

\Rightarrow Algorithm to find 'SPI' and 'CPI'

SPI: Step 1: Create an integer array called $g[]$ which stores the grades obtained in that particular subjects. Create one more integer array called $c[]$ which stores the maximum credits one can obtain in that subject and store the credits in the array in such manner that grades obtained at i^{th} position should match the credits

Step 2: Initialize a floating point variable m to 0 which will store the summation of the product obtained by multiplying elements from array $g[]$ and $c[]$

Step 3: Initialize an integer variable n to 0, which will store the total credit hours obtained by adding the elements from array $c[]$

Step 4: Initialize a floating point variable spi to 0, which will store our desired output

Step 5: Run a for loop and in this loop compute the product of the grade $g[i]$ and the credit $c[i]$ and add this product to variable m .

Similarly in the same for loop add the credits from $c[i]$ to variable n to accumulate the total credit hours

Step 6: After for loop execution is over call the variable spi and obtain the desired result by dividing values stored in variable m by value stored in variable n and print it to the user

CPI: step 1: Create a floating point array called $\text{spi}[]$, which will store all the spi obtained by the student up until the final semester

step 2: define an integer variable s to 8, which represents the total number of semesters present in Engineering

step 3: define two float variables m and cpi and initialize them to 0. m variable will be used to accumulate the summation of all the elements present in array of $\text{spi}[]$ and the cpi variable will hold the final desired result

step 4: Run a for loop from 0 to 7 (as there are 8 semesters in total) and at each i^{th} iteration add the elements of array $\text{spi}[]$ to the variable m , which will accumulate the total sum of all semester indices

step 5: After the execution of for loop, call the variable of cpi which will calculate the average of the semester indices by dividing the total sum obtained in variable m by the number of semesters stored in variable s

step 6: Print the value of the cpi to the user

⇒ Test case 1

no of sem : 2

sem 1 :

grades : 10, 8, 9, 7, 9.5, 8.5, 7, 6.5

credits : 2, 3, 1, 2, 4, 3, 2, 1

sem 2 :

grades : 9, 8, 7, 10, 9.5, 7.5, 8.5, 7

credits : 3, 3, 2, 1, 1, 2, 2, 3

Output :

SPI for sem 1 : 8.38

SPI for sem 2 : 8.08

CPI : 8.23

⇒ Test case 2

no of sem = 1

grades : 9, 8, 7, 6, 5, 4, 3, 2

credits : 3, 3, 3, 3, 3, 3, 3, 3

Output :

SPI : 5.5

CPI : 5.5

⇒ Test case 3

no of sem : 2

sem 1 :

grades : 8, 7, 6, 5, 4, 3, 2, 1

credits : 2, 2, 2, 2, 2, 2, 2, 2

sem 2 :

grades : 9, 8, 7, 6, 5, 4, 3, 2

credits : 1, 1, 1, 1, 1, 1, 1, 1

Output :

SPI for sem 1 : 4.5

SPI for sem 2 : 5.5

CPI : ~~9.83~~ 5

⇒ Test case 4

no of sem : 1

grades : 9, 8, 7, 6, 5, 4, 3, 2

credits : 0, 0, 0, 0, 0, 0, 0, 0

Output : error

⇒ Test case 5

no of sem : 1

grades : -9, -8, -7, -6, -5, -4, -3, -2

credits : 1, 1, 1, 1, 1, 1, 1, 1

Output : error

Conclusion:

In conclusion, I have learned how to design and implement algorithms to calculate both the semester performance index (SPI) and cumulative performance index (CPI). I successfully developed C++ code to compute these indices. The code generates appropriate and accurate results by handling a comprehensive set of test cases, which includes both positive and negative scenarios.