3	A Chopra	53	329.0
4	A Choudhary	25	402.5
...	...	...	...
600	Yash Dayal	0	594.0
601	Yashpal Singh	47	343.0
602	Younis Khan	3	547.5
603	Yuvraj Singh	2754	27.0
604	Z Khan	117	256.0

605 rows × 3 columns

In [105]:
```
# series to dataframe using reset_index
marks_series.reset_index()
```

Out[105]:

	index	0
0	maths	67
1	english	57
2	science	89
3	hindi	100

In [106]:
```
type(marks_series.reset_index())
```

Out[106]:
```
pandas.core.frame.DataFrame
```

rename(dataframe) -> index

In [107]:
```
 movies.set_index('title_x',inplace=True)
```

In [108]:
```
movies
```

Out[108]:

	imdb_id	poster_path	wiki_link	title_y	original_title	is_adult	year_
title_x							
Uri: The Surgical Strike	tt8291224	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Uri:_The_Surgica...	Uri: The Surgical Strike	Uri: The Surgical Strike	0	
Battalion 609	tt9472208	NaN	https://en.wikipedia.org/wiki/Battalion_609	Battalion 609	Battalion 609	0	
The Accidental Prime Minister (film)	tt6986710	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/The_Accidental_P...	The Accidental Prime Minister	The Accidental Prime Minister	0	
Why Cheat India	tt8108208	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Why_Cheat_India	Why Cheat India	Why Cheat India	0	
Evening Shadows	tt6028796	NaN	https://en.wikipedia.org/wiki/Evening_Shadows	Evening Shadows	Evening Shadows	0	
...	...	...	...	...	...	...	
Tera Mera Saath Rahen	tt0301250	https://upload.wikimedia.org/wikipedia/en/2/2b...	https://en.wikipedia.org/wiki/Tera_Mera_Saath_...	Tera Mera Saath Rahen	Tera Mera Saath Rahen	0	
Yeh Zindagi Ka Safar	tt0298607	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Yeh_Zindagi_Ka_S...	Yeh Zindagi Ka Safar	Yeh Zindagi Ka Safar	0	
Sabse Bada Sukh	tt0069204	NaN	https://en.wikipedia.org/wiki/Sabse_Bada_Sukh	Sabse Bada Sukh	Sabse Bada Sukh	0	
Daaka	tt10833860	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Daaka	Daaka	Daaka	0	
Humsafar	tt2403201	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Humsafar	Humsafar	Humsafar	0	

1629 rows × 18 columns

In [109]:
```
#Rename the columns
movies.rename(columns={'imdb_id' : 'imdb', 'poster_path':'link'},inplace=True)
```

In [110]:
```
movies
```

Out[110]:

	imdb	link	wiki_link	title_y	original_title	is_adult	year_
title_x							
Uri: The Surgical Strike	tt8291224	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Uri:_The_Surgica...	Uri: The Surgical Strike	Uri: The Surgical Strike	0	
Battalion 609	tt9472208	NaN	https://en.wikipedia.org/wiki/Battalion_609	Battalion 609	Battalion 609	0	
The Accidental Prime Minister (film)	tt6986710	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/The_Accidental_P...	The Accidental Prime Minister	The Accidental Prime Minister	0	
Why Cheat India	tt8108208	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Why_Cheat_India	Why Cheat India	Why Cheat India	0	
Evening Shadows	tt6028796	NaN	https://en.wikipedia.org/wiki/Evening_Shadows	Evening Shadows	Evening Shadows	0	
...	...	...	...	...	...	...	
Tera Mera Saath Rahen	tt0301250	https://upload.wikimedia.org/wikipedia/en/2/2b...	https://en.wikipedia.org/wiki/Tera_Mera_Saath_...	Tera Mera Saath Rahen	Tera Mera Saath Rahen	0	
Yeh Zindagi Ka Safar	tt0298607	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Yeh_Zindagi_Ka_S...	Yeh Zindagi Ka Safar	Yeh Zindagi Ka Safar	0	
Sabse Bada Sukh	tt0069204	NaN	https://en.wikipedia.org/wiki/Sabse_Bada_Sukh	Sabse Bada Sukh	Sabse Bada Sukh	0	
Daaka	tt10833860	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Daaka	Daaka	Daaka	0	
Humsafar	tt2403201	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Humsafar	Humsafar	Humsafar	0	

1629 rows × 18 columns

```
In [111]: # Rename the index
          movies.rename(index={'Uri: The Surgical Strike':'uri','Humsafar':'Hum'})
```

Out[111]:

	imdb	link	wiki_link	title_y	original_title	is_adult	year_
title_x							
uri	tt8291224	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Uri:_The_Surgica...	Uri: The Surgical Strike	Uri: The Surgical Strike	0	
Battalion 609	tt9472208	NaN	https://en.wikipedia.org/wiki/Battalion_609	Battalion 609	Battalion 609	0	
The Accidental Prime Minister (film)	tt6986710	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/The_Accidental_P...	The Accidental Prime Minister	The Accidental Prime Minister	0	
Why Cheat India	tt8108208	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Why_Cheat_India	Why Cheat India	Why Cheat India	0	
Evening Shadows	tt6028796	NaN	https://en.wikipedia.org/wiki/Evening_Shadows	Evening Shadows	Evening Shadows	0	
...	...	...	...	...	...	...	
Tera Mera Saath Rahen	tt0301250	https://upload.wikimedia.org/wikipedia/en/2/2b...	https://en.wikipedia.org/wiki/Tera_Mera_Saath_...	Tera Mera Saath Rahen	Tera Mera Saath Rahen	0	
Yeh Zindagi Ka Safar	tt0298607	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Yeh_Zindagi_Ka_S...	Yeh Zindagi Ka Safar	Yeh Zindagi Ka Safar	0	
Sabse Bada Sukh	tt0069204	NaN	https://en.wikipedia.org/wiki/Sabse_Bada_Sukh	Sabse Bada Sukh	Sabse Bada Sukh	0	
Daaka	tt10833860	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Daaka	Daaka	Daaka	0	
Hum	tt2403201	https://upload.wikimedia.org/wikipedia/en/thum...	https://en.wikipedia.org/wiki/Humsafar	Humsafar	Humsafar	0	

1629 rows × 18 columns

unique

In [112]:
```
# unique(series)
temp = pd.Series([1,1,2,2,3,3,4,4,5,5,np.nan,np.nan])
print(temp)
temp.unique()
```

```
0     1.0
1     1.0
2     2.0
3     2.0
4     3.0
5     3.0
6     4.0
7     4.0
8     5.0
9     5.0
10    NaN
11    NaN
dtype: float64
```

Out[112]:
```
array([ 1.,  2.,  3.,  4.,  5., nan])
```

In [113]:
```
ipl['Season'].unique()
```

Out[113]:
```
['2022', '2021', '2020/21', '2019', '2018', ..., '2012', '2011', '2009/10', '2009', '2007/08']
Length: 15
Categories (15, object): ['2007/08', '2009', '2009/10', '2011', ..., '2019', '2020/21', '2021', '2022']
```

- nunique : returns the number of unique elements in a pandas Series or DataFrame. It doesn't count the missing values (NaNs) by default. If you want to count the missing values, you can set the argument "dropna" to False.
- unique: returns the unique elements in a pandas Series or DataFrame. It counts the missing values (NaNs) by default. If you don't want to count the missing values, you can use the "dropna" argument and set it to True.

In [114]:
```
len(ipl['Season'].unique())
```

Out[114]:
```
15
```

In [115]:
```
# nunique(series + dataframe) -> does not count nan -> dropna parameter
ipl['Season'].nunique()
```

Out[115]:
```
15
```

isnull(series + dataframe)

In [116]:
```
students
```

Out[116]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
3	NaN	NaN	NaN	NaN	NaN
4	mrityunjay	NaN	me	5.60	6.0
5	NaN	vlsi	ce	9.00	7.0
6	rishabh	ssit	civ	7.40	8.0
7	NaN	NaN	cse	10.00	9.0
8	aditya	NaN	bio	7.40	NaN
9	NaN	git	NaN	NaN	NaN

In [117]:
```
students['name'].isnull()
```

Out[117]:
```
0    False
1    False
2    False
3     True
4    False
5     True
6    False
7     True
8    False
9     True
Name: name, dtype: bool
```

In [118]:
```
# notnull(series + dataframe)
students['name'].notnull()
```

Out[118]:
```
0     True
1     True
2     True
3    False
4     True
5    False
6     True
7    False
8     True
9    False
Name: name, dtype: bool
```

In [119]:
```
students['name'][students['name'].notnull()]
```

Out[119]:
```
0        nitish
1         ankit
2        rupesh
4    mrityunjay
6       rishabh
8        aditya
Name: name, dtype: object
```

In [120]:
```
# hasnans(series)
students['college'].hasnans
```

Out[120]:
```
True
```

In [121]:
```
students.isnull()
```

Out[121]:

	name	college	branch	cgpa	package
0	False	False	False	False	False
1	False	False	False	False	False
2	False	False	False	False	False
3	True	True	True	True	True
4	False	True	False	False	False
5	True	False	False	False	False
6	False	False	False	False	False
7	True	True	False	False	False
8	False	True	False	False	True
9	True	False	True	True	True

In [122]:
```
students.notnull()
```

Out[122]:

	name	college	branch	cgpa	package
0	True	True	True	True	True
1	True	True	True	True	True
2	True	True	True	True	True
3	False	False	False	False	False
4	True	False	True	True	True
5	False	True	True	True	True
6	True	True	True	True	True
7	False	False	True	True	True
8	True	False	True	True	False
9	False	True	False	False	False

dropna -> for Missing Values

In [123]:
```
# dropna(series + dataframe) -> how parameter -> works like or
students['name'].dropna()
```

Out[123]:
```
0        nitish
1         ankit
2        rupesh
4    mrityunjay
6       rishabh
8       aditya
Name: name, dtype: object
```

how : {'any', 'all'}, default 'any'

```
    Determine if row or column is removed from DataFrame, when we have
    at least one NA or all NA.


    * 'any' : If any NA values are present, drop that row or column.
    * 'all' : If all values are NA, drop that row or column.
```

In [124]:
```
students.dropna(how='any')
```

Out[124]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
6	rishabh	ssit	civ	7.40	8.0

In [125]:
```
students.dropna(how='all')
```

Out[125]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
4	mrityunjay	NaN	me	5.60	6.0
5	NaN	vlsi	ce	9.00	7.0
6	rishabh	ssit	civ	7.40	8.0
7	NaN	NaN	cse	10.00	9.0
8	aditya	NaN	bio	7.40	NaN
9	NaN	git	NaN	NaN	NaN

subset : array-like, optional

```
    Labels along other axis to consider, e.g. if you are dropping rows
    these would be a list of columns to include.
```

In [126]:
```
students.dropna(subset=['name'])
```

Out[126]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
4	mrityunjay	NaN	me	5.60	6.0
6	rishabh	ssit	civ	7.40	8.0
8	aditya	NaN	bio	7.40	NaN

In [127]:
```
students.dropna(subset=['name','college'])
```

Out[127]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
6	rishabh	ssit	civ	7.40	8.0

fill na (series + dataframe)

In [128]:
```
students
```

Out[128]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
3	NaN	NaN	NaN	NaN	NaN
4	mrityunjay	NaN	me	5.60	6.0
5	NaN	vlsi	ce	9.00	7.0
6	rishabh	ssit	civ	7.40	8.0
7	NaN	NaN	cse	10.00	9.0
8	aditya	NaN	bio	7.40	NaN
9	NaN	git	NaN	NaN	NaN

In [129]:
```
students['name'].fillna('unknown')
```

Out[129]:
```
0        nitish
1         ankit
2        rupesh
3       unknown
4    mrityunjay
5       unknown
6       rishabh
7       unknown
8        aditya
9       unknown
Name: name, dtype: object
```

In [130]:
```
students.fillna('0')
```
Out[130]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
3	0	0	0	0	0
4	mrityunjay	0	me	5.6	6.0
5	0	vlsi	ce	9.0	7.0
6	rishabh	ssit	civ	7.4	8.0
7	0	0	cse	10.0	9.0
8	aditya	0	bio	7.4	0
9	0	git	0	0	0

In [131]:
```

students['package'].fillna(students['package'].mean())
```
Out[131]:
```
0    4.000000
1    5.000000
2    6.000000
3    6.428571
4    6.000000
5    7.000000
6    8.000000
7    9.000000
8    6.428571
9    6.428571
Name: package, dtype: float64
```

In [132]:
```
students['name'].fillna(method='ffill') #forward fill method
```
Out[132]:
```
0        nitish
1         ankit
2        rupesh
3        rupesh
4    mrityunjay
5    mrityunjay
6       rishabh
7       rishabh
8        aditya
9        aditya
Name: name, dtype: object
```

In [133]:
```
students['name'].fillna(method='bfill') # backward fill method
```
Out[133]:
```
0        nitish
1         ankit
2        rupesh
3    mrityunjay
4    mrityunjay
5       rishabh
6       rishabh
7        aditya
8        aditya
9           NaN
Name: name, dtype: object
```

drop_duplicates

In [134]:
```
# drop_duplicates(series + dataframe) -> works like and -> duplicated()

```

In [135]:
```
marks
```
Out[135]:
```
{'maths': 67, 'english': 57, 'science': 89, 'hindi': 100}
```

In [144]:
```
marks
```
Out[144]:

	iq	marks	package
0	100	80	10
1	90	70	7
2	120	100	14
3	80	70	14
4	80	70	14

In [145]:
```
marks.drop_duplicates()
```
Out[145]:

	iq	marks	package
0	100	80	10
1	90	70	7
2	120	100	14
3	80	70	14

In [146]:
```
marks.drop_duplicates(keep='last')
```
Out[146]:

	iq	marks	package
0	100	80	10
1	90	70	7
2	120	100	14
4	80	70	14

In [148]:
```
# find the last match played by virat kohli in Delhi
ipl.sample(2)
```
Out[148]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	SuperOver	WinningTeam	WonBy	M
6	1304114	Mumbai	2022-05-20	2022	68	Chennai Super Kings	Rajasthan Royals	Brabourne Stadium, Mumbai	Chennai Super Kings	bat	N	Rajasthan Royals	Wickets	
276	1136598	Indore	2018-05-06	2018	38	Rajasthan Royals	Kings XI Punjab	Holkar Cricket Stadium	Kings XI Punjab	field	N	Kings XI Punjab	Wickets	

In [149]:
```
ipl['all Players'] = ipl['Team1Players'] + ipl['Team2Players']
ipl.sample(2)
```
Out[149]:

nue	TossWinner	TossDecision	...	WinningTeam	WonBy	Margin	method	Player_of_Match	Team1Players	Team2Players	Umpire1	Umpire2
MA ıram ium, ɔauk	Rajasthan Royals	bat	...	Chennai Super Kings	Wickets	8.0	NaN	MEK Hussey	['MEK Hussey', 'M Vijay', 'SK Raina', 'JA Mork...	['SR Watson', 'R Dravid', 'AL Menaria', 'J Bot...	SS Hazare	RB Tiffin
ıede ium, nbai	Delhi Capitals	field	...	Royal Challengers Bangalore	Runs	16.0	NaN	KD Karthik	['F du Plessis', 'Anuj Rawat', 'V Kohli', 'GJ ...	['PP Shaw', 'DA Warner', 'MR Marsh', 'RR Pant'...	Chirra Ravikanthreddy	J Madanagopal

In [154]:
```
def did_kohli_play(players_list):
    return 'V Kohli' in players_list
```

In [160]:
```
ipl['did_kohli_play'] = ipl['all Players'].apply(did_kohli_play)
```

In [165]:
```
ipl.sample(2)
```

Out[165]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	...	Margin	method	Player_of_Matc
940	335991	Chandigarh	2008-04-25	2007/08	10	Kings XI Punjab	Mumbai Indians	Punjab Cricket Association Stadium, Mohali	Mumbai Indians	field	...	66.0	NaN	KC Sangakka
826	419114	Delhi	2010-03-17	2009/10	9	Delhi Daredevils	Mumbai Indians	Feroz Shah Kotla	Delhi Daredevils	field	...	98.0	NaN	SR Tendulk

2 rows × 23 columns

In [166]:
```
ipl[( ipl['City'] == 'Delhi')  & (ipl['did_kohli_play'] == True)]
```

Out[166]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	...	Margin	method	Player_of_Match
208	1178421	Delhi	2019-04-28	2019	46	Delhi Capitals	Royal Challengers Bangalore	Arun Jaitley Stadium	Delhi Capitals	bat	...	16.0	NaN	S Dhawan
269	1136605	Delhi	2018-05-12	2018	45	Delhi Daredevils	Royal Challengers Bangalore	Arun Jaitley Stadium	Royal Challengers Bangalore	field	...	5.0	NaN	AB de Villiers
318	1082646	Delhi	2017-05-14	2017	56	Delhi Daredevils	Royal Challengers Bangalore	Feroz Shah Kotla	Royal Challengers Bangalore	bat	...	10.0	NaN	HV Patel
467	829757	Delhi	2015-04-26	2015	26	Delhi Daredevils	Royal Challengers Bangalore	Feroz Shah Kotla	Royal Challengers Bangalore	field	...	10.0	NaN	VR Aaron
571	598054	Delhi	2013-05-10	2013	57	Delhi Daredevils	Royal Challengers Bangalore	Feroz Shah Kotla	Delhi Daredevils	field	...	4.0	NaN	JD Unadkat
638	548372	Delhi	2012-05-17	2012	67	Delhi Daredevils	Royal Challengers Bangalore	Feroz Shah Kotla	Delhi Daredevils	field	...	21.0	NaN	CH Gayle
746	501227	Delhi	2011-04-26	2011	30	Delhi Daredevils	Royal Challengers Bangalore	Feroz Shah Kotla	Royal Challengers Bangalore	field	...	3.0	NaN	V Kohli
801	419140	Delhi	2010-04-04	2009/10	35	Delhi Daredevils	Royal Challengers Bangalore	Feroz Shah Kotla	Delhi Daredevils	bat	...	37.0	NaN	PD Collingwood
933	335998	Delhi	2008-04-30	2007/08	17	Delhi Daredevils	Royal Challengers Bangalore	Feroz Shah Kotla	Royal Challengers Bangalore	field	...	10.0	NaN	GD McGrath

9 rows × 23 columns

In [168]:
```
ipl[( ipl['City'] == 'Delhi')  & (ipl['did_kohli_play'] == True)].drop_duplicates(subset=['City','did_kohli_play'],keep='
```

Out[168]:

	ID	City	Date	Season	MatchNumber	Team1	Team2	Venue	TossWinner	TossDecision	...	Margin	method	Player_of_Match	Tea
208	1178421	Delhi	2019-04-28	2019	46	Delhi Capitals	Royal Challengers Bangalore	Arun Jaitley Stadium	Delhi Capitals	bat	...	16.0	NaN	S Dhawan	['F D

1 rows × 23 columns

drop(series + dataframe)

In [169]:
```
# Series
temp = pd.Series([10,2,3,16,45,78,10])
temp
```

Out[169]:
```
0    10
1     2
2     3
3    16
4    45
5    78
6    10
dtype: int64
```

In [170]:
```
temp.drop(index=[0,6])
```

Out[170]:
```
1     2
2     3
3    16
4    45
5    78
dtype: int64
```

In [171]:
```
students
```

Out[171]:

	name	college	branch	cgpa	package
0	nitish	bit	eee	6.66	4.0
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
3	NaN	NaN	NaN	NaN	NaN
4	mrityunjay	NaN	me	5.60	6.0
5	NaN	vlsi	ce	9.00	7.0
6	rishabh	ssit	civ	7.40	8.0
7	NaN	NaN	cse	10.00	9.0
8	aditya	NaN	bio	7.40	NaN
9	NaN	git	NaN	NaN	NaN

In [172]:
```
students.drop(columns=['branch','cgpa']) # To delete Columns
```
Out[172]:

	name	college	package
0	nitish	bit	4.0
1	ankit	iit	5.0
2	rupesh	vit	6.0
3	NaN	NaN	NaN
4	mrityunjay	NaN	6.0
5	NaN	vlsi	7.0
6	rishabh	ssit	8.0
7	NaN	NaN	9.0
8	aditya	NaN	NaN
9	NaN	git	NaN

In [173]:
```
students.drop(index=[0,8]) # to delete rows
```
Out[173]:

	name	college	branch	cgpa	package
1	ankit	iit	it	8.25	5.0
2	rupesh	vit	cse	6.41	6.0
3	NaN	NaN	NaN	NaN	NaN
4	mrityunjay	NaN	me	5.60	6.0
5	NaN	vlsi	ce	9.00	7.0
6	rishabh	ssit	civ	7.40	8.0
7	NaN	NaN	cse	10.00	9.0
9	NaN	git	NaN	NaN	NaN

In [174]:
```
students.set_index('name')
```
Out[174]:

	college	branch	cgpa	package
name				
nitish	bit	eee	6.66	4.0
ankit	iit	it	8.25	5.0
rupesh	vit	cse	6.41	6.0
NaN	NaN	NaN	NaN	NaN
mrityunjay	NaN	me	5.60	6.0
NaN	vlsi	ce	9.00	7.0
rishabh	ssit	civ	7.40	8.0
NaN	NaN	cse	10.00	9.0
aditya	NaN	bio	7.40	NaN
NaN	git	NaN	NaN	NaN

In [175]:
```
students.set_index('name').drop(index=['nitish','aditya']) # delete by names
```
Out[175]:

	college	branch	cgpa	package
name				
ankit	iit	it	8.25	5.0
rupesh	vit	cse	6.41	6.0
NaN	NaN	NaN	NaN	NaN
mrityunjay	NaN	me	5.60	6.0
NaN	vlsi	ce	9.00	7.0
rishabh	ssit	civ	7.40	8.0
NaN	NaN	cse	10.00	9.0
NaN	git	NaN	NaN	NaN

apply(series + dataframe)

In [176]:
```
# series
temp = pd.Series([10,20,30,40,50])

temp
```

Out[176]:
```
0    10
1    20
2    30
3    40
4    50
dtype: int64
```

In [177]:
```
def sigmoid(value):
    return 1/1+np.exp(-value)
```

In [178]:
```
temp.apply(sigmoid)
```

Out[178]:
```
0    1.000045
1    1.000000
2    1.000000
3    1.000000
4    1.000000
dtype: float64
```

In [179]:
```
# On data Frame
points = pd.DataFrame(
    {
        '1st point':[(3,4),(-6,5),(0,0),(-10,1),(4,5)],
        '2nd point':[(-3,4),(0,0),(2,2),(10,10),(1,1)]
    }
)

points
```

Out[179]:

	1st point	2nd point
0	(3, 4)	(-3, 4)
1	(-6, 5)	(0, 0)
2	(0, 0)	(2, 2)
3	(-10, 1)	(10, 10)
4	(4, 5)	(1, 1)

In [180]:
```
def euclidean(row):
    point_A = row['1st point']
    point_B = row['2nd point']
    return ((point_A[0] - point_B[0])** 2 + (point_A[1]- point_B[1])**2 )** 0.5
```

In [182]:
```
points.apply(euclidean,axis=1) # mention axis=1 because its row wise
```

Out[182]:
```
0     6.000000
1     7.810250
2     2.828427
3    21.931712
4     5.000000
dtype: float64
```

In [184]:
```
points['distance'] = points.apply(euclidean,axis=1)
points
```

Out[184]:

	1st point	2nd point	distance
0	(3, 4)	(-3, 4)	6.000000
1	(-6, 5)	(0, 0)	7.810250
2	(0, 0)	(2, 2)	2.828427
3	(-10, 1)	(10, 10)	21.931712
4	(4, 5)	(1, 1)	5.000000

Groupby (Applies on Categorical data)

In [187]:
```
movies = pd.read_csv("imdb-top-1000.csv")
```

In [189]:
```
movies.head(1)
```

Out[189]:

	Series_Title	Released_Year	Runtime	Genre	IMDB_Rating	Director	Star1	No_of_Votes	Gross	Metascore
0	The Shawshank Redemption	1994	142	Drama	9.3	Frank Darabont	Tim Robbins	2343110	28341469.0	80.0

In [190]:
```
movies.groupby('Genre')
```

Out[190]:
```
<pandas.core.groupby.generic.DataFrameGroupBy object at 0x000001EFE1E1F670>
```

In [195]:
```
generes =movies.groupby('Genre')
```

In [196]:
```
# Applying builtin aggregation fuctions on groupby objects
generes.sum()
```

Out[196]:

	Runtime	IMDB_Rating	No_of_Votes	Gross	Metascore
Genre					
Action	22196	1367.3	72282412	3.263226e+10	10499.0
Adventure	9656	571.5	22576163	9.496922e+09	5020.0
Animation	8166	650.3	21978630	1.463147e+10	6082.0
Biography	11970	698.6	24006844	8.276358e+09	6023.0
Comedy	17380	1224.7	27620327	1.566387e+10	9840.0
Crime	13524	857.8	33533615	8.452632e+09	6706.0
Drama	36049	2299.7	61367304	3.540997e+10	19208.0
Family	215	15.6	551221	4.391106e+08	158.0
Fantasy	170	16.0	146222	7.827267e+08	0.0
Film-Noir	312	23.9	367215	1.259105e+08	287.0
Horror	1123	87.0	3742556	1.034649e+09	880.0
Mystery	1429	95.7	4203004	1.256417e+09	633.0
Thriller	108	7.8	27733	1.755074e+07	81.0
Western	593	33.4	1289665	5.822151e+07	313.0

In [197]:
```
generes.mean()
```

Out[197]:

	Runtime	IMDB_Rating	No_of_Votes	Gross	Metascore
Genre					
Action	129.046512	7.949419	420246.581395	1.897224e+08	73.419580
Adventure	134.111111	7.937500	313557.819444	1.319017e+08	78.437500
Animation	99.585366	7.930488	268032.073171	1.784326e+08	81.093333
Biography	136.022727	7.938636	272805.045455	9.404952e+07	76.240506
Comedy	112.129032	7.901290	178195.658065	1.010572e+08	78.720000
Crime	126.392523	8.016822	313398.271028	7.899656e+07	77.080460
Drama	124.737024	7.957439	212343.612457	1.225259e+08	79.701245
Family	107.500000	7.800000	275610.500000	2.195553e+08	79.000000
Fantasy	85.000000	8.000000	73111.000000	3.913633e+08	NaN
Film-Noir	104.000000	7.966667	122405.000000	4.197018e+07	95.666667
Horror	102.090909	7.909091	340232.363636	9.405902e+07	80.000000
Mystery	119.083333	7.975000	350250.333333	1.047014e+08	79.125000
Thriller	108.000000	7.800000	27733.000000	1.755074e+07	81.000000
Western	148.250000	8.350000	322416.250000	1.455538e+07	78.250000

In [198]:
```
generes.min()
```

Out[198]:

	Series_Title	Released_Year	Runtime	IMDB_Rating	Director	Star1	No_of_Votes	Gross	Metascore
Genre									
Action	300	1924	45	7.6	Abhishek Chaubey	Aamir Khan	25312	3296.0	33.0
Adventure	2001: A Space Odyssey	1925	88	7.6	Akira Kurosawa	Aamir Khan	29999	61001.0	41.0
Animation	Akira	1940	71	7.6	Adam Elliot	Adrian Molina	25229	128985.0	61.0
Biography	12 Years a Slave	1928	93	7.6	Adam McKay	Adrien Brody	27254	21877.0	48.0
Comedy	(500) Days of Summer	1921	68	7.6	Alejandro G. Iñárritu	Aamir Khan	26337	1305.0	45.0
Crime	12 Angry Men	1931	80	7.6	Akira Kurosawa	Ajay Devgn	27712	6013.0	47.0
Drama	1917	1925	64	7.6	Aamir Khan	Abhay Deol	25088	3600.0	28.0
Family	E.T. the Extra-Terrestrial	1971	100	7.8	Mel Stuart	Gene Wilder	178731	4000000.0	67.0
Fantasy	Das Cabinet des Dr. Caligari	1920	76	7.9	F.W. Murnau	Max Schreck	57428	337574718.0	NaN
Film-Noir	Shadow of a Doubt	1941	100	7.8	Alfred Hitchcock	Humphrey Bogart	59556	449191.0	94.0
Horror	Alien	1933	71	7.6	Alejandro Amenábar	Anthony Perkins	27007	89029.0	46.0
Mystery	Dark City	1938	96	7.6	Alex Proyas	Bernard-Pierre Donnadieu	33982	1035953.0	52.0
Thriller	Wait Until Dark	1967	108	7.8	Terence Young	Audrey Hepburn	27733	17550741.0	81.0
Western	Il buono, il brutto, il cattivo	1965	132	7.8	Clint Eastwood	Clint Eastwood	65659	5321508.0	69.0

In [206]:
```
# find the top 3 genres by total earning
movies.groupby('Genre').sum()['Gross'].sort_values(ascending=False).head(3)
```

Out[206]:
```
Genre
Drama      3.540997e+10
Action     3.263226e+10
Comedy     1.566387e+10
Name: Gross, dtype: float64
```

In [212]:
```
#Second Approach
movies.groupby('Genre')['Gross'].sum().sort_values()
```

Out[212]:
```
Genre
Thriller     1.755074e+07
Western      5.822151e+07
Film-Noir    1.259105e+08
Family       4.391106e+08
Fantasy      7.827267e+08
Horror       1.034649e+09
Mystery      1.256417e+09
Biography    8.276358e+09
Crime        8.452632e+09
Adventure    9.496922e+09
Animation    1.463147e+10
Comedy       1.566387e+10
Action       3.263226e+10
Drama        3.540997e+10
Name: Gross, dtype: float64
```

In [214]:
```
movies.groupby('Genre')['Gross'].sum().sort_values(ascending= False).head(3)
```

Out[214]:
```
Genre
Drama      3.540997e+10
Action     3.263226e+10
Comedy     1.566387e+10
Name: Gross, dtype: float64
```

In [217]:
```
# find the genre with highest avg IMDB rating
movies.groupby('Genre')['IMDB_Rating'].mean().sort_values(ascending=False).head(1)
```

Out[217]:
```
Genre
Western    8.35
Name: IMDB_Rating, dtype: float64
```