CGPA Generator and Analyser

Mukta Shah (20BEC072)
Department of Electronics and Communication Technology
Nirma University, Ahemdabad
20bec072@nirmauni.ac.in

Devika Pedada (20BEC089)
Department of Electronics and Communication Technology
Nirma University, Ahemdabad
20bec089@nirmauni.ac.in

***Abstract* -- In this era of digital word, it is important to manage large and complex data digitally as it becomes strenuous and time consuming to manually look after such large data sets. For instance, at all education institutions maintaining record of all student's performance in a given year is a very important task for a teacher and this task is still done manually. This paper presents a developed solution which generates report card of a student digitally using python pandas.**

***Keywords* — CGPA Generator, Report Analysis, SPI, Pandas, Python**

I. INTRODUCTION

With the aim to solve this real-life problem of manually maintaining record of all student's academic performance we have we have prepared a report card generator system using python that displays a student's performance in each subject, each year and its consistency graph through the years. Further it also analyses class performance and displays it in the form of bell curve making it extremely useful for teacher. This will not only help to reduce manpower, time, wastage of paper but also help a teacher by automating task of handling such complex data.

The cumulative grade point average (CGPA) is an educational ranking/assessment method. The CGPA is a number that reflects the grade point average for all courses one has taken and for courses for which one has received credit, e.g. B. To calculate your CGPA, we need to know the total number of grade points one has earned and the total number of credit hours one has attempted.

While countries and institutions use a variety of alphanumeric grading scales, their formulas for calculating students' cumulative grade point average (CGPA) are essentially the same. In mathematical terms, the CGPA score is a "weighted mean," wherein the influence each grade has on the cumulative score depends on the number of credit hours the course was worth.

II. PROBLEM STATEMENT

Almost all universities use the cumulative grade point average (GPA) calculator to simplify their exam and results processes. This tool is effective and it works efficiently. This is a tool that calculates CGPA in seconds. All you have to do is enter all the files with the grades of all the students. In this project we will work with several CSV files and the output will be in the new tables. In this project, the CSV files must contain the following details:

- Roll No
- Marks of
  - Quiz –I
  - Quiz – II
  - SE
  - Special Assignment
  - LPW (if applicable)
  - SEE

III. METHODOLOGY

A. Overview

The CGPA Generator has been designed to keep record of the Students semester information and provides output to the end-user about the students current and their previous semesters and give their overall performance. Program has its own database which is used to perform all the operations. When the CSV files are fed into the system it fetches data from it, perform calculations and displays the output to the end-user. If a specific student is in short of marks in the Continuous Evaluation (CE) component then the program automatically marks the student with an IF grade. The program also

displays the overall performance of a batch in a particular semester.

B. Grade Point Consideration

In this program we have considered relative grading for the batches. So first the total marks at the end are normalized, so that we obtain a range in between 0 to 1. Then we assign them a grade point according to the below given range:

TABLE I
GRADE POINT TABLE

GRADE	GRADE POINT
0.90 – 1.00	10
0.75 – 0.90	9
0.60 – 0.75	8
0.40 – 0.60	7
0.20 – 0.40	6
0.00 – 0.20	5

C. Working

The program will work as follows:

a. The program will take the following input from the user:
- Number of semesters to be analyzed
- Subjects of each semester
- Credits of the respective subject
- CSV files of each subject (containing all the information as mentioned earlier)

b. Following this the user will have the program menu. Each option of the menu is briefed below:

1. View Tables
- In this option the user gets a variety of choices for viewing tables.
- The user can view report tables for:
  - One particular subject
  - One particular semester
  - All the subjects of one semester
  - All the semesters at once
  - And the Final CGPA table
- In "One Subject" the user can also view the data of students who have not qualified the subject.

2. Display One Student Report
- In this option the user can view all the marks obtained the student.
- It displays both the subject wise report and the semester wise report.

3. Display Subject Report
- In this option, we have two choices:
  - Stats of One Subject
  - Bell Curve
- For performing the statistical operations of one particular subject, we have used the Pandas Profiling.

Pandas Profiling

Pandas profiling is an open source Python module which generates profile reports from a pandas DataFrame. It also does exploratory data analysis and generates interactive reports in web format that are easy to understand by any person. Pandas profiling saves us from all the work of visualizing and understanding the distribution of each variable. It generates a report with all the information available.

- Pandas Profiling gives us the following in an interactive report:
  - **Type inference**: detect the types of columns in a DataFrame
  - **Essentials**: type, unique values, indication of missing values
  - **Quantile statistics**: minimum value, Q1, median, Q3, maximum, range, interquartile range
  - **Descriptive statistics**: mean, mode, standard deviation, sum, median absolute deviation, coefficient of variation, skewness
  - **Most frequent and extreme values**
  - **Histograms**: categorical and numerical
  - **Correlations**: high correlation warnings, based on different correlation metrics
  - **Missing values**: through counts, matrix, heatmap and dendrograms
  - **Duplicate rows**: list of the most common duplicated rows
- The second choice the user has is "Bell Curve". This basically represents the distribution of marks
- Bell curves can also be used in performance management, for example, detecting

students who perform in a subject in an average fashion in the normal distribution of the graph. The high performers and the lowest performers are represented on either side with the dropping slope. It is very useful for the universities when doing performance review of a student.

c. Below is given a brief about the functions which are used in the program:

- input_subj_credits() :
  - Used for taking input, i.e., the subject codes and their respective credits, from the user.
  - Returns the subject list and credit list
- input_file_path(subj) :
  - Used for taking file path of respective subjects from the user.
  - Returns the list of filepaths
- subj_df(filename) :
  - Used for making dataframe of individual subjects from their respective CSV files.
  - Returns individual list of dataframe of students who are eligible and who are not.
- make_sem_df(stu_passed,sub_credits):
  - Used for making semester wise dataframe.
  - It contains Roll No, Subjects and the final SPIs of the semester.
  - Returns list of semester dataframe.
- make_cgpa_df(sem_df,total_credits) :
  - Used for making (and also returns) Final CGPA dataframe
- make_one_subj(inp,allsem,allsemsubj)
  - Used to extract one subject out of all the subjects present in the list of subj_df
- display_all_subj(semno,allsemsubj)
  - Used to display all the subjects present in the list of subj_df
- display_one_student(rollno,allsemsubj,final cgpa)
  - Used to extract and display data of one student from the above mentioned dataframes

V. FUTURE SCOPE AND CHALLENGES FACED

- This program has demand at school and university levels. This project is designed specially to maintain the data in a sequential manner and to save the time and efforts of Database Administrator. The project is structured according to today's need.
- Due to time constraint, many features remained uncovered by us. In the future, we will update our program to give valuable information left at present, such as,
  - Qualitative analysis can be performed ,i e., we can give a range for the outputs which can user if the student's performance is good or bad
  - We can have more analysis which can display the roll no of the student who has obtained the highest marks. Further we can have more visual representation of data.
  - An individual student performance can be compared against the whole batch to determine his/her overall performance.
  - The above code was just the idea on the calculation of GPA. The next target is to have a great user interface where users can enter the details by having the GUI.
- Though it has been designed according to the requirements of the users, it has its own limitation. Some of which are:
  - Difficulties in analysing the data of students who have not been qualified. For example, if the student has not passed in one subject, then it should not be displayed in the final table.
  - Object-oriented Approach has been not been fully utilized

VI. CONCLUSION

Through this project we are able to create an absolute system that manages grade books of the students and creates a guidebook that will help the teachers effectively understand the students and guide them towards academic excellence.
Further, the analysis of overall class performance in the various examinations also allows the teacher to evaluate the effectiveness of their own teaching. The project is hence able to attain its ultimate aim of solving real life problem faced by the education systems by automating the entire process of grade assignment and analysing system.

V. OUTPUT SCREENSHOTS

Here we have taken the example for 2 semesters, each having two subjects.

1. Taking inputs from the user

```
Enter the number of semesters you want to analyse : 2

Enter sem no : 3
Input data for sem 3 :
Enter subject names seprated by commas : 2EC301, 2EC302
Enter respective subject credits seprated by commas : 3,4
Enter file (or filepath) for 2EC301: C:\Users\User\csvfiles\2EC301.csv
Enter file (or filepath) for 2EC302: C:\Users\User\csvfiles\2EC302.csv

Enter sem no : 4
Input data for sem 4 :
Enter subject names seprated by commas : 2EC401, 2EC402
Enter respective subject credits seprated by commas : 3,4
Enter file (or filepath) for 2EC401: C:\Users\User\csvfiles\2EC303.csv
Enter file (or filepath) for 2EC402: C:\Users\User\csvfiles\2EC304.csv
```

2. Program Menu

```
Data Analysis :
1. View Tables

2. Display One Student Report

3. Display Subject Report

4. Exit

Enter Choice : 1
```

3.1 View Tables – Display One Subject

```
Enter Choice : 1

        Enter choice:
        1.1 Display one subject table
        1.2 Display all subjects of one sem
        1.3 Display one semester
        1.4 Display all semesters
        1.5 Display final cgpa
        1.6 Back to menu : 1
Enter subject : 2EC302
```

2EC302 :

	ROLL NO	Quiz-1(15)	Quiz-2(20)	SE(35)	SA(30)	SEE(100)	CEtotal	Total(100)	CGPA
0	20BEC001	0.00	11.50	19.0	25.0	78	55.50	64.0	6.0
1	20BEC002	6.42	14.67	28.0	26.0	47	75.09	64.0	6.0
2	20BEC003	10.17	9.33	22.0	25.0	54	66.50	62.0	6.0
3	20BEC004	11.00	15.00	28.0	23.0	64	77.00	72.0	8.0
4	20BEC005	10.08	15.00	27.0	23.0	72	75.08	74.0	8.0
5	20BEC006	8.17	12.50	22.0	23.0	18	65.67	47.0	5.0
6	20BEC007	12.25	13.67	34.0	27.0	33	86.92	65.0	7.0
7	20BEC008	9.50	12.33	26.0	26.0	94	73.83	82.0	10.0
8	20BEC009	7.25	13.83	1.0	23.0	86	45.08	61.0	6.0
9	20BEC010	8.75	10.50	25.0	26.0	39	70.25	58.0	6.0
10	20BEC011	6.17	7.83	6.0	22.0	78	42.00	56.0	5.0
11	20BEC012	11.58	6.33	8.0	23.0	85	48.91	63.0	6.0
12	20BEC013	12.75	16.50	30.0	20.0	72	79.25	76.0	9.0
13	20BEC014	11.75	14.50	29.0	24.0	25	79.25	58.0	6.0
14	20BEC015	10.08	16.00	32.0	24.0	89	82.08	85.0	10.0
15	20BEC016	9.83	9.00	31.0	24.0	22	73.83	53.0	5.0
16	20BEC017	10.50	12.00	23.0	23.0	27	68.50	52.0	5.0
17	20BEC018	12.50	16.00	32.0	27.0	63	87.50	78.0	9.0
18	20BEC019	12.75	18.00	33.0	29.0	17	92.75	62.0	6.0
19	20BEC020	8.33	7.50	16.0	25.0	41	56.83	50.0	5.0

Students who have not passed :
None

3.2 View Tables – Display All Subjects of One Semester

Enter sem : 3

2EC301 :

	ROLL NO	Quiz-1(15)	Quiz-2(20)	SE(35)	SA(30)	LPW(120)	Viva(25)	SEE(100)	CEtotal	Total(100)	CGPA
0	20BEC001	8.25	8.83	17.0	25.0	78	13	56	59.08	62.0	5.0
1	20BEC002	7.50	7.50	29.0	25.0	95	9	83	69.00	80.0	8.0
2	20BEC003	13.75	17.00	31.0	25.0	98	8	55	86.75	76.0	7.0
3	20BEC004	7.67	13.50	32.0	27.0	76	9	45	80.17	65.0	5.0
4	20BEC005	11.25	10.00	27.0	22.0	83	20	100	70.25	85.0	9.0
5	20BEC006	10.75	16.50	25.0	24.0	101	17	35	76.25	65.0	5.0
6	20BEC007	8.42	14.00	29.0	25.0	88	20	95	76.42	86.0	10.0
7	20BEC008	11.00	15.00	27.0	28.0	67	18	80	81.00	78.0	7.0
8	20BEC009	9.42	17.00	29.0	27.0	103	24	60	82.42	78.0	7.0
9	20BEC010	8.00	15.50	21.0	25.0	98	14	80	69.50	79.0	8.0
10	20BEC011	5.50	6.50	25.0	21.0	93	23	70	58.00	70.0	6.0
11	20BEC012	10.80	17.17	30.0	23.0	94	11	55	80.97	73.0	6.0
12	20BEC013	10.75	14.33	29.0	24.0	82	10	100	78.08	88.0	10.0
13	20BEC014	5.25	12.00	28.0	23.0	97	17	40	68.25	63.0	5.0
14	20BEC015	7.25	11.33	27.0	25.0	101	8	100	70.58	88.0	10.0
15	20BEC016	9.50	17.00	28.0	28.0	84	10	68	82.50	77.0	7.0
16	20BEC017	8.92	13.83	29.0	26.0	84	20	85	77.75	82.0	9.0
17	20BEC018	9.25	15.33	24.0	24.0	67	25	65	72.58	68.0	5.0
18	20BEC019	9.08	11.83	28.0	23.0	102	21	74	71.91	79.0	8.0
19	20BEC020	12.17	17.00	28.0	24.0	100	19	54	81.17	74.0	7.0

2EC302 :

	ROLL NO	Quiz-1(15)	Quiz-2(20)	SE(35)	SA(30)	SEE(100)	CEtotal	Total(100)	CGPA
0	20BEC001	9.50	16.17	30.0	27.0	39	82.67	65.0	6.0
1	20BEC002	12.25	13.67	34.0	27.0	77	86.92	83.0	10.0
2	20BEC003	9.42	18.50	32.0	26.0	25	85.92	62.0	6.0
3	20BEC004	9.50	12.33	26.0	26.0	13	73.83	49.0	5.0
4	20BEC005	10.17	15.83	31.0	26.0	91	83.00	86.0	10.0
5	20BEC006	7.25	13.83	1.0	23.0	91	45.08	63.0	6.0
6	20BEC007	11.00	16.50	28.0	26.0	48	81.50	68.0	7.0
7	20BEC008	8.75	10.50	25.0	26.0	58	70.25	65.0	6.0
8	20BEC009	11.67	17.33	31.0	25.0	56	85.00	73.0	7.0
10	20BEC011	7.00	15.17	30.0	24.0	72	76.17	75.0	8.0
12	20BEC013	6.83	9.00	15.0	25.0	58	55.83	57.0	5.0
13	20BEC014	12.75	16.50	30.0	20.0	10	79.25	52.0	5.0
14	20BEC015	7.50	11.00	17.0	24.0	58	59.50	59.0	6.0
15	20BEC016	11.75	14.50	29.0	24.0	49	79.25	67.0	7.0
16	20BEC017	12.92	14.33	21.0	23.0	49	71.25	62.0	6.0
17	20BEC018	10.08	16.00	32.0	24.0	51	82.08	70.0	7.0
18	20BEC019	13.00	17.50	31.0	29.0	29	90.50	66.0	7.0
19	20BEC020	9.83	9.00	31.0	24.0	13	73.83	49.0	5.0

3.3 View Tables – Display One Semester

```
Enter Choice : 1

        Enter choice:
        1.1 Display one subject table
        1.2 Display all subjects of one sem
        1.3 Display one semester
        1.4 Display all semesters
        1.5 Display final cgpa
        1.6 Back to menu : 3
Enter sem : 4
```

```
Enter sem : 4
Sem  4  :
```

	ROLL NO	2EC401	2EC402	SPI
0	20BEC001	5.0	6.0	5.57
1	20BEC002	7.0	6.0	6.43
2	20BEC003	6.0	6.0	6.00
3	20BEC004	7.0	8.0	7.57
4	20BEC005	6.0	8.0	7.14
5	20BEC006	6.0	5.0	5.43
6	20BEC007	7.0	7.0	7.00
7	20BEC008	10.0	10.0	10.00
8	20BEC009	6.0	6.0	6.00
9	20BEC010	5.0	6.0	5.57
10	20BEC011	9.0	5.0	6.71
11	20BEC012	7.0	6.0	6.43
12	20BEC013	9.0	9.0	9.00
13	20BEC014	9.0	6.0	7.29
14	20BEC015	10.0	10.0	10.00
15	20BEC016	7.0	5.0	5.86
16	20BEC017	5.0	5.0	5.00
17	20BEC019	7.0	6.0	6.43

3.4 View Tables – Display All Semesters

```
Sem  3  :
```

	ROLL NO	2EC301	2EC302	SPI
0	20BEC001	5.0	6.0	5.57
1	20BEC002	8.0	10.0	9.14
2	20BEC003	7.0	6.0	6.43
3	20BEC004	5.0	5.0	5.00
4	20BEC005	9.0	10.0	9.57
5	20BEC006	5.0	6.0	5.57
6	20BEC007	10.0	7.0	8.29
7	20BEC008	7.0	6.0	6.43
8	20BEC009	7.0	7.0	7.00
10	20BEC011	6.0	8.0	7.14
12	20BEC013	10.0	5.0	7.14
13	20BEC014	5.0	5.0	5.00
14	20BEC015	10.0	6.0	7.71
15	20BEC016	7.0	7.0	7.00
16	20BEC017	9.0	6.0	7.29
17	20BEC018	5.0	7.0	6.14
18	20BEC019	8.0	7.0	7.43
19	20BEC020	7.0	5.0	5.86

```
Sem  4  :
```

	ROLL NO	2EC401	2EC402	SPI
0	20BEC001	5.0	6.0	5.57
1	20BEC002	7.0	6.0	6.43
2	20BEC003	6.0	6.0	6.00
3	20BEC004	7.0	8.0	7.57
4	20BEC005	6.0	8.0	7.14
5	20BEC006	6.0	5.0	5.43
6	20BEC007	7.0	7.0	7.00
7	20BEC008	10.0	10.0	10.00
8	20BEC009	6.0	6.0	6.00
9	20BEC010	5.0	6.0	5.57
10	20BEC011	9.0	5.0	6.71
11	20BEC012	7.0	6.0	6.43
12	20BEC013	9.0	9.0	9.00
13	20BEC014	9.0	6.0	7.29
14	20BEC015	10.0	10.0	10.00
15	20BEC016	7.0	5.0	5.86
16	20BEC017	5.0	5.0	5.00
17	20BEC019	7.0	6.0	6.43

3.5 View Tables – Display Final CGPA

```
Enter Choice : 1

        Enter choice:
        1.1 Display one subject table
        1.2 Display all subjects of one sem
        1.3 Display one semester
        1.4 Display all semesters
        1.5 Display final cgpa
        1.6 Back to menu : 5
```

	ROLL NO	3	4	CGPA
0	20BEC001	5.57	5.57	5.570
1	20BEC002	9.14	6.43	7.785
2	20BEC003	6.43	6.00	6.215
3	20BEC004	5.00	7.57	6.285
4	20BEC005	9.57	7.14	8.355
5	20BEC006	5.57	5.43	5.500
6	20BEC007	8.29	7.00	7.645
7	20BEC008	6.43	10.00	8.215
8	20BEC009	7.00	6.00	6.500
9	20BEC011	7.14	6.71	6.925
10	20BEC013	7.14	9.00	8.070
11	20BEC014	5.00	7.29	6.145
12	20BEC015	7.71	10.00	8.855
13	20BEC016	7.00	5.86	6.430
14	20BEC017	7.29	5.00	6.145
15	20BEC018	6.14	NaN	3.070
16	20BEC019	7.43	6.43	6.930
17	20BEC020	5.86	NaN	2.930

4. Display One Student Report

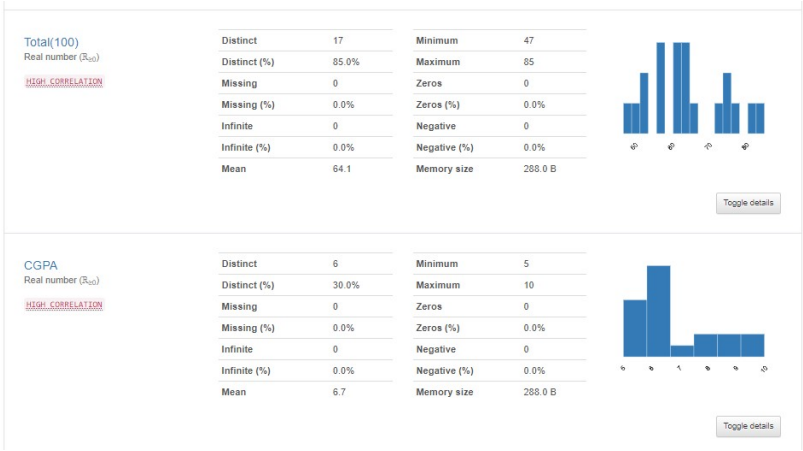
```
Data Analysis :
1. View Tables

2. Display One Student Report

3. Display Subject Report

4. Exit

Enter Choice : 2
Enter roll no : 20BEC008
Subject wise overall review :
```

	Subject	Quiz-1(15)	Quiz-2(20)	SE(35)	SA(30)	LPW(120)	Viva(25)	SEE(100)	CEtotal	Total(100)	CGPA
7	2EC301	11.00	15.00	27.0	28.0	67.0	18.0	80.0	81.00	78.0	7.0
7	2EC302	8.75	10.50	25.0	26.0	NaN	NaN	58.0	70.25	65.0	6.0
7	2EC401	13.00	17.50	31.0	29.0	95.0	19.0	86.0	90.50	90.0	10.0
7	2EC402	9.50	12.33	26.0	26.0	NaN	NaN	94.0	73.83	82.0	10.0

```
Semester wise overall review :
```

	ROLL NO	3	4	CGPA
7	20BEC008	6.43	10.0	8.215

5.1 Subject Report – Stats of one Subject



Total(100)
Real number (ℝ≥0)
HIGH CORRELATION

Distinct	17	Minimum	47
Distinct (%)	85.0%	Maximum	85
Missing	0	Zeros	0
Missing (%)	0.0%	Zeros (%)	0.0%
Infinite	0	Negative	0
Infinite (%)	0.0%	Negative (%)	0.0%
Mean	64.1	Memory size	288.0 B

Toggle details

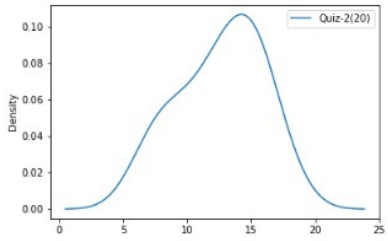
CGPA
Real number (ℝ≥0)
HIGH CORRELATION

Distinct	6	Minimum	5
Distinct (%)	30.0%	Maximum	10
Missing	0	Zeros	0
Missing (%)	0.0%	Zeros (%)	0.0%
Infinite	0	Negative	0
Infinite (%)	0.0%	Negative (%)	0.0%
Mean	6.7	Memory size	288.0 B

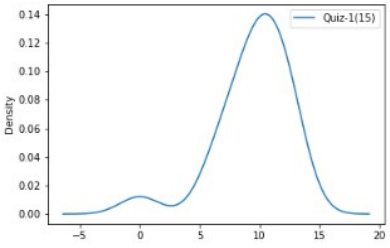
Toggle details

5.2 Subject Report – Bell Curve

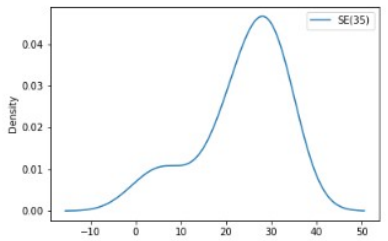
```
Data Analysis :
1. View Tables

2. Display One Student Report

3. Display Subject Report

4. Exit

Enter Choice : 3

        3.1 Stats of one subject
        3.2 Bell Curve
                Enter Choice : 2
Enter subject : 2EC402
```



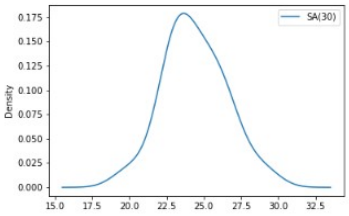

```
AxesSubplot(0.125,0.125;0.775x0.755)
```



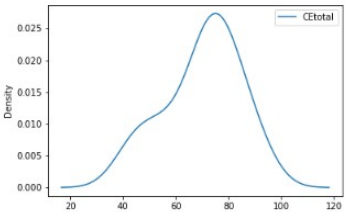

```
AxesSubplot(0.125,0.125;0.775x0.755)
```



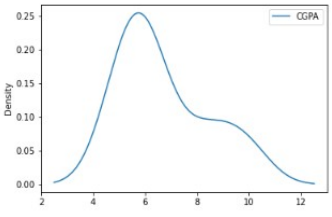

```
AxesSubplot(0.125,0.125;0.775x0.755)
```



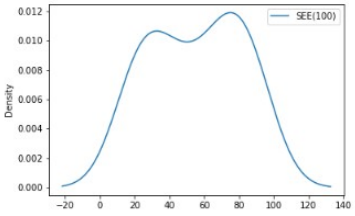

```
AxesSubplot(0.125,0.125;0.775x0.755)
```



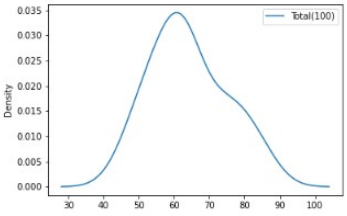

```
AxesSubplot(0.125,0.125;0.775x0.755)
```




```
AxesSubplot(0.125,0.125;0.775x0.755)
```




```
AxesSubplot(0.125,0.125;0.775x0.755)
```




```
AxesSubplot(0.125,0.125;0.775x0.755)
```