

Dates of Importance:

Tuesday, October 10: (Optional) Suggested Problems Due for Quiz Extra Credit
Thursday, October 12: (Required) In-class Exercise
Tuesday, October 17: (Required) In-class Quiz

Objectives:

This exercise will get you (further) experience with:

- declaring variables of various types.
- using Java objects.
- assignment statements.
- selective execution.
- iterative execution.

Preliminaries

Before attempting to complete this assignment, you should be comfortable with the material from Lab 1 and Chapters 1, 2, 3, 4.3, 5, 6.1, and 6.2 of the Horstmann text book. As a result, you should be comfortable with all of the material from Labs 1-2, all of the preliminary problems from Labs 1-2, and you should be able to complete the following problems before solving the actual lab problem.

1. *Chapter 5*: p. 219–223: problems R5.1–R5.7, R5.18 (month should be entered as a String, and day as an integer – *WRITE A COMPLETE JAVA PROGRAM, NOT JUST PSEUDOCODE AS THE PROBLEM ASKS!*), R5.27, R5.30–R5.32, p.224–226: E5.4, E5.7.
2. Consider the following Java code sequence (assuming all variables have been declared as integers and given appropriate values):

```
if (i==3)
    System.out.println("Wow!");
if (i==3 || i==9)
{
    System.out.println("Hello");
    System.out.println("World");
}
else if (i==1 || i==2)
    System.out.println("Low balled!");
else if (i==7)
    System.out.println("Lucky You!");
else
    System.out.println("Please be");
    System.out.println("Carefull!");
```

Rewrite the above sequence so that it does not contain the keyword `if` or `else` but still performs equivalently for any given value of `i`.

3. *Chapter 6*: p. 294-296: problems E6.2 a-c only, E6.3, E6.12, E6.14

NOTE: You may submit **personally hand-written** solutions to **all** of the above problems **at the beginning** of the class period before the lab. This can earn you up to 2 bonus points on the quiz to be given during the next class meeting after the lab session, but only if you answer **all** of the problems!

The Exercise

Write a program for the Unlimited Loan Officer Systems Enterprises (ULOSE) company that:

1. Prompts for and reads a current loan balance, that might include dollar and cents values (ex. 1.99).
2. Prompts for and reads in the current monthly interest rate. Note that this value can have fractional parts to it.
3. Prompts for and reads in the monthly payment to be made on this loan.
4. For every month in repayment given the values just entered, prints out (on a single line):
 - the payment number,
 - the interest applied that month,
 - the balance after the monthly payment has been applied (which will be either negative or zero in the last month when the loan is repaid completely).

However, there are some catches:

- At the 24th month (and not before), the monthly interest rate doubles. A message indicating such has happened should be printed.
- At the 120th month, the monthly interest rate doubles again. A message indicating such has happened should be printed.
- If at any point in time, the program detects that the loan will never be repaid (since interest in a single month is more than the payment), the program should print a message indicating such and terminate.

Example Runs

The following represents a few sample runs, separated by horizontal lines with output in plain text and *user input in italics*.

```
Enter loan amount:1000
Enter monthly interest rate:0.01
Enter proposed monthly payment:200

Payment #1 Interest: 10.0 Balance:810.0
Payment #2 Interest: 8.1 Balance:618.1
Payment #3 Interest: 6.181 Balance:424.28100000000006
Payment #4 Interest: 4.24281 Balance:228.52381000000008
Payment #5 Interest: 2.285238100000001 Balance:30.809048100000098
Payment #6 Interest: 0.30809048100000097 Balance:-168.8828614189999
```

```
Enter loan amount:1000
Enter monthly interest rate:0.01
Enter proposed monthly payment:25
```

Payment #1	Interest: 10.0	Balance:985.0
Payment #2	Interest: 9.85	Balance:969.85
Payment #3	Interest: 9.698500000000001	Balance:954.5485
Payment #4	Interest: 9.545485	Balance:939.093985
Payment #5	Interest: 9.39093985	Balance:923.48492485
Payment #6	Interest: 9.2348492485	Balance:907.7197740985
Payment #7	Interest: 9.077197740985	Balance:891.796971839485
Payment #8	Interest: 8.91796971839485	Balance:875.7149415578798
Payment #9	Interest: 8.757149415578798	Balance:859.4720909734586
Payment #10	Interest: 8.594720909734587	Balance:843.0668118831933
Payment #11	Interest: 8.430668118831933	Balance:826.4974800020252
Payment #12	Interest: 8.264974800020251	Balance:809.7624548020455
Payment #13	Interest: 8.097624548020455	Balance:792.8600793500659
Payment #14	Interest: 7.928600793500659	Balance:775.7886801435666
Payment #15	Interest: 7.757886801435666	Balance:758.5465669450023
Payment #16	Interest: 7.585465669450023	Balance:741.1320326144523
Payment #17	Interest: 7.411320326144524	Balance:723.5433529405968
Payment #18	Interest: 7.235433529405968	Balance:705.7787864700028
Payment #19	Interest: 7.057787864700028	Balance:687.8365743347028
Payment #20	Interest: 6.878365743347029	Balance:669.7149400780498
Payment #21	Interest: 6.697149400780498	Balance:651.4120894788304
Payment #22	Interest: 6.514120894788304	Balance:632.9262103736187
Payment #23	Interest: 6.329262103736187	Balance:614.2554724773548
Payment #24	Interest: 6.142554724773548	Balance:595.3980272021283
**** Warning: Interest rate adjusted to: 0.02		
Payment #25	Interest: 11.907960544042567	Balance:582.3059877461709
Payment #26	Interest: 11.646119754923419	Balance:568.9521075010944
Payment #27	Interest: 11.379042150021887	Balance:555.3311496511162
Payment #28	Interest: 11.106622993022325	Balance:541.4377726441386
Payment #29	Interest: 10.828755452882772	Balance:527.2665280970214
Payment #30	Interest: 10.545330561940428	Balance:512.8118586589618
Payment #31	Interest: 10.256237173179237	Balance:498.068095832141
Payment #32	Interest: 9.96136191664282	Balance:483.02945774878384
Payment #33	Interest: 9.660589154975677	Balance:467.69004690375954
Payment #34	Interest: 9.35380093807519	Balance:452.04384784183475
Payment #35	Interest: 9.040876956836696	Balance:436.08472479867146
Payment #36	Interest: 8.721694495973429	Balance:419.8064192946449
Payment #37	Interest: 8.396128385892899	Balance:403.2025476805378
Payment #38	Interest: 8.064050953610757	Balance:386.2665986341486
Payment #39	Interest: 7.725331972682972	Balance:368.99193060683154
Payment #40	Interest: 7.379838612136631	Balance:351.37176921896815
Payment #41	Interest: 7.0274353843793635	Balance:333.3992046033475
Payment #42	Interest: 6.667984092066951	Balance:315.0671886954145
Payment #43	Interest: 6.30134377390829	Balance:296.36853246932276
Payment #44	Interest: 5.9273706493864555	Balance:277.2959031187092
Payment #45	Interest: 5.5459180623741835	Balance:257.8418211810834
Payment #46	Interest: 5.156836423621668	Balance:237.99865760470504
Payment #47	Interest: 4.759973152094101	Balance:217.75863075679914
Payment #48	Interest: 4.355172615135983	Balance:197.11380337193512
Payment #49	Interest: 3.9422760674387023	Balance:176.05607943937383
Payment #50	Interest: 3.5211215887874765	Balance:154.5772010281613
Payment #51	Interest: 3.0915440205632265	Balance:132.66874504872453

Payment #52	Interest: 2.6533749009744905	Balance:110.32211994969902
Payment #53	Interest: 2.2064423989939805	Balance:87.528562348693
Payment #54	Interest: 1.7505712469738601	Balance:64.27913359566686
Payment #55	Interest: 1.2855826719133372	Balance:40.564716267580195
Payment #56	Interest: 0.811294325351604	Balance:16.3760105929318
Payment #57	Interest: 0.327520211858636	Balance:-8.296469195209564

Enter loan amount:1000

Enter monthly interest rate:0.002

Enter proposed monthly payment:1

Payment #1 Interest: 2.0 Balance:1001.0

**** You will never pay this loan back!

Enter loan amount:1234567

Enter monthly interest rate:0.00375

Enter proposed monthly payment:5000

Payment #1	Interest: 4629.62625	Balance:1234196.62625
Payment #2	Interest: 4628.237348437499	Balance:1233824.8635984375
Payment #3	Interest: 4626.843238494141	Balance:1233451.7068369316
Payment #4	Interest: 4625.443900638494	Balance:1233077.1507375701
Payment #5	Interest: 4624.039315265888	Balance:1232701.190052836
Payment #6	Interest: 4622.629462698134	Balance:1232323.8195155342
Payment #7	Interest: 4621.214323183253	Balance:1231945.0338387175
Payment #8	Interest: 4619.793876895191	Balance:1231564.8277156127
Payment #9	Interest: 4618.368103933548	Balance:1231183.1958195462
Payment #10	Interest: 4616.936984323298	Balance:1230800.1328038694
Payment #11	Interest: 4615.50049801451	Balance:1230415.633301884
Payment #12	Interest: 4614.058624882065	Balance:1230029.691926766
Payment #13	Interest: 4612.611344725372	Balance:1229642.3032714913
Payment #14	Interest: 4611.158637268092	Balance:1229253.4619087593
Payment #15	Interest: 4609.700482157848	Balance:1228863.162390917
Payment #16	Interest: 4608.236858965939	Balance:1228471.399249883
Payment #17	Interest: 4606.767747187061	Balance:1228078.16699707
Payment #18	Interest: 4605.293126239012	Balance:1227683.460123309
Payment #19	Interest: 4603.812975462409	Balance:1227287.2730987712
Payment #20	Interest: 4602.327274120392	Balance:1226889.6003728916
Payment #21	Interest: 4600.836001398344	Balance:1226490.43637429
Payment #22	Interest: 4599.339136403587	Balance:1226089.7755106934
Payment #23	Interest: 4597.8366581651	Balance:1225687.6121688585
Payment #24	Interest: 4596.32854563322	Balance:1225283.9407144918

**** Warning: Interest rate adjusted to: 0.0075

Payment #25 Interest: 9189.629555358688 Balance:1229473.5702698505

**** You will never pay this loan back!

Enter loan amount:1234567

Enter monthly interest rate:0.0001

Enter proposed monthly payment:5000

Payment #1 Interest: 123.45670000000001 Balance:1229690.4567
Payment #2 Interest: 122.96904567 Balance:1224813.42574567

(.... to save space, 20 lines of output have been omitted here)

Payment #23 Interest: 112.71703241153183 Balance:1122283.0411477298
Payment #24 Interest: 112.228304114773 Balance:1117395.2694518445
**** Warning: Interest rate adjusted to: 2.0E-4
Payment #25 Interest: 223.4790538903689 Balance:1112618.7485057348
Payment #26 Interest: 222.52374970114698 Balance:1107841.272255436

(.... to save space, 92 lines of output have been omitted here)

Payment #119 Interest: 132.84018767974214 Balance:659333.7785863904
Payment #120 Interest: 131.8667557172781 Balance:654465.6453421077
**** Warning: Interest rate adjusted to: 4.0E-4
Payment #121 Interest: 261.7862581368431 Balance:649727.4316002446
Payment #122 Interest: 259.89097264009786 Balance:644987.3225728847

(.... to save space, 131 lines of output have been omitted here)

Payment #254 Interest: 2.9407979503341033 Balance:2354.9356737855924
Payment #255 Interest: 0.941974269514237 Balance:-2644.1223519448936

****PRE**-lab Work**

When you come into class for the lab exercise, you must have a corresponding program that:

1. compiles without any errors and ...
2. is a sincere attempt at a solution to the problem. Dr. Blythe's judgment on this will be final, no exceptions.

If you do not meet *both* of the above requirements, you will be given a 0 for this lab and will have to leave class immediately - *no exceptions!!!*

Preparation Notes

- You are *required* to work on this *before* the actual lab. If you do not, you will receive a zero for the lab and will be required to leave class for the day immediately.
- You will be given a minor change to this assignment to complete as part of the in-class exercise. This change will be so minor that if you have done the preparation yourself, it will likely take you less than ten minutes to complete; of course if you don't do your own work in preparing for the lab, the modification may be difficult to complete by the end of class (and completion by the end of class is a *requirement*).
- WARNING: For some people this lab will be a 15-30 minute exercise (if that). For others, it may be a 40+ hour exercise. *Do not wait until the night before this lab is due (when you no longer have 40+ hours) to start this lab and discover you fit in the latter group!!!!*