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Lab Manual # 3

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Department			
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Section			
Lab Date	/09/2024		
Submission Date			
Lab Grade:	10	**Obtained Grade**	
Instructor's Signature:			

A. ***Title:* C++ Basics**

B. ***Objectives of this lab:***

- learn about Kinds of Program Errors
- Learn about variables and assignments
- Learn about data types and expressions

2.1 - Kinds of Program Errors

When you use a program to solve a problem, you may have one of the following three errors: 1) Syntax Error, 2) Logic Error, and 3) Run_time Error.

1) Syntax Error

Syntax error will be the result of violation of the syntax (the grammar rules) of the programming language that you use. For instance, if you forget to put ; at the end of a C++ instruction, your compiler will not correctly compile and will display and error on the screen. To see the type of error, you can remove one of the ; a try to compile the program. Another example of this type of error is if you do not have a paired open { and close } set of braces.

2) Logic Error

The logic error will be the result of incorrect translation of your algorithm when you were writing the program. This error will not be detected by the computer and the only way to find it is to test the program carefully after it is completed. For instance, if in the following statement:

```
profit_per_day = cases_per_day * bottles_per_case * profit_per_bottle; //correct
```

which is the correct statement for computing the profit_per_day, but if by mistake, we use + instead of *, then we will have:

```
profit_per_day = cases_per_day +bottles_per_case * profit_per_bottle;  //wrong
```

We will get an answer, but that answer is not correct. The error is the result of the mistake in the translation of our algorithm. Instead of * we have used +.

3) Run_time Error

A run_time error is detected when we run a program. This type of error are mostly related to numeric calculations. For example, a computer cannot compute the square root of a negative number.

Activity 2-2 - Variables and Assignments

"All variables must be declared before they are used in a C++ program."

All variables used in a C++ program must be declared. The declaration of a variable can be done in several different ways; 1) right at the beginning of the main function, 2) right before its use in the program, and 3) right before the main function. As it was shown in the sample C++ program in the previous lab, we declared variables of type integer and float right at the beginning of the main function.

In general, the syntax for variable declaration is:

Type_name Variable_Name_1, Variable_Name_2;

Example:
int number_of_cases, bottles_per_case;

Here is the list of the most common variable types used in C++:

Variable Name	Variable Name
short (short int) - 2 bytes *short x; or short x = 34;*	*long - 4 bytes* *long x; or long x = 34;*
int - 4 bytes *int x; or int x = 34;*	*float - 4 bytes, 7 digits precision* *float x; or float x = 34.56;*
double - 8 bytes, 15 digits precision *double x; or double x = 34.56;*	*long double - 10 bytes, 19 digits precision*
char - holds any single character on the keyboard *char c; or char c = 'a';*	*bool - True (1), False (0)* *bool x; or bool x = TRUE;*

Every variable is identified by a name that is referred to as **identifier**. An identifier must start with either a letter or the underscore symbol. The remaining characters must all be letters, digits, or the underscore symbol.

In general, every variable should have a type. An attempt to assign a value of a different type other than the original assigned type to a variable is referred to as "type mismatch". One has to be very careful that not all compilers will allow type mismatch, i.e., may produce an error when such attempts are made.

2.3 Arithmetic Operators and Expressions

To perform mathematical calculations, we combine variables and/or numbers using arithmetic operators such as: + *for addition*, - *for subtraction*, * *for multiplication*, / *for division*, and % to find the remainder of a division. The arithmetic operators can be used with numbers of type int, long, double, float, long double, short, or with a combination of different types. When you use arithmetic operators, you need to be careful that if the correct variable types are not used, the result can be very different from what you were expecting. For example: 7.0/2 = 3.5, 7/2.0 = 3.5, however, 7/2 = 3 (not 3.5). The reason for such a significant difference is because the last one is actually using integer division. Perhaps the most significant problem will be seen in cases where the numerator is smaller than the denominator. In such cases the integer division will result in 0. An example of such a case is 5/9 = 0.

There are some shorthand notations that combine the assignment operator (=) and an arithmetic operator. The general form for this notation is:
Variable Operator = *Expression*,

' which is equivalent to: *Variable* = *Variable Operator* (*Expression*).

The expression can be another variable, a constant, or a more complicated arithmetic expression. Here are some examples:

Shorthand Notation	Equivalent
total += 2;	total = total+2;
amount += tax - rebate	amount = amount + (tax - rebate)

Similarly, we may use -=, *=, /=, and %=.

Exercise 21-1

Determine the answer to the following statements:

Question 2.1 3 -= 4*5;
Question 2.2 40 %= 16/2;
Question 2.3 88 /= 82%4;

Activity 2-4 A Simple C++ Program

A grocery store sells many cases of soft drink every day. In each case, there are 12 bottles and the store profits 20 cents per bottle. We want to compute the profit that the store has every day of selling soft drink. We also want to know the profit for selling soft drink in a year. Assume a year is 365 days.

1) Problem Definition:

Compute the profit that a store has in one day for selling soft drink?
Compute the profit that a store has in one year for selling soft drink?

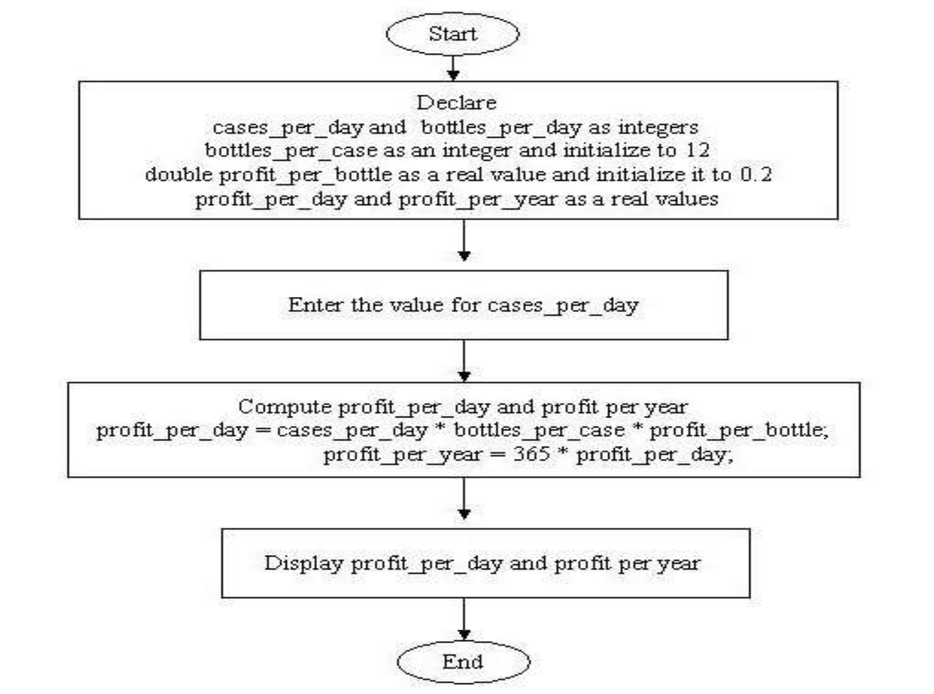
This program is so computationally extensive, that we want to write a C++ program to solve it on a computer! At least we will assume it is for now.

2) Program Design - Algorithm

Before we attempt to write the program, let's develop an algorithm for solving the problem.

Exercise 2.1

Design the algorithm for this problem. On a piece of paper draw a diagram or write in English the steps. Remember your algorithm must be precise. Once you are done with your design, if you wish you can compare your design with the one we have given here. This algorithm must be translated to C++ to obtain the program.


Start
Declare
cases_per_day and bottles_per_day as integers
bottles_per_case as an integer and initialize to 12
double profit_per_bottle as a real value and initialize it to 0.2
profit_per_day and profit_per_year as a real values
Enter the value for cases_per_day
Compute profit_per_day and profit per year
profit_per_day = cases_per_day * bottles_per_case * profit_per_bottle;
profit_per_year = 365 * profit_per_day;
Display profit_per_day and profit per year
End

2-A) Desktop Testing

Now that you have the algorithm, test it to see if it works on paper. 44

3) Implementing the Algorithm in C++

This is where you will translate the algorithm to C++. Here is a program that is designed based on the algorithm that is given in the previous part. Check to make sure you find everything is translated preciously.

Write Your code Here

```
// P2.cpp - This C++ Program will compute the profit of selling soft drinks

#include <iostream>
using namespace std;

int main( )
{
    int cases_per_day, bottles_per_day;
    int bottles_per_case = 12;
    double profit_per_bottle = 0.2;  // 20 cents per bottle profit
    double profit_per_day, profit_per_year;

    cout << “Press enter after entering each number \n”;
    cout << “Enter number of cases \n”;
    cin >> cases_per_day;

    profit_per_day = cases_per_day * bottles_per_case * profit_per_bottle;
    profit_per_year = 365 * profit_per_day;

    cout << “The store has a made : “;
    cout << profit_per_day;
    cout << “  per day. \n”;
    cout << “That means the profit for one year will be:  “;
    cout << profit_per_year << endl;

    cout << “Good business?! \n”;
    return 0;
}
```

1) What is the answer to the following arithmetic operations?

a) *(1/5)* * 3
b) *(8/2) * 4*
*c) (1.0/5.0) * 3*

Is there any difference between a and c?

2) Convert the following mathematical expressions to C++ expressions:

a) *4x*
b) *(2x + y)/3y*
c) *(2x - 3y)/(z -1)*

Your Answer Here

a)
b)
c)

3) Translate the following English statements to C++ expressions.

a) Assign 2.7 to variable a
c) Check to see if variable a is larger than 3.0
d) Check to see if a is larger than 3 OR it is 0.
e) Check to see if a is larger than or equal to 3 but less than 8
f) Check to see if a is not 5

Your Answer Here

a)
b)
c)
d)
e)
f)
g)

Assignment #1:

Write a C++ program to produce calculator to add,sub,mult and divide tow integers numbers?

Write Your code Here