

CHAPTER 2B

PROGRAMMING TIP

After the first laboratory assignment several students came to my office and asked questions that were very similar. Thus, this addendum to Chapter 1 was written. When a program is assigned to you the first thing you should do is to **understand the problem**. Even though you may think that the assignment is very easy and you can do it at the last minute, most of the time this is not the case. Therefore, I require you to solve the problem assigned to you with "paper and pencil" first. If you approach me or the graduate assistant for help with a programming problem, you will be asked show this handwritten work first. If you do not have it, we will not help you with the coding. We will still help you to understand the problem.

Once you understood the problem, figure out all the functions and variables needed to write the program. Make a structure chart and show the data flow. Next, write the psuedocode for each of the modules. A structure chart tells you what to do, a psuedocode tells you how to do it. I will cover this in class at great detail.

Here is an example of a programming assignment.

Write a program to determine how many quarter rolls, dime rolls, nickel rolls and penny rolls in a given amount of dollars.

Let us understand this problem.

What are the known information about this programming assignment?

There are ten dollars in a quarter roll.

There are five dollars in a dime roll.

There are two dollars in a nickel roll.

And there are two penny rolls in a dollar.

The amount may vary each time you run the program. For this example let us assume the amount is 38 dollars.

Quarter rolls may be obtained by doing integer division $38/10$. Integer division gives you only the integer portion of the result. ----->**3 quarter rolls.**

Remainder is $38-30$, which is 8. You can get the remainder by doing the modulus operation.

Dime rolls may be obtained by doing integer division $8/5$ -----> **1 dime roll.**

The remainder is $8-5$, which is 3.

Nickel rolls may be obtained by doing integer division $3/2$.-----> **1 nickel roll.**

The remainder may be obtained by doing the modulus operation, which will give a remainder of 1.

There are two rolls of pennies in a dollar.-----> **2 penny rolls.**

Refining this will give you the following:

get dollars

read dollars from the
keyboard

calculate quarter rolls and remainder

$\text{quarter_rolls} = \text{dollars} /$
 10

$\text{remainder} = \text{dollars} \% 10$

calculate dime rolls and remainder

$\text{dime_rolls} = \text{remainder} /$
 5

$\text{remainder} = \text{remainder} \%$
 5

calculate nickel rolls and remainder

$\text{nickel_rolls} = \text{remainder} /$
 2

```
remainder = remainder %  
2
```

calculate penny rolls

```
penny_rolls = remainder *  
2
```

After doing all the above, go to the computer lab, launch the Visual C++ or whatever compiler you like. Many of you write the entire program in then spend hours trying to debug it. A better practice is to write smaller portions first.

Write a shell of the program as follows, save it to the appropriate subdirectory. If you are using the campus computer, save to `c:\temp\yourfilename.cpp`. Replace yourfilename with whatever name you want to call it. Compile the program and make sure that there no errors. Remember to **copy the yourfilename.cpp to your floppy disk** before logging out of the computer. Once you logout all your work will be erased. You can copy the file by either dragging the file from the C: drive to A: drive or copying from C: and pasting to A:.

Sample program shell.

```
/*****
```

Put all your comments here

```
*****/
```

```
#include <iostream>
```

```
using namespace std;
```

```
int main()
```

```
{
```

```
return (0);
```

```
}
```

If no errors occurred in the above program, begin to write the source code. If you are not an experienced typist or a programmer, I suggest that you compile the program after every few lines. Make sure there are no errors. You are allowed to have warnings, but no errors. Correct the errors before continuing.

Program 2B_1.

```
*****
```

Calculate how many Quarter Rolls, Dime Rolls

Nickel Rolls and Penny rolls in given dollar amount.

By Dr. John Abraham

Created for 1370 students

```
*****/
```

```
#include <iostream>
```

```
using namespace std;
```

```
int main()
```

```
{
```

```
int dollar, quarterR, dimeR, nickelR, pennyR, remainder;
```

```
//prompt and read dollar
```

```
cout << "Enter amount of dollars to change---> ";
```

```
cin >> dollar;
```

```
//find quarter rolls
```

```
quarterR = dollar / 10;
```

```
remainder = dollar % 10;
```

```
//find dime rolls
```

```
dimeR = remainder / 5;
```

```
remainder = remainder % 5;

//find nickel rolls

nickelR = remainder / 2;

remainder = remainder %2;

//find penny rolls

pennyR = remainder *2;

//display results

cout << "amount entered ----> " << dollar << "\n";

cout << "quarter rolls -----> " << quarterR << "\n";

cout << "dime rolls -----> " << dimeR << "\n";

cout << "nickel rolls -----> " << nickelR << "\n";

cout << "penny rolls -----> " << pennyR << "\n";

return(0);

}
```

Program Run OneB_1

```
Enter amount of dollars to change---> 38
```

```
amount entered ----> 38
```

```
quarter rolls -----> 3
```

```
dime rolls -----> 1
```

```
nickel rolls -----> 1
```

```
penny rolls -----> 2
```

```
Press any key to continue
```

Here is a description of the program line by line.

```
int main()
```

Every program must have a main function. A program begins executing with the main function. Main returns an integer value to DOS.

```
{
```

The left bracket indicates the beginning of the main.

```
int dollar, quarterR, dimeR, nickelR, pennyR, remainder;
```

Variables that are used in the main are declared. There are six variables of type integer. These variable names (identifiers) stand for

memory locations. In each of these memory locations, only whole numbers within the range of -32768 to 32767 can be stored.

```
//prompt and read dollar  
  
cout << "Enter amount of dollars to change---> ";
```

Displays the prompt to the user.

```
cin >> dollar;
```

Waits for the user to type in a value at the keyboard. When a value is entered, that value is stored in the memory location referred to by dollar.

```
//find quarter rolls  
  
quarterR = dollar / 10;
```

Result of this integer division is stored in the variable called quarterB.

```
remainder = dollar % 10;
```

Result of this modulus operation is stored in the memory location referred to by remainder.

```
//find dime rolls  
  
dimeR = remainder / 5;  
  
remainder = remainder % 5;  
  
//find nickel rolls  
  
nickelR = remainder / 2;
```

```

remainder = remainder %2;

//find penny rolls

pennyR = remainder *2;

//display results

cout << "amount entered ----> " << dollar << "\n";

cout << "quarter rolls -----> " << quarterR << "\n";

cout << "dime rolls -----> " << dimeR << "\n";

cout << "nickel rolls -----> " << nickelR << "\n";

cout << "penny rolls -----> " << pennyR << "\n";

return(0);

}

```

This program only prints to the monitor. We want the program run to be saved in a file. The following program shows the necessary lines required to do it.

Program 2B_2.

```

/*****

```

Calculate how many Quarter Rolls, Dime Rolls

Nickel Rolls and Penny rolls in given dollar amount.

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Created for 1370 students

```
*****/
```

```
#include <iostream>
```

```
#include <fstream>
```

```
using namespace std;
```

```
int main()
```

```
{
```

```
    //file routines
```

```
    ofstream outfile;
```

```
    outfile.open("a:OneB_1.txt");
```

```
    int dollar, quarterR, dimeR, nickelR, pennyR, remainder;
```

```
    //prompt and read dollar
```

```
    cout << "Enter amount of dollars to change---> ";
```

```
    cin >> dollar;
```

```
    outfile << "Enter amount of dollars to change---> " << dollar  
<< "\n";
```

```
//find quarter rolls

quarterR = dollar / 10;

remainder = dollar % 10;

//find dime rolls

dimeR = remainder / 5;

remainder = remainder % 5;

//find nickel rolls

nickelR = remainder / 2;

remainder = remainder % 2;

//find penny rolls

pennyR = remainder * 2;

//display results

cout << "amount entered ----> " << dollar << "\n";

cout << "quarter rolls -----> " << quarterR << "\n";

cout << "dime rolls -----> " << dimeR << "\n";

cout << "nickel rolls -----> " << nickelR << "\n";

cout << "penny rolls -----> " << pennyR << "\n";
```

```
outfile << "amount entered ----> " << dollar << "\n";

outfile << "quarter rolls -----> " << quarterR << "\n";

outfile << "dime rolls -----> " << dimeR << "\n";

outfile << "nickel rolls -----> " << nickelR << "\n";

outfile << "penny rolls -----> " << pennyR << "\n";

outfile.close();

return(0);

}
```

Once this program is run a file is created in the floppy disk drive.

I opened the file that was created (2B_2.txt) using MS Word.

Here is the output:

```
Enter amount of dollars to change---> 44

amount entered ----> 44

quarter rolls -----> 4

dime rolls -----> 0

nickel rolls -----> 2

penny rolls -----> 0
```