

CPE 150 Laboratory 4: Control Structures II

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1 Objectives

- To understand basic problem-solving techniques.
- To be able to develop algorithms through the process of top-down stepwise refinement.
- To be able to use the `while` and `for` repetition structures to execute statement in a program repeatedly.
- To understand counter-controlled repetition and sentinel-controlled repetition.
- To be able use the increment, decrement, assignment and logical operators.
- To be able to use `break` and `continue` program control statements.

2 Lab Exercise 1 - Department Store

Write a program that will determine if a department-store customer has exceeded the credit limit on a charge account. For each customer, the following information is available:

1. account number (an integer);
2. balance at the beginning of the month;
3. total of all items charged by the customer this month;
4. total of all credits applied to the customer's account this month;
5. allowed credit limit.

This program should input this information, calculate the new balance ($= \textit{beginning balance} + \textit{charges} - \textit{credits}$) and determine if the new balance exceeds the customer's credit limit. For those customers whose credit limit is exceeded, the program should display the customer's account number, credit limit, new balance and the message "Credit limit exceeded."

```
Enter account number (-1 to end): 100
Enter beginning balance: 5394.78
Enter total charges: 1000.00
Enter total credits: 500.00
Enter credit limit: 5500.00
```

```

*****
Account:      100
Credit Limit: 5500.00
New Balance:  5894.78
Credit Limit Exceeded.
*****

Enter account number (-1 to end): 200
Enter beginning balance: 1000.00
Enter total charges: 123.45
Enter total credits: 321.00
Enter credit limit: 1500.00

Enter account number (-1 to end): 300
Enter beginning balance: 500.00
Enter total charges: 274.73
Enter total credits: 100.00
Enter credit limit: 800.00

Enter account number (-1 to end): -1

```

Follow-Up Questions and Activities

Why it is necessary to ask the user to input the first account number before you begin the `while` loop? What problems could occur if the user was asked for an account number only inside the `while` loop?

3 Lab Exercise 2 - Pythagorean Triples

The set of three integer values for the lengths of the sides of a right triangle is called a *Pythagorean triple*. These three sides must satisfy the relationship that the sum of the squares of two of the sides is equal to the square of the hypotenuse. Write a program that asks the user to enter the lengths of 3 sides for a triangle (all integers). (e.g., `side1`, `side2` and `side3`), then the program should determine whether those sides form a Pythagorean Triple.

Hint: First, you need to find the largest side among the three sides, then do the Pythagorean triple check.

4 Lab Exercise 3 - Sales Bar Chart

Write a program that asks the user to enter today's sales for five stores. The program should then display a bar graph comparing each store's sales. Create each bar in the bar graph by displaying a row of asterisks. Each asterisk should represent \$100 of sales. Here is an example of the program's output.

```

Enter today's sales for store 1: 1000 [Enter]
Enter today's sales for store 2: 1200 [Enter]
Enter today's sales for store 3: 1800 [Enter]
Enter today's sales for store 4: 800 [Enter]

```

```
Enter today's sales for store 5: 1900 [Enter]
SALES BAR CHART
(Each * = $100)
Store 1: *****
Store 2: *****
Store 3: *****
Store 4: *****
Store 5: *****
```

5 Postlab Exercise

Write a program that reads a nonnegative integer and computes and prints its factorial. The factorial of a nonnegative integer n is written $n!$ (pronounced “ n factorial”) and is defined as follows:

$n! = n \times (n - 1) \times (n - 2) \times \cdots \times 1$ (for values of n greater than or equal to 1) and $n! = 1$ for $n = 0$

For example, $5! = 5 \times 4 \times 3 \times 2 \times 1$ which is 120.