# DAA Assignment 1

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**Q. Read the rule book for the UG program. Understand the process of finding SPI and CPI. Write an algorithm for the same. Write a program to solve the given problem using your algorithm.**

SPI: Semester Performance Index is the measure of student's academic performance of a specific semester

**SPI = (Σ(Ci * Gi)) / (ΣCi)**

Ci: Credits of a subject
Gi: Grade that the student received in the subject

CPI: Cumulative Performance Index is the measure of student's academic performance until a particular semester

**CPI = (ΣSPI) / (ΣN)**

SPI = SPI of all semesters until Nth semester
N = No. of semester until the CPI is to be calculated

## Algorithm:

## SPI:

Input:

credits: Array containing credits of the respective course
grades: Array containing grades obtained by the student in the respective course
N: Total number of courses

Output:

SPI of the student

Step 1: Initialize sum = 0 and totalCredits = 0

Step 2: if N = 0
print “Number of courses not provided” and return NULL

Step 3: for i ranging from 0 to N-1
sum += credits[i]*grades[i]
totalCredits += credits[i]

Step 4: If totalCredits = 0
print “Please provide the credits of each subject” and return NULL

Step 5: SPI = sum/totalCredits

Step 6: Print and return the value of SPI

**CPI:**

Input:
spi: Array containing spi of the student of each semester
N: Total number of semesters

Output:
CPI of the student

Step 1: Initialize sum = 0

Step 2: if N = 0
print “Number of semesters not provided” and return NULL

Step 3: for i ranging from 0 to N-1
sum += spi[i]

Step 4: If sum = 0
print “Please provide the spi of the student” and return NULL

Step 5: CPI = sum/N

Step 6: Print and return the value of CPI

**Program:**

```
#include <iostream>
#include <vector>
#include <iomanip>
using namespace std;

void input(vector<double> &arr, const string &name)
{
	cout << "Enter " << name << ":" << endl;
	for (int i = 0; i < arr.size(); ++i)
	{
	cin >> arr[i];
	}
}

double spi(vector<double> &credits, vector<double> &grades)
{
	double totalCredits = 0.0;
	double sum = 0.0;
	for (int i = 0; i < credits.size(); ++i)
	{
	sum += grades[i] * credits[i];
	totalCredits += credits[i];
	}
	if(totalCredits == 0) {
	cout<<"Please provide the credits of each subject";
	}
	return sum / totalCredits;
```

```
}

double cpi(vector<double> &spiArray, int N)
{
	double sum = 0.0;
	for (int i = 0; i < spiArray.size(); ++i)
	{
	sum += spiArray[i];
	}
	return sum/N;
}

int main()
{
	int courses, sems;
	cout << "Enter number of courses in the semester: ";
	cin >> courses;
	if(courses == 0) {
	cout<<"Enter the correct number of courses";
	return 0;
	}
	vector<double> credits(courses), grades(courses);
	input(credits, "course credits");
	input(grades, "course grades");
	double SPI = spi(credits, grades);
	cout << "SPI: " << fixed << setprecision(2) << SPI << endl;

	cout << "Enter number of semesters: ";
	cin >> sems;
	vector<double> spiArray(sems), totalCredits(sems);
	cout << "Enter SPI values for each semester:" << endl;
	input(spiArray, "SPI values");
	double CPI = cpi(spiArray, sems);
```

```
    cout << "CPI: " << fixed << setprecision(2) << CPI << endl;
    return 0;
}
```

**Test cases:**

1. Input:
    a. Courses: 0

    Output:
        Invalid input

```
Enter number of courses in the semester: 0
Enter the correct number of courses
```

2. Input:
    a. Courses: 5
    b. Credits : [3, 2, 1, 3, 2]
    c. Grades: [8, 9, 10, 7, 8]
    d. Semesters: 4
    e. Spi: [8.45, 8.09, 9.15, 9.54]

    Output:
        SPI: 8.09
        CPI: 8.81

```
Enter number of courses in the semester: 5
Enter course credits:
3
2
1
3
2
Enter course grades:
8
9
10
7
8
SPI: 8.09
Enter number of semesters: 4
Enter SPI values for each semester:
Enter SPI values:
8.45
8.09
9.15
9.54
CPI: 8.81
```

3. Input:
    a. Courses: 4
    b. Credits: [0, 0, 0, 0]
    c. Grades: [8, 7, 9, 10]

    Output:

    Invalid Input

```
Enter number of courses in the semester: 4
Enter course credits:
0
0
0
0
Enter course grades:
9
8
7
9
Please provide the credits of each subject
```

4. Input:
    a. Courses: 4
    b. Credits: [2, 2, 3, 1]
    c. Grades: [9, 10, 8, 9]
    d. Semesters: 2
    e. SPI: [8.09, 8.88]

    Output:

    SPI: 8.88

    CPI: 8.48

```
Enter number of courses in the semester: 4
Enter course credits:
2
2
3
1
Enter course grades:
9
10
8
9
SPI: 8.88
Enter number of semesters: 2
Enter SPI values for each semester:
Enter SPI values:
8.09
8.88
CPI: 8.48
```

**Conclusion:** Hence, we have studied how CPI and SPI is calculated and the algorithm to calculate the respective values