

SCHOOL OF COMPUTER SCIENCES

ACADEMIC SESSION 2016 / 2017, SEMESTER 1

CPT 111 – PRINCIPLES OF PROGRAMMING

ASSIGNMENT 2

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**Problem analysis:**

**Input:**

**User’s input:-**

1. semester
2. course
3. gp
4. unit

**Process:-**

1. Initialise i, number of current semester to 0.
2. Initialise j, number of current course to 0.
3. Initialise proceed = ‘Y’.
4. Prompt user to input number of semester.
5. Get semester.
   1. While semester < 0 or semester > 10 or not integer
      1. Clear semester input.
      2. Print invalid input.
      3. Prompt user to input number of semester.
      4. Get semester.
6. For i = 0, i < semester
   1. Prompt user to input number of course.
   2. Get course.
   3. While course < 0 or course > 6 or not integer
      1. Clear course input.
      2. Print invalid input.
      3. Prompt user to input number of course.
      4. Get course.
7. For j = 0, j < course
   * + 1. Prompt user to input the alphabetical grade of the course.
       2. Get grade.
       3. While grade is not the correct input
          1. Clear grade input.
          2. Print invalid input.
          3. Prompt user to input alphabetical grade again.
          4. Get grade.
       4. Prompt user to input the unit of the course.
       5. Get unit.
       6. While the unit < 0 or not integer
          1. Clear unit input.
          2. Print invalid input.
          3. Prompt user to input unit of the course.
          4. Get unit.
       7. If grade == “A” or “a”, gp = 4.00
          1. Otherwise if grade == “A-” or “a-”, gp = 3.67
          2. Otherwise if grade == “B+” or “b+”, gp = 3.33
          3. Otherwise if grade == “B” or “b”, gp = 3.00
          4. Otherwise if grade == “B-” or “b-”, gp = 2.67
          5. Otherwise if grade == “C+” or “c+”, gp = 2.33
          6. Otherwise if grade == “C” or “c”, gp = 2.00
          7. Otherwise if grade == “C-” or “c-”, gp = 1.67
          8. Otherwise if grade == “D+” or “d+”, gp = 1.33
          9. Otherwise if grade == “D” or “d”, gp = 1.00
          10. Otherwise if grade == “D-” or “d-”, gp = 0.67
          11. Otherwise if grade == “F” or “f”, gp = 0.00
       8. Calculate the total unit of courses.
          1. totalunit = totalunit + unit
       9. Calculate the total grade points of courses.
          1. totalgp = totalgp + (unit \* gp)
       10. Calculate the GPA for the semester.
           1. gpa = totalgp / totalunit
       11. Print gpa
       12. Increase the value of j by 1 in the loop.
       13. Assign value of totalgp to accutotalgp and value of totalunit to accutotalunit.
       14. Set totalgp and totalunit to 0.
       15. Check the condition of the loop.
   1. For default case, break.
8. Calculate the CGPA.
   1. cgpa = accutotalgp / accutotalunit
9. Print cgpa
   1. If cgpa >= 3.75 and cgpa <= 4.00
      1. Print “Excellent!”
   2. Otherwise if cgpa >= 3.25 and cgpa <= 3.74
      1. Print “Very Good!”
   3. Otherwise if cgpa >= 2.75 and cgpa <=3.24
      1. Print “Good!”
   4. Otherwise if cgpa>= 2.25 and cgpa <= 2.74
      1. Print “Work Smart!”
   5. Otherwise if cgpa>= 0.00 and cgpa <= 2.24
      1. Print “Work Very Hard and Work Smart!”
10. Prompt user to input proceed.
    1. While proceed == ‘Y’ or proceed ‘y’, loop for the whole program will be executed.

**Formula:-**

1. Formula to calculate total unit of courses in a semester

totalunit = totalunit + unit

2. Formula to calculate total grade points of courses in a semester

totalgp = totalgp + (unit \* gp)

3. Formula to calculate the GPA of a semester

gpa = totalgp / totalunit

4. Fomula to calculate the CGPA

cgpa = accutotalgp / accutotalunit

**Output:-**

1. gpa
2. cgpa

**Algorithm (Pseudocode):-**

BEGIN

1. Initialise i, number of current semester to 0.
2. Initialise j, number of current course to 0.
3. Initialise proceed = ‘Y’.
4. Prompt user to input number of semester.
5. Get semester.
   1. While semester < 0 or semester > 10 or not integer
      1. Clear semester input.
      2. Print invalid input.
      3. Prompt user to input number of semester.
      4. Get semester.
6. For i = 0, i < semester
   1. Prompt user to input number of course.
   2. Get course.
   3. While course < 0 or course > 6 or not integer
      1. Clear course input.
      2. Print invalid input.
      3. Prompt user to input number of course.
      4. Get course.
7. For j = 0, j < course
   * + 1. Prompt user to input the alphabetical grade of the course.
       2. Get grade.
       3. While grade is not the correct input
          1. Clear grade input.
          2. Print invalid input.
          3. Prompt user to input alphabetical grade again.
          4. Get grade.
       4. Prompt user to input the unit of the course.
       5. Get unit.
       6. While the unit < 0 or not integer
          1. Clear unit input.
          2. Print invalid input.
          3. Prompt user to input unit of the course.
          4. Get unit.
       7. If grade == “A” or “a”, gp = 4.00
          1. Otherwise if grade == “A-” or “a-”, gp = 3.67
          2. Otherwise if grade == “B+” or “b+”, gp = 3.33
          3. Otherwise if grade == “B” or “b”, gp = 3.00
          4. Otherwise if grade == “B-” or “b-”, gp = 2.67
          5. Otherwise if grade == “C+” or “c+”, gp = 2.33
          6. Otherwise if grade == “C” or “c”, gp = 2.00
          7. Otherwise if grade == “C-” or “c-”, gp = 1.67
          8. Otherwise if grade == “D+” or “d+”, gp = 1.33
          9. Otherwise if grade == “D” or “d”, gp = 1.00
          10. Otherwise if grade == “D-” or “d-”, gp = 0.67
          11. Otherwise if grade == “F” or “f”, gp = 0.00
       8. Calculate the total unit of courses.
          1. totalunit = totalunit + unit
       9. Calculate the total grade points of courses.
          1. totalgp = totalgp + (unit \* gp)
       10. Calculate the GPA for the semester.
           1. gpa = totalgp / totalunit
       11. Print gpa
       12. Increase the value of j by 1 in the loop.
       13. Assign value of totalgp to accutotalgp and value of totalunit to accutotalunit.
       14. Set totalgp and totalunit to 0.
       15. Check the condition of the loop.
   1. For default case, break.
8. Calculate the CGPA.
   1. cgpa = accutotalgp / accutotalunit
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   1. If cgpa >= 3.75 and cgpa <= 4.00
      1. Print “Excellent!”
   2. Otherwise if cgpa >= 3.25 and cgpa <= 3.74
      1. Print “Very Good!”
   3. Otherwise if cgpa >= 2.75 and cgpa <=3.24
      1. Print “Good!”
   4. Otherwise if cgpa>= 2.25 and cgpa <= 2.74
      1. Print “Work Smart!”
   5. Otherwise if cgpa>= 0.00 and cgpa <= 2.24
      1. Print “Work Very Hard and Work Smart!”
10. Prompt user to input proceed.
    1. While proceed == ‘Y’ or proceed ‘y’, loop for the whole program will be executed.

END

**Desk check:-**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of semester | Number of course | Unit | Grade | Grade Point | Total Grade Point | Sum of Total Grade Point | Total Unit | GPA | Accu. Total Grade Point | Accu. Total Unit | CGPA |
| 2 | 6 | 4 | A | 4.00 | 16.00 | 71.33 | 20 | 3.57 | 134.32 | 38 | 3.53 |
| 4 | B+ | 3.33 | 13.32 |
| 3 | A- | 3.67 | 11.01 |
| 3 | B | 3.00 | 9.00 |
| 4 | A | 4.00 | 16.00 |
| 2 | B | 3.00 | 6.00 |
| 5 | 4 | A- | 3.67 | 14.68 | 62.99 | 18 | 3.50 |
| 3 | B+ | 3.33 | 9.99 |
| 4 | A | 4.00 | 1600 |
| 4 | B+ | 3.33 | 13.32 |
| 3 | B | 3.00 | 9.00 |
| 3 | 4 | 4 | A- | 3.67 | 14.68 | 50.99 | 15 | 3.40 | 179.00 | 52 | 3.44 |
| 3 | C+ | 2.33 | 6.99 |
| 4 | B+ | 3.33 | 13.32 |
| 4 | A | 4.00 | 16.00 |
| 6 | 4 | A | 4.00 | 16.00 | 64.00 | 19 | 3.37 |
| 3 | B+ | 3.33 | 9.99 |
| 3 | B- | 2.67 | 8.01 |
| 3 | A- | 3.67 | 11.01 |
| 3 | B | 3.00 | 9.00 |
| 3 | B+ | 3.33 | 9.99 |
| 5 | 4 | A- | 3.67 | 14.68 | 64.01 | 18 | 3.56 |
| 3 | A | 4.00 | 12.00 |
| 4 | B+ | 3.33 | 13.32 |
| 4 | A | 4.00 | 16.00 |
| 3 | B- | 2.67 | 8.01 |
| 4 | 5 | 4 | B+ | 3.33 | 13.32 | 63.68 | 18 | 3.54 | 203.01 | 58 | 3.50 |
| 3 | A | 4.00 | 12.00 |
| 4 | A- | 3.67 | 14.68 |
| 3 | B | 3.00 | 9.00 |
| 4 | A- | 3.67 | 14.68 |
| 5 | 4 | B+ | 3.33 | 13.32 | 55.00 | 17 | 3.24 |
| 4 | A- | 3.67 | 14.68 |
| 3 | A | 4.00 | 12.00 |
| 3 | C+ | 2.33 | 6.99 |
| 3 | B- | 2.67 | 8.01 |  |  |  |
| 3 | 4 | A- | 3.67 | 14.68 | 44.00 | 12 | 3.67 |
| 4 | A | 4.00 | 16.00 |
| 4 | B+ | 3.33 | 13.32 |
| 3 | 4 | B+ | 3.33 | 13.32 | 40.33 | 11 | 3.67 |
| 4 | A | 4.00 | 16.00 |
| 3 | A- | 3.67 | 11.01 |
| 13 | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. |
| 1 | 10 | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. | Inv. |

**C++ Program:-**

#include <iostream>

#include <cstdlib>

#include <iomanip>

using namespace std;

int main()

{

int unit, totalunit, accutotalunit, semester, course, i, j;

string grade;

double gp, gpa, cgpa, totalgp, accutotalgp;

char proceed ='Y';

while (proceed == 'Y' || proceed == 'y') //Loop for continuation of usage of the program

{

system("cls"); //Command to clear the screen

totalunit = 0; gpa = 0, cgpa = 0, totalgp = 0, accutotalgp = 0, totalunit = 0, accutotalunit = 0;

cout << fixed << showpoint << setprecision(2);

cout << "--------------------------------------------------" << endl;

cout << "| |" << endl;

cout << "| CGPA Calculator |" << endl;

cout << "| |" << endl;

cout << "--------------------------------------------------" << endl;

cout << "Welcome to CGPA Calculator!" << endl;

cout << "This program can help you to calculate your GPA and also CGPA!" << endl;

cout << "Please enter the number of semester you have gone through: ";

cin >> semester;

while (semester <= 0 || semester > 10 || !cin)

{

cin.clear();

cin.ignore(100,'\n');

cout << "Invalid input. The number of semester cannot be less than 0 or more than 10." << endl;

cout << "Please try again: ";

cin >> semester;

}

cout << endl;

for (i = 0; i < semester; ++i) //Loop for semester

{

cout << "For Semester " << i+1 << endl;

cout << "Please enter the number of courses you have taken: ";

cin >> course;

while (course < 0 || course > 6 || !cin) //Loop to prevent invalid input

{

cin.clear(); //Line to clear recent input

cin.ignore(100,'\n'); //Line to ignore input

cout << "The number of courses cannot be less than 0 or more than 6." << endl;

cout << "Please try again: ";

cin >> course;

}

cout << endl;

for(j = 0; j < course; ++j) // Loop for number of course

{

cout << "For course " << j+1 << endl;

cout << "Please enter the grade of the course: ";

cin >> grade;

while (grade!="A" && grade!="a" && grade!="A-" && grade!="a-" && grade!="B+" && grade!="b+" && grade!="B" && grade!="b" && grade!="B-" && grade!="b-" && grade!="C+" && grade!="c+" && grade!="C" && grade!="c" && grade!="C-" && grade!="c-" && grade!="D+" && grade!="d+" && grade!="D" && grade!="d" && grade!="D-" && grade!="d-" && grade!="F" && grade!="f") //Loop to prevent invalid input

{

cin.clear();

cin.ignore(100,'\n');

cout << "Invalid input. Please enter again: ";

cin >> grade;

}

cout << "Please enter the unit of the course: ";

cin >> unit;

while (unit < 0 || !cin) //Loop to prevent invalid input for unit of course

{

cin.clear();

cin.ignore(100,'\n');

cout << "The unit of the course cannot be less than zero. Please enter again: ";

cin >> unit;

}

cout << endl;

if (grade == "A" || grade == "a")

gp = 4.00;

else if (grade == "A-" || grade == "a-")

gp = 3.67;

else if (grade == "B+" || grade == "b+")

gp = 3.33;

else if (grade == "B" || grade == "b")

gp = 3.00;

else if (grade == "B-" || grade == "b-")

gp = 2.67;

else if (grade == "C+" || grade == "c+")

gp = 2.33;

else if (grade == "C" || grade == "c")

gp = 2.00;

else if (grade == "C-" || grade == "c-")

gp = 1.67;

else if (grade == "D+" || grade == "d+")

gp = 1.33;

else if (grade == "D" || grade == "d")

gp = 1.00;

else if (grade== "D-" || grade == "d-")

gp = 0.67;

else if (grade == "F" || grade == "f")

gp = 0.00;

totalunit = totalunit + unit;

totalgp = totalgp + (unit \* gp);

gpa = totalgp / totalunit;

}

cout << "Your GPA is: " << gpa << endl;

cout << endl;

accutotalgp = accutotalgp + totalgp;

accutotalunit = accutotalunit + totalunit;

totalgp = 0, totalunit = 0;

}

cgpa = accutotalgp / accutotalunit;

cout << endl;

cout << "Congratulations!" << endl;

cout << "Your CGPA is: " << cgpa << endl;

if(cgpa >= 3.75 && cgpa <= 4.00)

cout << "Excellent!" << endl;

else if (cgpa >= 3.25 && cgpa <=3.74)

cout << "Very Good!" << endl;

else if (cgpa >= 2.75 && cgpa <= 3.24)

cout << "Good!" << endl;

else if (cgpa >= 2.25 && cgpa <= 2.74)

cout << "Work Smart!" << endl;

else if (cgpa >= 0.00 && cgpa <= 2.24)

cout << "Work Very Hard and Work Smart!" << endl;

cout << endl;

cout << "Do you want to continue? (Y for yes, any key to exit): "; //Ask user to continue

cin >> proceed;

}

system("pause");

return 0;

}

**Sample input and output:-** 