Object oriented programming and software engineering

Laboratory No. 1

Revision of the material and introduction to C ++

<u>Pass conditions:</u>
- participation in laboratory classes,
- implementation of instructions in laboratories,
- reports and homework,
- announced and unannounced tests,
- group / final project.

Materials for classes will be published on the home page: *home.agh.edu.pl/turlej* and on the course on the UPEL platform (login data will be sent by USOS).

Repetition of material:

As part of the revision of the material carried out on the Basic of Informatics subject, perform the following tasks:

1. Write a program calculating the quadratic equation:
   - variables a, b, c declared inside the program,
   - variables a, b, c given by the user (from the keyboard),
   - variables a, b, c given by the user (from the keyboard) and checking the condition of the number of solutions (delta) - conditional statement if.
2. Write a program displaying the squares of the first ten numbers:
   - with loop for
   - with loop while
   - with loop do-while
3. Declare 10-elements array and ,with use of for – loop, fill in the array elements with squares of natural numbers.
4. Using a while-loop, write elements of an even-numbered array (including zero).
5. Write a program that will allow you to enter your name, surname (declare char-arrays), age and display this data on the screen.
6. Based on the tasks from the previous classes define your own function for calculating the delta value. Modify the program using the written function to calculate the square root functions. The arguments of the "delta" function should be the coefficients a, b, c.

Place your delta function:
   - in the program, a square function: int delta(float a, float b, float c).
   - in a separate header file (library function), eg. delta.h
7. Write a program that:
   - Writes odd numbers from the interval [1; 100].
   - Writes numbers divisible by 5 from the interval [1; 50] (continue).
   - Writes the sum of array table elements int array_sum [] = {5,2,4,6,1,0, -20,10,20}.
   - The entire ASCII character array.

8. Using the switch statement, build the calculator (4 basic operations). The choice of operation is a condition of the switch statement.
9. Write a program that draws a Christmas tree at the height indicated by the user. Apply the break statement.
10. Write a program with an infinite for loop, which if you enter the letter q will end the program (break statement).
11. Write a structure representing a point in two-dimensional vector space. Use it in a function that calculates the distance between two points.
12. Write a structure representing a circle in a two-dimensional vector space. Use it in a function that decides whether the given point belongs to the inside, the edge or is outside the circle.
13. Define enum-type variable for storage the marks (form ndst to bdb) and use this variable to control the switch steatement that will be displaying the mark depending on average from partial marks. Define another switch statement with case ranges (...).
14. Using strcpy, strlen, strncpy, strcat, strncat, strcmp, toupper and tolower functions, write a program to enter the names of several users, and then allow you to paste all the names and only a few letters from individual names into one string. The program should enter the same name once. In one case, print the resulting string as lower case letters and then as uppercase letters.
15. Define structure Person with fields (with correct type): Name, Age, Height, Sex (W/M). Define another structure Person1, with the same fields, but with initializing and p3 with initializing with designators. Create a program with 3 variables (structures): p1, p2 and p3. Then set up fields by assignments structure p1. Then create a pointer to variable p1. Display values of p1 (address and the fields) with use of pointers and by referring to individual fields (like p1.Name).
16. Using structure p1 from pervious exercise declare an array of students and initialize it by names of your colleagues. Fill another fields with random data and display all this data on the screen (with any loop). Try different way to initialize values of structure p1 (with designators).
17. Modify structure Person and define a pointer to structure Person itself and implement a linked list with two positions – use example from lectures.
18. Define a function personal1 returning type struct Person (from previously ex.): struct Person and with formal arguments the same as in the structure Person (fields Name, Age, Height, Sex). The function of personal1 is to display complete information about the person on the screen (like: My name is: /Name/. I'm /Age/, etc.
19. Define a function that will be comparing age of data of people included in the structure Person Arguments of this function should be type of structure (Person). Also You can compare a length of names.
20. Use typedef declaration to simplifying declaration of structures //typedef struct {...}Person;
21. Create a file: data.txt in the same directory as *.exe file. In file data.txt put some sentences with small and capitol letters. Then define two programs: one that will be using getchar and putchar to convert small letters to capital letters – keyboard and second program that will be converting letters from file data.txt. //display on the screen and save in output file.
22. Using fprintf and fscanf modify yours quadratic function – as a, b, c - coefficients use data from text file (check correctness of loading all data).

Source codes from all points should be attached to the report (on the UPEL platform).