Homework 5

Due Date: May 14, 2009 at 5:00PM   **Points**: 100

Written Exercises

1. (*5 points each*) Consider this very simple function:
   ```
   def cube(x):
        answer = x * x * x
        return answer
   ```
   a. What does this function do?
   b. Show how a program could use this function to print the value of y^3, assuming `y` is a variable.
   c. Here is a fragment of a program that uses this function:
   ```
   answer = 4
   result = cube(3)
   print answer, result
   ```
   The output from this fragment is 4 27. Explain why the output is not 27 27, even though `cube` seems to change the value of `answer` to 27.

   [*text*, §6.8, Discussion problem 5]
2. (*15 points*) Here is a statement with lots of nesting:
   ```
   if a > b:
        if b > c:
             print "First"
        else:
             print "Second"
   elif b > c:
        if a >= c:
             print "Third"
        elif a < b:
             print "Fourth"
        else:
             print "Fifth"
   else:
        if a == b:
             print "Sixth"
        else
             print "Seventh"
   ```
   Eliminate the nesting by combining conditions appropriately, using "and" and "or" as needed.

Programming Exercises

Remember to turn in your error logs and refinement files.

3. (*20 points*) The body mass index (BMI) is calculated as a person's weight (in pounds) times 720, divided by the square of the person's height (in inches). A BMI in the range 19–25, inclusive, is considered healthy for most people (as always, consult your doctor to determine

if your BMI is considered healthy for you). Write a program that calculates a person's BMI and prints a message telling them whether they are above, within, or below the healthy range given above. Your program is to take as input a single line with weight first, a comma, and then height. Please turn in the program in the file `bmi.py`.
[*text*, §7.7, Programming Exercises problem 5, modified]

4. (*20 points*) Write a function to determine whether a year, given as the argument, is a leap year. A year is a leap year if it is divisible by 4, unless it is divisible by 100 and not 400. So 2000 was a leap year, but 2100 and 2200 will not be. Then write a program that asks the user to enter a year and uses the function you wrote to determine whether the year is a leap year. The program then prints the result. Please turn in the program in the file `leap.py`.
[*text*, §7.7, Programming Exercises problem 11, modified]

5. (*30 points*) The greatest common divisor (GCD) of two integers m and n is the largest number that divides evenly into both of them. For example, the GCD of 12 and 15 is 3, and of 16 and 40 is 8. Write a program that asks the user to enter two integers, then calculates and displays their GCD. Please turn in your program in the file `gcd.py`.

Hint: The classic algorithm for computing the GCD, known as Euclid's Algorithm, goes as follows. Let m and n be variables containing the two numbers. Divide m by n. Save the divisor (that is, n) in m, and save the remainder in n. If n is 0, stop; m contains the GCD. Otherwise, repeat the process, starting with the division of m by n.

Extra Credit (Programming)

Remember to turn in your error logs and the refinement file.

6. (*20 points*) The National Weather Service computes the windchill index using the following formula:

$$35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

where T is the temperature in degrees Fahrenheit and V is the wind speed in miles per hour.

Write a program that prints a nicely formatted table of windchill values. Rows should represent wind speed for 0 to 50 in 5 mph increments, and the columns should represent temperatures from –20 to +60 in 10-degree increments. Your program must use the above formula to compute the entries in the table. Please turn in your program in the file `chill.py`.
[*text*, §8.7, Programming Exercises problem 2, modified]