CS 221: **Problem Using Recursion** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Upon graduation, you are offered a job with an initial salary of $38,000. You have choice of 3 options. Write the recurrence relation and initial condition for Sn, the salary at the end of n years for each:

|  |  |
| --- | --- |
| Options for Yearly Raises: | Recurrence Relation, Sn |
| a) A guaranteed raise of $2200/year. | Sn = 38,000 n =0  Sn+1 =Sn0 +2200 |
| b) A guaranteed raise of 5%/year. | Sn = 38,000 n = 0  Sn+1 = Sn + 0.5Sn |
| c) A guaranteed raise of $1000/year plus a 3%/year cost of living adjustment. | Sn = 38,000 n = 0  Sn+1 =Sn +1000+0.3Sn |

1. **Complete the following recursive method** which will find the salary from years 2013 through 2023 for each salary option. Assume that the initial salary is $38,000 in 2013. Which option provides a larger salary in a specific year?

public static void recursiveComputeSalary(double s1, double s2, double s3, int y, int yearEnd){

if (y < yearEnd){

System.out.printf("%15d %12.2f %12.2f %12.2f\n", y, s1, s2, s3);

s1= \_\_\_\_\_\_\_\_\_;

s2 = \_\_\_\_\_\_\_\_\_\_;

s3 = \_\_\_\_\_\_\_\_\_\_\_\_\_;

recursiveComputeSalary ( s1,s2,s3,y+1, yearEnd);

}

}

1. Determine the appropriate call in the main method:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. We can do better. Write code that would label each column.
2. \*\* [Bonus} Write an **iterative method** that will calculate the salary for all 3 choices also. Determine the appropriate call in the main method.

**Hand in: Printout of Solution with your analysis. For what year(s) is each method best??**

/\*\*

\* Write a description of class Recursion here.

\*

\* @author (your name)

\* @version (a version number or a date)

\*/

public class Recursion

{

public static void main(String[] args){

int y = 2013;

int yearEnd = 2023;

double s1 = 38000;

double s2 = 38000;

double s3 = 38000;

System.out.printf("%15s %15s %15s %15s","Year","First Salary", "Second Salary", "Third Salary");

System.out.println("");

recursiveComputeSalary(s1,s2,s3,y,yearEnd);

}

public static void recursiveComputeSalary(double s1,double s2,double s3,int y, int yearEnd){

if(y < yearEnd){

System.out.printf("%15d %14.2f %14.2f %14.2f\n",y,s1,s2,s3);

s1 += 2200;

s2 = s2 +s2 \* 0.05;

s3 = s3 + 1000 + (s3\*0.03);

recursiveComputeSalary(s1,s2,s3,y+1,yearEnd);

}

}

}

Year First Salary Second Salary Third Salary

2013 38000.00 38000.00 38000.00

2014 40200.00 39900.00 40140.00

2015 42400.00 41895.00 42344.20

2016 44600.00 43989.75 44614.53

2017 46800.00 46189.24 46952.96

2018 49000.00 48498.70 49361.55

2019 51200.00 50923.63 51842.40

2020 53400.00 53469.82 54397.67

2021 55600.00 56143.31 57029.60

2022 57800.00 58950.47 59740.49

As the output suggests the best salary deal is the option 3.