Sub-Quest 12.1

200 EXP

CPSC121 SI

Rex: Hey Programmer!

Rex: This is Sub-Quest 12. This is branch of Quest 12 that covers important material, which was not covered in the main quest.

Rex: I am a Functions G-E-N-I-U-S so Erin allowed me to create this sub quest. This sub quest covers passing by value/reference, and local/global/static variables.

Rex: Alright, so you should know how functions work at this point, but have you ever wondered about the parameters being passed to the function?

Rex: Yea…. Probably not. Only a genius like myself would ever wonder about such intricacies. There is this thing called passing by value and passing by reference. Passing by value means that you will be passing just the value of the variable, not the variable itself. Passing by reference means that you will be passing the actual variable to the function.

Rex: So if you pass by value to a function, anything you do to that value will not affect the actual variable whatsoever. However, if you pass the variable by reference then if the variable is changed in the function, then it is changed in its actual memory location as well!

Rex: So how do you program a pass by value or reference? If the parameter is pass by value then you just need to say what datatype the variable is. If it is pass by reference, then you need to put and ampersand (&) after the datatype. This sends the memory address of your variable to the function so that the function can alter its actual content.

Rex: Quite elementary stuff right? I guess we'll see how well you understand with a test. I am going to give you some functions that use pass by value and pass by reference, and see if you can trace it properly.

```cpp
int myfunc(int x, int y, char& z)
{
    x += 2;
    y += 3;
    z = 'R';
    return x + y;
}
void rexIsSmart(int n, double& m, char& p)
{
    m += n;
    n = 0;
    if(n == 0)
    {
        p = 'E';
    }
}


int num1 = 4, num2 = 3, num3 = 1;
double d1 = 0.5;
char gen = 'Y', i = 'G', us = 'X';

num1 = myfunc(num2, num3, gen);
num2 = myfunc(num1, num2, i);
rexIsSmart( num1, d1, i);
```

Rex: What values do the variables hold now?

num1:   num2:   num3:
d1:
gen: i: us:

Rex: Okay, so let's cover local/global/static variables. Local variables are what you have probably used up to this point. Local variables exist only in the block/scope that it is declared. Global variables can be accessed by all functions and modified as well. There are also global constants, which can be referenced by all functions, but not modified. Lastly, there are static local variables that are defined and initialized only the FIRST time the function or block is called. Also, unlike regular local variables, static local variables retain their content between function calls.

Rex: For this part of the sub quest, there will be no example or program. Instead you must show your SI leader your understanding of local/global/static variables by showing them where and how you would declare the following variables:

Local variable
static local variable
global variable
global constant