Part I: Advanced Programming (AP-OOAD) Lab - CSP318

Lab Assignment-4 (Introduction to C++/JAVA Concepts)

Objective: Basic functionalities of C++ .

**Experiment 1:** Define a function hypotenuse that calculates the hypotenuse of a right triangle when the other two sides are given. The function should take two double arguments and return the hypotenuse as a double. Use this function in a program to determine the hypotenuse for each of the triangles shown below.

Triangle Side 1 Side 2

1 3.0 4.0

2 5.0 12.0

3 8.0 15.0

**Experiment 2:** Write a program that plays the game of “guess the number” as follows: Your program chooses the number to be guessed by selecting an integer at random in the range 1 to 1000. The program then displays the following:

I have a number between 1 and 1000.

Can you guess my number?

Please type your first guess.

The player then types a first guess. The program responds with one of the following:

1. Excellent! You guessed the number!

Would you like to play again (y or n)?

2. Too low. Try again.

3. Too high. Try again.

If the player’s guess is incorrect, your program should loop until the player finally gets the number right. Your program should keep telling the player Too high or Too low to help the player “zero in” on the correct answer.

**Experiment 3:** It’s interesting to watch recursion “in action.” Write the factorial function to print its local variable and recursive call parameter. For each recursive call, display the outputs on a separate line and add a level of indentation. Do your utmost to make the outputs clear, interesting and meaningful. Your goal here is to design and implement an output format that helps a person understand recursion better. You may want to add such display capabilities to the many other recursion examples and exercises throughout the text.

**Experiment 4:** Develop a C++ program that deals with a book inventory. Create a class Book with private members title, author, and quantity. Implement two functions:

a) **decreaseQuantityByValue** that decreases the quantity of books by passing a copy of the object and returning the updated quantity.

b) **decreaseQuantityByReference** that decreases the quantity of books by passing the object by reference..

**Experiment 5:** Develop a C++ program that uses a function template named **findNode** to search for a specific node in a linked list. Test the program with linked lists of integers, strings, and characters.

**Experiment 6:** You are tasked with creating a simple math quiz game to help students practice addition. The program should generate two random positive one-digit integers using the rand() function and prompt the user with a question, such as:

"How much is 3 plus 4?"

The student then inputs the answer. To provide a more engaging experience, add various comments based on the correctness of the answer. Implement the following responses:

Possible responses to a correct answer:

Great job!

Fantastic!

Awesome!

You're a math whiz!

Possible responses to an incorrect answer:

Oops. Try again.

Not quite right. Give it another shot.

Don't worry, you'll get it next time.

Incorrect. Keep trying.

Use random-number generation to choose a number from 1 to 4, which will be used to select one of the appropriate responses for each correct or incorrect answer. Utilize a switch statement to issue the responses. Create a separate function named **generateQuestion(**) that generates a new question. This function should be called once when the application begins execution and each time the user answers a question correctly.