In [1]:
```
# Assignment - A2     |     Name : Pratik Pingale     |     Roll No : 19CO056
```

Importing pandas and numpy libs

In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

Reading the dataset and loading into pandas dataframe

In [3]:
```
df = pd.read_csv("Academic-Performance-Dataset.csv")
df
```

Out[3]:

	Rollno	Name	Gender	Branch	Attendence	Phy_marks	Che_marks	EM1_marks	PPS_marks	SME_marks	Total Marks	Percentage
0	1	Mohammed	M	Comp	72.0	62.0	98.0	63.0	89.0	36.0	368	73.6
1	2	Reyansh	M	IT	58.0	62.0	83.0	83.0	88.0	34.0	350	70.0
2	3	Aarav	M	IT	57.0	-20.0	100.0	NaN	56.0	36.0	192	38.4
3	4	Atharv	M	IT	60.0	89.0	83.0	70.0	33.0	23.0	298	59.6
4	5	Vivaan	M	Comp	85.0	90.0	NaN	78.0	23.0	56.0	247	49.4
5	6	Advik	M	ENTC	94.0	99.0	84.0	100.0	56.0	99.0	438	87.6
6	7	Ansh	M	ENTC	98.0	88.0	95.0	81.0	78.0	78.0	420	84.0
7	8	Ishaan	M	ENTC	75.0	66.0	51.0	83.0	-99.0	76.0	192	38.4
8	9	Dhruv	M	ENTC	63.0	NaN	NaN	97.0	56.0	55.0	208	41.6
9	10	Siddharth	M	ENTC	96.0	67.0	78.0	95.0	NaN	98.0	338	67.6
10	11	Vihaan	M	ENTC	82.0	54.0	70.0	88.0	55.0	56.0	323	64.6
11	12	NaN	M	IT	75.0	64.0	67.0	71.0	66.0	87.0	355	71.0
12	13	Aarush	M	IT	67.0	56.0	81.0	NaN	90.0	55.0	282	56.4
13	14	Leo	M	IT	98.0	-34.0	70.0	94.0	77.0	66.0	273	54.6
14	15	Maryam	F	IT	64.0	87.0	60.0	90.0	65.0	90.0	392	78.4
15	16	Saanvi	F	Comp	66.0	90.0	95.0	67.0	99.0	77.0	428	85.6
16	17	Zaranew	F	Comp	93.0	54.0	NaN	75.0	90.0	65.0	284	56.8
17	18	Inaya	F	Comp	74.0	67.0	93.0	93.0	87.0	99.0	439	87.8
18	19	Aarya	F	Comp	72.0	88.0	84.0	81.0	80.0	45.0	378	75.6
19	20	NaN	F	Comp	53.0	76.0	81.0	93.0	65.0	23.0	338	67.6

In [4]:
```
df.shape
```

Out[4]:
```
(20, 12)
```

In [5]:
```
df.dtypes.value_counts()
```

Out[5]:
```
float64    7
object     3
int64      2
dtype: int64
```

Handle the Missing value

Handle the Missing value

In [6]:
```
df.isna().sum()
```

Out[6]:
```
Rollno          0
Name            2
Gender          0
Branch          0
Attendence      0
Phy_marks       1
Che_marks       3
EM1_marks       2
PPS_marks       1
SME_marks       0
Total Marks     0
Percentage      0
dtype: int64
```

Make a list of column having missing value

In [7]:
```
cols_with_na = []
for col in df.columns:
    if df[col].isna().sum() > 0:
        cols_with_na.append(col)

cols_with_na
```

Out[7]:
```
['Name', 'Phy_marks', 'Che_marks', 'EM1_marks', 'PPS_marks']
```

Fill the missing value using mean for float and int datatypes and for other forword fill

In [8]:
```
pd.options.mode.chained_assignment = None
for col in cols_with_na:
    col_dt = df[col].dtypes
    if (col_dt == 'int64' or col_dt == 'float64'):
        df_col = df[col]
        for i in range(df.shape[0]):
            if (df_col[i] < 0 or df_col[i] > 100):
                df_col[i] = np.nan
        df_col.fillna(df_col.mean(), inplace=True)
    else:
        df[col] = df[col].fillna(method='ffill')
df
```

Out[8]:

	Rollno	Name	Gender	Branch	Attendence	Phy_marks	Che_marks	EM1_marks	PPS_marks	SME_marks	Total Marks	Percentage
0	1	Mohammed	M	Comp	72.0	62.000000	98.000000	63.000000	89.000000	36.0	368	73.6
1	2	Reyansh	M	IT	58.0	62.000000	83.000000	83.000000	88.000000	34.0	350	70.0
2	3	Aarav	M	IT	57.0	74.058824	100.000000	83.444444	56.000000	36.0	192	38.4
3	4	Atharv	M	IT	60.0	89.000000	83.000000	70.000000	33.000000	23.0	298	59.6
4	5	Vivaan	M	Comp	85.0	90.000000	80.764706	78.000000	23.000000	56.0	247	49.4
5	6	Advik	M	ENTC	94.0	99.000000	84.000000	100.000000	56.000000	99.0	438	87.6
6	7	Ansh	M	ENTC	98.0	88.000000	95.000000	81.000000	78.000000	78.0	420	84.0
7	8	Ishaan	M	ENTC	75.0	66.000000	51.000000	83.000000	69.611111	76.0	192	38.4
8	9	Dhruv	M	ENTC	63.0	74.058824	80.764706	97.000000	56.000000	55.0	208	41.6
9	10	Siddharth	M	ENTC	96.0	67.000000	78.000000	95.000000	69.611111	98.0	338	67.6
10	11	Vihaan	M	ENTC	82.0	54.000000	70.000000	88.000000	55.000000	56.0	323	64.6
11	12	Vihaan	M	IT	75.0	64.000000	67.000000	71.000000	66.000000	87.0	355	71.0
12	13	Aarush	M	IT	67.0	56.000000	81.000000	83.444444	90.000000	55.0	282	56.4
13	14	Leo	M	IT	98.0	74.058824	70.000000	94.000000	77.000000	66.0	273	54.6
14	15	Maryam	F	IT	64.0	87.000000	60.000000	90.000000	65.000000	90.0	392	78.4
15	16	Saanvi	F	Comp	66.0	90.000000	95.000000	67.000000	99.000000	77.0	428	85.6
16	17	Zaranew	F	Comp	93.0	54.000000	80.764706	75.000000	90.000000	65.0	284	56.8
17	18	Inaya	F	Comp	74.0	67.000000	93.000000	93.000000	87.000000	99.0	439	87.8
18	19	Aarya	F	Comp	72.0	88.000000	84.000000	81.000000	80.000000	45.0	378	75.6
19	20	Aarya	F	Comp	53.0	76.000000	81.000000	93.000000	65.000000	23.0	338	67.6

Correction in Total Marks, Percentage after filling missing value

In [9]:
```
df['Total Marks']=df['Phy_marks']+df['Che_marks']+df['EM1_marks']+df['PPS_marks']+df['SME_marks']
df['Percentage']=df['Total Marks']/5

df
```

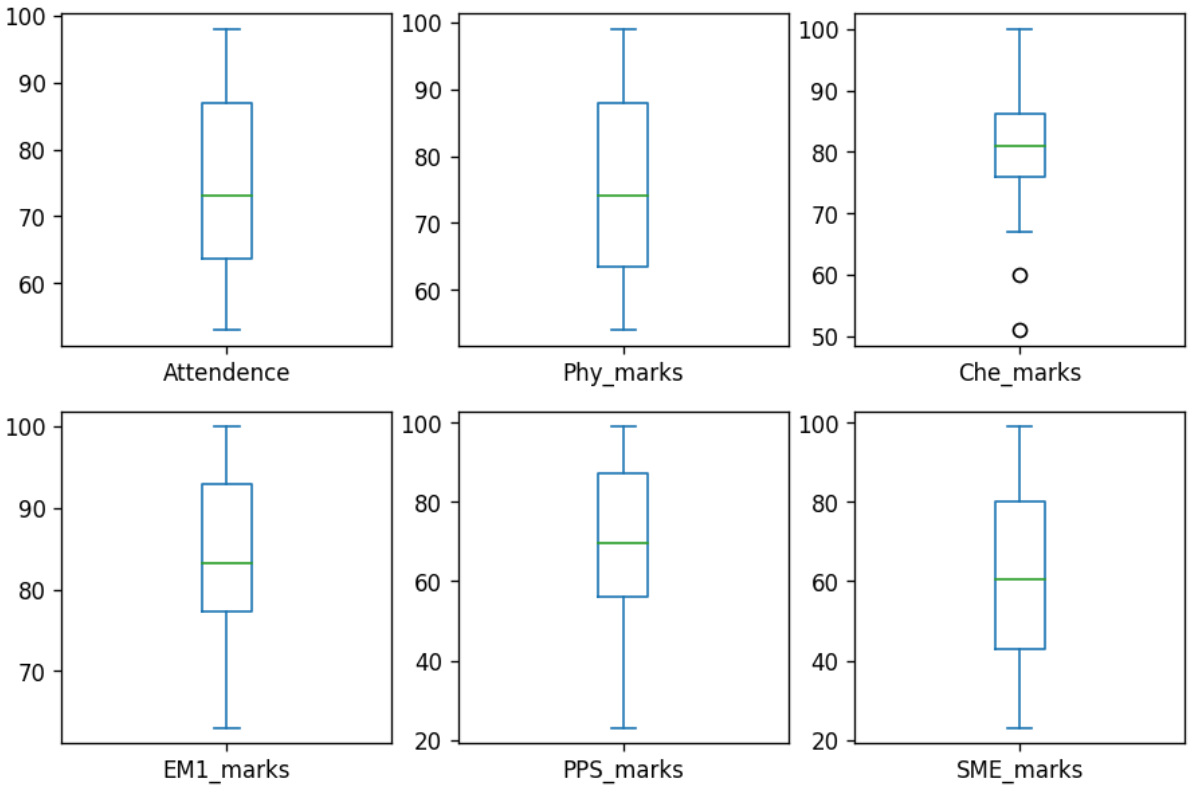
Out[9]:

	Rollno	Name	Gender	Branch	Attendence	Phy_marks	Che_marks	EM1_marks	PPS_marks	SME_marks	Total Marks	Percentage
0	1	Mohammed	M	Comp	72.0	62.000000	98.000000	63.000000	89.000000	36.0	348.000000	69.600000
1	2	Reyansh	M	IT	58.0	62.000000	83.000000	83.000000	88.000000	34.0	350.000000	70.000000
2	3	Aarav	M	IT	57.0	74.058824	100.000000	83.444444	56.000000	36.0	349.503268	69.900654
3	4	Atharv	M	IT	60.0	89.000000	83.000000	70.000000	33.000000	23.0	298.000000	59.600000
4	5	Vivaan	M	Comp	85.0	90.000000	80.764706	78.000000	23.000000	56.0	327.764706	65.552941
5	6	Advik	M	ENTC	94.0	99.000000	84.000000	100.000000	56.000000	99.0	438.000000	87.600000
6	7	Ansh	M	ENTC	98.0	88.000000	95.000000	81.000000	78.000000	78.0	420.000000	84.000000
7	8	Ishaan	M	ENTC	75.0	66.000000	51.000000	83.000000	69.611111	76.0	345.611111	69.122222
8	9	Dhruv	M	ENTC	63.0	74.058824	80.764706	97.000000	56.000000	55.0	362.823529	72.564706
9	10	Siddharth	M	ENTC	96.0	67.000000	78.000000	95.000000	69.611111	98.0	407.611111	81.522222
10	11	Vihaan	M	ENTC	82.0	54.000000	70.000000	88.000000	55.000000	56.0	323.000000	64.600000
11	12	Vihaan	M	IT	75.0	64.000000	67.000000	71.000000	66.000000	87.0	355.000000	71.000000
12	13	Aarush	M	IT	67.0	56.000000	81.000000	83.444444	90.000000	55.0	365.444444	73.088889
13	14	Leo	M	IT	98.0	74.058824	70.000000	94.000000	77.000000	66.0	381.058824	76.211765
14	15	Maryam	F	IT	64.0	87.000000	60.000000	90.000000	65.000000	90.0	392.000000	78.400000
15	16	Saanvi	F	Comp	66.0	90.000000	95.000000	67.000000	99.000000	77.0	428.000000	85.600000
16	17	Zaranew	F	Comp	93.0	54.000000	80.764706	75.000000	90.000000	65.0	364.764706	72.952941
17	18	Inaya	F	Comp	74.0	67.000000	93.000000	93.000000	87.000000	99.0	439.000000	87.800000
18	19	Aarya	F	Comp	72.0	88.000000	84.000000	81.000000	80.000000	45.0	378.000000	75.600000
19	20	Aarya	F	Comp	53.0	76.000000	81.000000	93.000000	65.000000	23.0	338.000000	67.600000

Outliers Detection

In [10]:
```
import matplotlib.pyplot as plt
plt.rcParams["figure.figsize"] = (9, 6)
df_list = ['Attendence', 'Phy_marks', 'Che_marks', 'EM1_marks', 'PPS_marks', 'SME_marks']
fig, axes = plt.subplots(2, 3)
fig.set_dpi(120)

count=0
for r in range(2):
    for c in range(3):
        df[df_list[count]].plot(kind = 'box', ax=axes[r,c])
        count+=1
```



Removal of Outliers from Che_marks

In [11]:
```
Q1 = df['Che_marks'].quantile(0.25)
Q3 = df['Che_marks'].quantile(0.75)
IQR = Q3 - Q1

Lower_limit = Q1 - 1.5 * IQR
Upper_limit = Q3 + 1.5 * IQR

print(f'Q1 = {Q1}, Q3 = {Q3}, IQR = {IQR}, Lower_limit = {Lower_limit}, Upper_limit = {Upper_limit}')
```

```
Q1 = 76.0, Q3 = 86.25, IQR = 10.25, Lower_limit = 60.625, Upper_limit = 101.625
```

In [12]:
```
df[(df['Che_marks'] < Lower_limit) | (df['Che_marks'] > Upper_limit)]
```

Out[12]:

	Rollno	Name	Gender	Branch	Attendence	Phy_marks	Che_marks	EM1_marks	PPS_marks	SME_marks	Total Marks	Percentage
7	8	Ishaan	M	ENTC	75.0	66.0	51.0	83.0	69.611111	76.0	345.611111	69.122222
14	15	Maryam	F	IT	64.0	87.0	60.0	90.0	65.000000	90.0	392.000000	78.400000

In [13]:
```
df[(df['Che_marks'] < Lower_limit) & (df['Che_marks'] > Upper_limit)]
```

Out[13]:

Rollno	Name	Gender	Branch	Attendence	Phy_marks	Che_marks	EM1_marks	PPS_marks	SME_marks	Total Marks	Percentage

Convert Into Normal Distribution

BINNING USING FREQUENy

In [14]:
```
def BinningFunction(column, cut_points, labels = None) :
    minper = column.min()
    maxper = column.max( )
    break_points=[minper] + cut_points + [maxper]
    print('Gradding According to percentage \n>60 = F \n60-70 = B \n70-80 = A\n80-100 = O')
    t=pd.cut(column, bins=break_points, labels=labels, include_lowest=True)
    return t
```

In [15]:
```
cut_points=[60, 70, 80]
labels=['F', 'B', 'A', 'O']
df['Grade']=BinningFunction(df['Percentage'], cut_points, labels)

df
```

```
Gradding According to percentage
>60 = F
60-70 = B
70-80 = A
80-100 = O
```

Out[15]:

	Rollno	Name	Gender	Branch	Attendence	Phy_marks	Che_marks	EM1_marks	PPS_marks	SME_marks	Total Marks	Percentage	Grade
0	1	Mohammed	M	Comp	72.0	62.000000	98.000000	63.000000	89.000000	36.0	348.000000	69.600000	B
1	2	Reyansh	M	IT	58.0	62.000000	83.000000	83.000000	88.000000	34.0	350.000000	70.000000	B
2	3	Aarav	M	IT	57.0	74.058824	100.000000	83.444444	56.000000	36.0	349.503268	69.900654	B
3	4	Atharv	M	IT	60.0	89.000000	83.000000	70.000000	33.000000	23.0	298.000000	59.600000	F
4	5	Vivaan	M	Comp	85.0	90.000000	80.764706	78.000000	23.000000	56.0	327.764706	65.552941	B
5	6	Advik	M	ENTC	94.0	99.000000	84.000000	100.000000	56.000000	99.0	438.000000	87.600000	O
6	7	Ansh	M	ENTC	98.0	88.000000	95.000000	81.000000	78.000000	78.0	420.000000	84.000000	O
7	8	Ishaan	M	ENTC	75.0	66.000000	51.000000	83.000000	69.611111	76.0	345.611111	69.122222	B
8	9	Dhruv	M	ENTC	63.0	74.058824	80.764706	97.000000	56.000000	55.0	362.823529	72.564706	A
9	10	Siddharth	M	ENTC	96.0	67.000000	78.000000	95.000000	69.611111	98.0	407.611111	81.522222	O
10	11	Vihaan	M	ENTC	82.0	54.000000	70.000000	88.000000	55.000000	56.0	323.000000	64.600000	B
11	12	Vihaan	M	IT	75.0	64.000000	67.000000	71.000000	66.000000	87.0	355.000000	71.000000	A
12	13	Aarush	M	IT	67.0	56.000000	81.000000	83.444444	90.000000	55.0	365.444444	73.088889	A
13	14	Leo	M	IT	98.0	74.058824	70.000000	94.000000	77.000000	66.0	381.058824	76.211765	A
14	15	Maryam	F	IT	64.0	87.000000	60.000000	90.000000	65.000000	90.0	392.000000	78.400000	A
15	16	Saanvi	F	Comp	66.0	90.000000	95.000000	67.000000	99.000000	77.0	428.000000	85.600000	O
16	17	Zaranew	F	Comp	93.0	54.000000	80.764706	75.000000	90.000000	65.0	364.764706	72.952941	A
17	18	Inaya	F	Comp	74.0	67.000000	93.000000	93.000000	87.000000	99.0	439.000000	87.800000	O
18	19	Aarya	F	Comp	72.0	88.000000	84.000000	81.000000	80.000000	45.0	378.000000	75.600000	A
19	20	Aarya	F	Comp	53.0	76.000000	81.000000	93.000000	65.000000	23.0	338.000000	67.600000	B