

GE U111 ENGINEERING PROBLEM SOLVING & COMPUTATION, SPRING 2004  
HOMEWORK #3 – MAKING CHANGE

DATE ASSIGNED: February 2, 2004  
DATE DUE: February 9, 2004 (at the beginning of class)  
READING: Chapter 3 (JK)

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When cashiers give change, they try to use the least amount of bills and coins possible to make the correct change. Your job is to write a program to automate this task. This program should prompt the user for the sale amount and the amount tendered. Your program should loop until the user enters "0" for the sale amount. If the tendered amount is less than the sale amount, your program should output an appropriate warning and continue looping.

Assume the register contains sufficient amounts of \$20, \$10, \$5, and \$1 bills as well as Quarters, Dimes, Nickels, and Pennies. Provide a solution using the **least** amount of coins and bills due to the customer. For example, if the sale were \$0.58, and you were handed a dollar, the correct solution would be one that required 1 Quarter, 1 Dime, 1 Nickel, and 2 Pennies. A solution that suggests, for example, 42 Pennies, would be considered incorrect.

Do **not** print out lines for which the number of bills or coins is zero. If the number of bills or coins is exactly one, then print the singular form of the bill/coin name. If the number of bills/coins is two or more, print the plural form.

In other words, for **full credit**, your code must output the following text:

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C:\Documents and Settings\Dr. Suparna Datta\Debug\makechange.exe
Please enter the sale amount: 11.36
Please enter the tender amount: 20
The change due from $20 for a $11.36 sale is:
1 - $5 bill
3 - $1 bills
2 - Quarters
1 - Dime
4 - Pennies

Please enter the sale amount: 11.32
Please enter the tender amount: 50
The change due from $50 for a $11.32 sale is:
1 - $20 bill
1 - $10 bill
1 - $5 bill
3 - $1 bills
2 - Quarters
1 - Dime
1 - Nickel
3 - Pennies

Please enter the sale amount: 11.36
Please enter the tender amount: 20.01
The change due from $20.01 for a $11.36 sale is:
1 - $5 bill
3 - $1 bills
2 - Quarters
1 - Dime
1 - Nickel

Please enter the sale amount: 1.59
Please enter the tender amount: 1
Insufficient funds offered! Please have customer arrested!

Please enter the sale amount: .99
Please enter the tender amount: 1
The change due from $1 for a $0.99 sale is:
1 - Penny

Please enter the sale amount: 0
Press any key to continue
```

To get started on this assignment, think about how change is made. If I need to make \$8.42 in change, I first see how many \$20 bills I need. Then I check \$10, \$5, ... , and finally the Pennies. At each stage, I subtract the value of each currency used from the remaining change. If I do it in this order, I automatically end up with the least amount of change items.

**Note: the simplest way to solve this problem is to use integer division and the modulo operator.**

1. Write pseudocode or make a flowchart for this problem. Call your program “HW3xxx.cpp”, where xxx are your initials. Be sure to **document** your source file (i.e., COMMENT your program so that it is clear what you are trying to do, and how you are trying to do it!) Test your program **for all 6 cases** given in the aforementioned example (the 6<sup>th</sup> case is sale amount = 0). Print out what appears on your terminal window (use ALT + PRINT SCREEN).
2. Submit the following items in a folder properly labeled and bound. Be sure that both your name and class section appear on the front of the folder. Assignments presented otherwise will be returned with penalty.
  - a. Correspondence page (cover letter, memo, fax sheet)
  - b. List of contents
  - c. Flowchart or pseudocode
  - d. Printed copy of your commented source file (HW3xxx.cpp)
  - e. Printout of terminal window for the six cases specified above
  - f. Diskette with program files (HW3xxx.cpp)
3. Email a copy of your program file (HW3xxx.cpp) to Stephen Frechette at [sfrechet@ece.neu.edu](mailto:sfrechet@ece.neu.edu) before the start of class on February 9th. In the subject line, type the following: “Your last name, GE U111-Section X, HW 3”.