CS2010 Lab 3: Fun with the modulus operator 5 pts

**Due: Friday, January 26, 2018**

### For this lab you will be working with a partner to complete the assignment following the steps listed below. Turn in only one copy of the .cpp file on Canvas for the two of you.

### 1. Practice first with the modulus operator by tracing through the program below. What value is displayed for *result* if the original number is:

### 47 \_\_\_\_\_\_\_\_\_\_\_\_\_ 95 \_\_\_\_\_\_\_\_\_\_\_\_\_ 28 \_\_\_\_\_\_\_\_\_\_\_\_\_

Describe in words what this program does with any two-digit number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#include <iostream>

using namespace std;

int main()

{

int origNum, result;

int a, b;

// Ask user to enter a two-digit number

cout << "Enter any two-digit number: ";

cin >> origNum;

// Perform calculations on number

a = origNum / 10;

b = origNum % 10;

result = b \* 10 + a;

// Display original number and result

cout << endl;

cout << "Original number: " << origNum << endl;

cout << "Result after calculations: " << result << endl;

cout << endl;

system("pause");

return 0;

}

2. **Making change:** You just purchased a piece of candy at the store for 26 cents. You give the clerk a dollar and figure that you should get 74 cents back in change. What coins should the clerk give you?

Quarters \_\_\_\_\_\_\_\_\_\_\_

Dimes \_\_\_\_\_\_\_\_\_\_\_

Nickels \_\_\_\_\_\_\_\_\_\_\_

Pennies \_\_\_\_\_\_\_\_\_\_\_

Write a program to find the correct combination of coins to make change for any amount from 1 to 99 cents. Your program should do the following:

- Ask the user to enter the amount of change needed (1 – 99 cents).

- Find the number of each coin needed to make the correct change. **Hint**: Use the divide and modulus operators and the number of cents in a coin (e.g., 25 for a quarter) to find the number of each coin to give as change.

- Display the number of quarters, dimes, nickels and pennies needed to make the correct change.

a. Use good program development techniques for your project (i.e., design and write the algorithm in the space given below). For the calculation steps, think carefully about how you will find the number of each coin. Test your calculations with paper and pencil before you worry about the C++ statements.

b. Once you think your calculations are correct, create a new Visual C++ project using your last names and Lab3 for the project name and .cpp file name (e.g., MoneyBaggs\_Lab3 and MoneyBaggs Lab3.cpp).

c. Add BOTH OF YOUR NAMES in the header comments.

d. Be sure to debug and test your program with several different change amounts (e.g, 30, 85, 47, 10).

e. **Turn in your program** – Close your project (**Close 🡪 Close solution** OR exit Visual Studio) and turn in one copy of the.cpp file. If you want to do the Bonus you will have a second .cpp file to turn in.

\* Write the algorithm– the list of steps needed to solve the problem. No C++ statements please!

- Input steps (e.g., consider which values are needed as inputs and determine data types of those values)

- Processing steps (e.g., calculations- what/how need to be calculated?)

- Output steps (e.g., what should be shown as outputs?)

3. **BONUS (1 pt)** Modify the program from step 2 so it does the same thing for a three-digit number (i.e., for any amount from 1 to 999 cents.).

a. First figure out the calculations needed using paper and pencil. Desk-check your work with several different numbers (e.g., 158 and 624) to make sure your calculations are correct.

b. Next, figure out what changes need to be made to the program so that it will work for three-digit numbers instead of two. Do you need additional variables, assignment statements, etc.?

c. Create a new Visual C++ project using your last names and **Lab3b** for the project name and .cpp file name. (e.g., MoneyBaggs\_Lab3b and MoneyBaggs Lab3b.cpp

d. Add your names and class time in the header comments.

e. Type in the program with your modifications.

f. Debug and test your program until you are sure it is working correctly.

g. **Turn in your program** – Close your project (**Close 🡪 Close solution** OR exit Visual Studio) and turn in one copy of the.cpp file.

### CS2010 Lab 3 Grading Rubric

### Due: Friday, January 26, 2018

For the lab assignment you need to turn in only one copy of the **.cpp file** for you and your partneron Canvas.

\_\_\_\_\_ (1) Change program uses good program style (meaningful data names, white space, indentation).

\_\_\_\_\_ (4) Change program correctly calculates number of each coin needed to make change, output labeled and displayed clearly.

\_\_\_\_\_ (1) **Bonus!** Modifications to number program (step 2) correctly handle three-digit number.

**\_\_\_\_\_\_\_** **(5) Total Points (6 with bonus)**