COMP101 Lab8: Taxation report

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Requirements

The problem to solve were to write a program that will calculate and print the net salary, gross salary and the tax being charged after entering the start salary, and yearly percentage of growth from the keyboard. As extended requirements the program should allow to enter custom low tax percentage, high tax percentage and custom threshold from keyboard for two separate tax schemes and display the net salary, gross salary, the tax being charged, total net salary, total gross salary, total tax being charged for each of two schemes and the comparison of total net salary, total gross salary, total tax being charged from each of two schemes.

Analysis and design

I wrote this program in three classes. TaxationUser – the user class of Taxation class, TaxationUserExtended – it does extended requirements and Taxation where the main core of the program is.

In Taxation class which is common for both, normal and extended requirements I declared three constants to keep the low tax, high tax and threshold that are initialised in constructor method. I also declared an 2-dimensional array to keep all the data in. The first dimension of array means the number of the year considered and the second one means that if it is a gross salary, net salary or tax. Then I created a loop with a set of if-else statements that saves the computed results to the array. Finally I created three methods to allow to display gross salary, net salary and tax after inputting a year considered.

In TaxationUser class I created a method printBasics to print the gross salary, net salary and the tax. In main method I added some constants to keep notification strings there. Then starting salary, yearly percentage and number of years in inputted by the user from keyboard. Then the program instantiates the Taxation object. Finally I’m calling the printBasics method.

In TaxationUserExtended class I initialized some constants with the notification strings contained. Then I created three methods to calculate total gross salary, total net salary and total tax. Then I created printBasics method that works same as the one from TaxationUser class. I also added compareThings class where calculates and displays the difference between gross salary, net salary and the tax from each of two schemes. In main method the starting salary, yearly percentage, the number of years, low tax rate, high tax rate and boundary limit for each scheme. Then printBasics method is called and the totals are printed for each scheme. Finally compareThings is called.

Class diagram

**Taxation**

**TaxationUser**

- LOW\_TAX : double

- HIGH\_TAX : double

- THRESHOLD : int

- retArray : double[][]

- yearsNum : int

+ main(String[])

+ displayGrossSalary() : double

+ displayNetSalary() : double

+ displayTax() : double

+ calculateTotalGrossSalary() : double

+ calculateTotalNetSalary() : double

+ calculateTotalTax() : double

+ printBasics() : void

**TaxationUserExtended**

- compareThings() : void

+ main(String[]) : void

Pseudocode

METHOD printBasics

INPUT instance, yearsNum

OUTPUT

FOR FROM startCondition = 0 TO startCondition = yearsNum-1 DO:

PRINT the gross salary, net salary and the tax for year startCondition

INCREMENT startCondition by 1

METHOD main (Normal requirements)

INPUT args

OUTPUT

GET starting salary (>0) and yearly percentage (0-100) from the keyboard

INSTANTIATE the Taxation object

CALL Taxation.printBasics

METHOD compareThings

INPUT instance1, instance2, yearsNum

OUTPUT

CALCULATE the difference between gross salaries, net salaries and the taxes from each of two schemes by calling calculateTotalGrossSalary(), calculateTotalNetSalary() and calculateTotalTax() from each instance.

PRINT the results

METHOD main (Extended requirements)

INPUT args

OUTPUT

GET starting salary, yearly percentage, number of years and low tax rates, high tax rates and boundary limits for each of two schemes

INSTANTIATE two Taxation objects with different low tax rates, high tax rates and boundary limits

CALL Taxation.printBasics from each instance

CALL and PRINT the results of calculateTotalGrossSalary(), calculateTotalNetSalary(), calculateTotalTax() from each instance

CALL compareThings

METHOD Taxation (Constructor method)

INPUT theSalary, theYear, theYearsNum, theLowTaxTate, theHighTaxRate, theBoundaryLimit

DECLARE the LOW\_TAX, HIGH\_TAX and THRESHOLD, tax and 2-dimensional array retArray[][]

FOR FROM startExpression = 0 TO startExpression = theYearsNum-1

IF startExpression = 0 THEN:

ADD theSalary to retArray[startExpression][0]

ELSE

SET theSalary = theSalary+(theSalary\*theYear/100)

ADD theSalary to retArray[startExpression][0]

IF theSalary <= THRESHOLD THEN:

tax = theSalary\*LOW\_TAX/100

ADD tax to retArray[startExpression][2]

ELSE

tax = (THRESHOLD\*LOW\_TAX/100) + ((theSalary –THRESHOLD)\*HIGH\_TAX/100)

ADD tax to retArray[startExpression][2]

ADD theSalary-tax to retArray[startExpression][1]

METHOD displayGrossSalary

INPUT tYear

OUTPUT retArray[tYear][0]

METHOD displayNetSalary

INPUT tYear

OUTPUT retArray[tYear][1]

METHOD displayTax

INPUT tYear

OUTPUT retArray[tYear][2]

METHOD calculateTotalGrossSalary

INPUT

OUTPUT totalGrossSalary

SET totalGrossSalary as 0

FOR FROM startExpression = 0 TO startExpression = yearsNum-1 DO:

SET totalGrossSalary = totalGrossSalary + displayGrossSalary(startExpression)

METHOD calculateTotalNetSalary

INPUT

OUTPUT totalNetSalary

SET totalNetSalary as 0

FOR FROM startExpression = 0 TO startExpression = yearsNum-1 DO:

SET totalNetSalary = totalNetSalary + displayNetSalary(startExpression)

METHOD calculateTotalTax

INPUT

OUTPUT totalTax

SET totalTax as 0

FOR FROM startExpression = 0 TO startExpression = yearsNum-1 DO:

SET totalTax = totalTax + displayTax(startExpression)

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| Testing  I tested all needed input cases. Some of them are not listed because of obvious/similar behavior as listed below.   |  |  | | --- | --- | | INPUT VALUES | EXPECTED RESULT | | startingSalary = 25000  yearlyPercentage = 20 | YEAR 1  Gross salary = 25000.00  Net salary = 20000.00  Tax = 5000.00  YEAR 2  Gross salary = 30000.00  Net salary = 24000.00  Tax = 6000.00  YEAR 3  Gross salary = 36000.00  Net salary = 27000.00  Tax = 9000.00  YEAR 4  Gross salary = 43200.00  Net salary = 30600.00  Tax = 12600.00  YEAR 5  Gross salary = 51840.00  Net salary = 34920.00  Tax = 16920.00 | | startingSalary = 35000  yearlyPercentage = 20 | YEAR 1  Gross salary = 35000.00  Net salary = 26500.00  Tax = 8500.00  YEAR 2  Gross salary = 42000.00  Net salary = 30000.00  Tax = 12000.00  YEAR 3  Gross salary = 50400.00  Net salary = 34200.00  Tax = 16200.00  YEAR 4  Gross salary = 60480.00  Net salary = 39240.00  Tax = 21240.00  YEAR 5  Gross salary = 72576.00  Net salary = 45288.00  Tax = 27288.00 | | startingSalary = 0  yearlyPercentage = 20  OR  startingSalary = 35000  yearlyPercentage = 0  OR  startingSalary = 35000  yearlyPercentage = 20  OR  startingSalary = -25000  yearlyPercentage = -20 | Display error message and allow to re-enter values |  |  |  | | --- | --- | | INPUT VALUES | EXPECTED RESULT | | startingSalary = 15000  yearlyPercentage = 10  yearsNum = 3  lowTaxRate1 = 30  highTaxRate1 = 60  boundaryLimit1 = 40000  lowTaxRate2 = 10  highTaxRate2 = 40  boundaryLimit2 = 20000 | SCHEME 1  YEAR 1  Gross salary = 15000.00  Net salary = 10500.00  Tax = 4500.00  YEAR 2  Gross salary = 16500.00  Net salary = 11500.00  Tax = 4950.00  YEAR 3  Gross salary = 18150.00  Net salary = 12705.00  Tax = 5445.00  Total gross salary = 49650.00  Total net salary = 34755.00  Total tax = 14895.00  SCHEME 2  YEAR 1  Gross salary = 15000.00  Net salary = 13500.00  Tax = 1500.00  YEAR 2  Gross salary = 16500.00  Net salary = 14850.00  Tax = 1650.00  YEAR 3  Gross salary = 18150.00  Net salary = 16335.00  Tax = 1815.00  Total gross salary = 49650.00  Total net salary = 44685.00  Total tax = 4965.00  Total gross salary difference = 0.00  Total net salary difference = -9930.00  Total tax difference = 9930.00 | | startingSalary = 25000  yearlyPercentage = 20  yearsNum = 2  lowTaxRate1 = 25  highTaxRate1 = 50  boundaryLimit1 = 30000  lowTaxRate2 = 15  highTaxRate2 = 40  boundaryLimit2 = 20000 | SCHEME 1  YEAR 1  Gross salary = 25000.00  Net salary = 18750.00  Tax = 6250.00  YEAR 2  Gross salary = 30000.00  Net salary = 22500.00  Tax = 7500.00  Total gross salary = 55000.00  Total net salary = 41250.00  Total tax = 13750.00  SCHEME 2  YEAR 1  Gross salary = 25000.00  Net salary = 20000.00  Tax = 5000.00  YEAR 2  Gross salary = 30000.00  Net salary = 23000.00  Tax = 7000.00  Total gross salary = 55000.00  Total net salary = 43000.00  Total tax = 12000.00  Total gross salary difference = 0.00  Total net salary difference = -1750.00  Total tax difference = 1750.00 | | startingSalary = 0  yearlyPercentage = 20  yearsNum = 2  lowTaxRate1 = 25  highTaxRate1 = 50  boundaryLimit1 = 30000  lowTaxRate2 = 15  highTaxRate2 = 40  boundaryLimit2 = 20000  OR  startingSalary = 25000  yearlyPercentage = 20  yearsNum = 1  lowTaxRate1 = 25  highTaxRate1 = 50  boundaryLimit1 = 30000  lowTaxRate2 = 15  highTaxRate2 = 40  boundaryLimit2 = 20000  OR  startingSalary = 25000  yearlyPercentage = 20  yearsNum = 2  lowTaxRate1 = 25  highTaxRate1 = 50  boundaryLimit1 = 30000  lowTaxRate2 = 15  highTaxRate2 = 40  boundaryLimit2 = -3  OR  startingSalary = 25000  yearlyPercentage = 20  yearsNum = 2  lowTaxRate1 = 25  highTaxRate1 = 50  boundaryLimit1 = -30000  lowTaxRate2 = -3  highTaxRate2 = -35  boundaryLimit2 = 20000 | Display error message and allow to re-enter values |   The finally working program returned:   |  | | --- | | CONSOLE | | $java TaxationUser  ======= TAXATION =======  This program calculates the gross pay, net pay and tax dependent on the amount of money.  Give me the starting salary (>0): 25000  Give me the yearly percentage in % (0-100): 20  Year 1  The gross salary is 25000.00 pounds.  The net salary is 20000.00 pounds.  The tax is 5000.00 pounds to pay.  Year 2  The gross salary is 30000.00 pounds.  The net salary is 24000.00 pounds.  The tax is 6000.00 pounds to pay.  Year 3  The gross salary is 36000.00 pounds.  The net salary is 27000.00 pounds.  The tax is 9000.00 pounds to pay.  Year 4  The gross salary is 43200.00 pounds.  The net salary is 30600.00 pounds.  The tax is 12600.00 pounds to pay.  Year 5  The gross salary is 51840.00 pounds.  The net salary is 34920.00 pounds.  The tax is 16920.00 pounds to pay.  $java TaxationUser  ======= TAXATION =======  This program calculates the gross pay, net pay and tax dependent on the amount of money.  Give me the starting salary (>0): 35000  Give me the yearly percentage in % (0-100): 20  Year 1  The gross salary is 35000.00 pounds.  The net salary is 26500.00 pounds.  The tax is 8500.00 pounds to pay.  Year 2  The gross salary is 42000.00 pounds.  The net salary is 30000.00 pounds.  The tax is 12000.00 pounds to pay.  Year 3  The gross salary is 50400.00 pounds.  The net salary is 34200.00 pounds.  The tax is 16200.00 pounds to pay.  Year 4  The gross salary is 60480.00 pounds.  The net salary is 39240.00 pounds.  The tax is 21240.00 pounds to pay.  Year 5  The gross salary is 72576.00 pounds.  The net salary is 45288.00 pounds.  The tax is 27288.00 pounds to pay. | |

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| CONSOLE |
| ...  Give me the starting salary (>0): 0  You entered incorrect data  Give me the starting salary (>0):  ... |

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| CONSOLE |
| $java TaxationUserExtended  ======= TAXATION EXTENDED =======  This program calculates the gross pay, net pay, tax and sums each of them from scheme 1 and scheme 2 dependent on the amount of money.  Give me the starting salary (>0): 15000  Give me the yearly percentage in % (0-100): 10  Give me the number of years (>1): 3  Give me the first low tax rate in % (0-100): 30  Give me the first high tax rate in % (0-100): 60  Give me the first boundary limit (>0): 40000  Give me the second low tax rate in % (0-100): 10  Give me the second high tax rate in % (0-100): 40  Give me the second boundary limit (>0): 20000  --- Tax scheme 1 ---  Year 1  The gross salary is 15000.00 pounds.  The net salary is 10500.00 pounds.  The tax is 4500.00 pounds to pay.  Year 2  The gross salary is 16500.00 pounds.  The net salary is 11550.00 pounds.  The tax is 4950.00 pounds to pay.  Year 3  The gross salary is 18150.00 pounds.  The net salary is 12705.00 pounds.  The tax is 5445.00 pounds to pay.  The total gross salary is 49650.00 pounds.  The total net salary is 34755.00 pounds.  The total tax is 14895.00 pounds.  --- Tax scheme 2 ---  Year 1  The gross salary is 15000.00 pounds.  The net salary is 13500.00 pounds.  The tax is 1500.00 pounds to pay.  Year 2  The gross salary is 16500.00 pounds.  The net salary is 14850.00 pounds.  The tax is 1650.00 pounds to pay.  Year 3  The gross salary is 18150.00 pounds.  The net salary is 16335.00 pounds.  The tax is 1815.00 pounds to pay.  The total gross salary is 49650.00 pounds.  The total net salary is 44685.00 pounds.  The total tax is 4965.00 pounds.  Total gross salary difference between scheme 1 and 2 is 0.00.  Total net salary difference between scheme 1 and 2 is -9930.00.  Total tax difference between scheme 1 and 2 is 9930.00.  $java TaxationUserExtended  ======= TAXATION EXTENDED =======  This program calculates the gross pay, net pay, tax and sums each of them from scheme 1 and scheme 2 dependent on the amount of money.  Give me the starting salary (>0): 25000  Give me the yearly percentage in % (0-100): 20  Give me the number of years (>1): 2  Give me the first low tax rate in % (0-100): 25  Give me the first high tax rate in % (0-100): 50  Give me the first boundary limit (>0): 30000  Give me the second low tax rate in % (0-100): 15  Give me the second high tax rate in % (0-100): 40  Give me the second boundary limit (>0): 20000  --- Tax scheme 1 ---  Year 1  The gross salary is 25000.00 pounds.  The net salary is 18750.00 pounds.  The tax is 6250.00 pounds to pay.  Year 2  The gross salary is 30000.00 pounds.  The net salary is 22500.00 pounds.  The tax is 7500.00 pounds to pay.  The total gross salary is 55000.00 pounds.  The total net salary is 41250.00 pounds.  The total tax is 13750.00 pounds.  --- Tax scheme 2 ---  Year 1  The gross salary is 25000.00 pounds.  The net salary is 20000.00 pounds.  The tax is 5000.00 pounds to pay.  Year 2  The gross salary is 30000.00 pounds.  The net salary is 23000.00 pounds.  The tax is 7000.00 pounds to pay.  The total gross salary is 55000.00 pounds.  The total net salary is 43000.00 pounds.  The total tax is 12000.00 pounds.  Total gross salary difference between scheme 1 and 2 is 0.00.  Total net salary difference between scheme 1 and 2 is -1750.00.  Total tax difference between scheme 1 and 2 is 1750.00. |

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| CONSOLE |
| $java TaxationUserExtended  ======= TAXATION EXTENDED =======  This program calculates the gross pay, net pay, tax and sums each of them from scheme 1 and scheme 2 dependent on the amount of money.  Give me the starting salary (>0): 0  You entered incorrect data  Give me the starting salary (>0):  ... |

Encountered problems

- Problem with initializing array – it needs to be initialized in constructor class but it has to be seen from all the methods in the class. I found the solution by declaring private double[][] retArray and in constructor method initializing - retArray = new double[theYearsNum][3] .

- The constants in user class weren’t set as static