

CS150-02 Lab 3

Laundromat

Date: Tuesday, September 13, 2005

Due date: Thursday, September 15, 2005, 8am

Total points: 20

Objectives

The main objective of this assignment is to use arithmetic operators to solve a complex problem.

Problem statement

- 1) We're ready to start programming. First, we need a problem to solve. Here is your mission for today:

After years of doing laundry at a laundromat, you have finally purchased your own washer and dryer. Congratulations on achieving one of life's sweetest goals! The only unfortunate consequence of this wonderful purchase is that you now have jars and jars of quarters that will take you years to spend. So, you've decided to start selling those quarters to all of your poor friends who are still visiting the laundromat. You want to write a nice program that will calculate how many quarters to give your friends when they start bringing you money to change.

- 2) Your output should look exactly as follows (sample input is given in bold):

```
*****
*           Quarters to Dollars and Change           *
*                               Converter              *
*****
Please enter your name: Bob
Welcome, Bob.
Please enter the amount of money you would like to
change into quarters: 3.40
$3.4 will be changed into 13 quarters with 15 cents
left over.
```

3) First we need a program analysis. Answering the following questions will help step you through the process.

a) What is the input for your program? What units will it be in?

b) What is the output for your program? What units will it be in?

c) What are the calculations needed for your program? Answering the following questions will help you answer this overall question. Note: The input to the program is an amount of money that is a decimal amount. It has two components: the number of dollars and the number of cents. We will need both of these components for our calculations. So, this means we'll be converting a decimal number into two integer parts.

i) How do you calculate the number of dollars that you are changing from the total money amount inputted?

ii) How do you calculate the number of cents?

iii) How do you determine the number of quarters in the whole dollar amount?

iv) How do you determine the number of quarters in the cents amount?

v) How do you calculate the total number of quarters?

vi) How do you determine if you have any leftover amount that cannot be changed into quarters?

- 4) Next, you need to do an algorithm design. What are the steps of your algorithm? Remember, these are the steps that you'll need to comment in your program.

- 5) Now you're ready to start programming. Create a new project in Visual Studio .NET. You should name your project "03PUNetId", where PUNetId is your own id. I would name my project "03khoj0332". While working on a project, it should be located on the current computer you are working on (i.e. the desktop). Once you have completed developing, you should copy the project folder onto Turing.

- 6) Write the code that will solve the problem. Make sure that you add comments to the code as you type.

- 7) How can you verify that your program works correctly? What numbers would you use to test the program?

- 8) It is possible to find input values where it looks like your program made an error. In these cases, the amount of cents left over is one less than it should be. Can you find an input value where this is the case? What is it? In reality, your program did not make a mistake. It's working exactly as it should. The problem is with how the doubles are stored in the computer. Because they're not stored in decimal format (it's scientific format), decimal numbers are not represented exactly. So, when you try to make it an integer, it might convert to a number that is one less or one more than the number. This is called roundoff error and it's something you'll have to be very careful about when coding later on. For now, it's enough that we know what it is.

- 9) When you have completed writing the program and you have verified that it works correctly, you will need to show it to the instructor. Once you have done this you will submit the project for grading. You submit your program by placing a copy of the project folder in the "CS150-01 Lab" folder on Turing. Make sure that you also place a copy of the project folder in your own folder on Turing.