CMPSC 111
Introduction to Computer Science I
Fall 2014
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Lab 6 for Sections 01 and 02
9 October 2014
Due: Thursday, 16 October by 2:30pm

Objectives

To write a Java program that calculates the compound interest using methods from Java's `Math` and `Format` classes.

General Guidelines for Labs

- **Work on the Alden Hall computers.** If you want to work on a different machine, be sure to transfer your programs to the Alden machines and re-run them before submitting.

- **Update your repository often!** You should add, commit, and push your updated files each time you work on them. I will not grade your programs until the due date has passed.

- **Review the Honor Code policy.** You may discuss programs with others, but programs that are nearly identical to others will be taken as evidence of violating the Honor Code.

Reading Assignment

To learn more about Java Math methods and formatting, review Sections 3.5 and 3.6 in your textbook.

Create a new directory and a Java program

In your own `cs111F2014-<your user name>` repository inside `labs` directory, create a directory called `lab6` by typing "`mkdir lab6`'. Type "`cd lab6`" to move to the new directory. Then using `gvim` create a `Lab6.java` file.

Compound Interest Calculation

Compound interest is the interest added to the principal of a loan or a deposit, so that the interest is paid not only on the principal, but also on the interest that has already been earned. This way, the balance doesn't merely grow, it grows at an increasing rate. The idea behind compound interest is one of the most useful concepts in finance. It is the basis of everything from a personal savings plan to the long term growth of the stock market. It also accounts for the effects of inflation, and the importance of paying down your debt.

The periodic compound interest formula is as follows:

$$A = P \left(1 + \frac{r}{n}\right)^{nt} \tag{1}$$

- `A` is the amount of money accumulated after n years, including interest.

- `P` is the principal amount (the initial amount you borrow or deposit).

- `r` is the annual rate of interest (as a decimal number).

- `t` are the number of years the amount is deposited or borrowed for.

- `n` is the number of times the interest is compounded per year.

Write a Java program that will do the following:

1. Using descriptive messages (print statements), get `P, t` and `n` values from the user. A message "Enter a value for P" is not descriptive, while "Enter the amount of money you have borrowed" is more descriptive.

2. Declare a variable to hold the value for the interest `r` and randomly choose a value for it in the range between 0.02 and 0.15 (2-15 percent).

3. Calculate the value of `A` using Formula 1.

4. Output the result (the value of `A`) along with the values of `P, r, t` and `n` using a descriptive message. Use `Format` class to output `A` and `P` as dollar values and `r` as a percentage.

5. Now, for the same values of `P, A, t` and `r`, calculate the value for `A` using a continuous compounding formula:
$$A = Pe^{rt} \tag{2}$$
Continuous compounding is achieved by making the compounding period infinitesimally small, this is done by taking the limit as n goes to infinity.
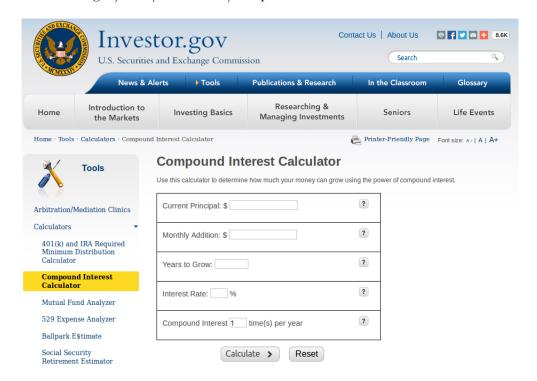
6. Output the result (value of `A`) along with the values of `P, r` and `t` for the continuous compounding using a descriptive message. Use `Format` class to output `A` and `P` as dollar values and `r` as a percentage.

Additional Program Requirements

- Make sure your program prints your name, the lab number, and the date.

- Make sure your program contains the comment header with the honor pledge, your name, lab number, date, and the purpose of the program.

- Make sure your program is documented properly, with the comments throughout your program whenever appropriate.

- Make sure your output is neat (no missing spaces, no typos, etc.) and that your program is neat (indenting, etc.).

Special Challenge

As an optional challenge, consider reimplementing this program as a Graphical User Interface (GUI), by creating frames, panels, buttons and text fields. You can create a compound interest calculator similar to the one in the figure below that can be found on:
http://www.investor.gov/tools/calculators/compound-interest-calculator

Although we have not and most likely will not cover this material in class, you can read Chapters 3.9 and 4.7–4.9 to learn how to create GUI text fields and buttons.

Required Deliverables

For this assignment you are invited to submit electronic versions of the following deliverables through the Bitbucket repository.

1. A completed, properly commented and formatted `Lab6.java` program.

2. An output document containing an output obtained after running `Lab6.java` program.

As you complete this step, you should make sure that you created a `lab6/` directory within the Git repository. Then, you can save all of the required deliverables in the `lab6/` directory—please see the course instructor or a teaching assistant if you are not able to create your directory properly.

Share your program and the output file with me through your Git repository by correctly using "`git add`", "`git commit`", and "`git push`" commands. When you are done, please ensure that the Bitbucket Web site has a `lab6/` directory in your repository with the two files called `Lab6.java` and `output`. You should see the instructor if you have questions about assignment submission.