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

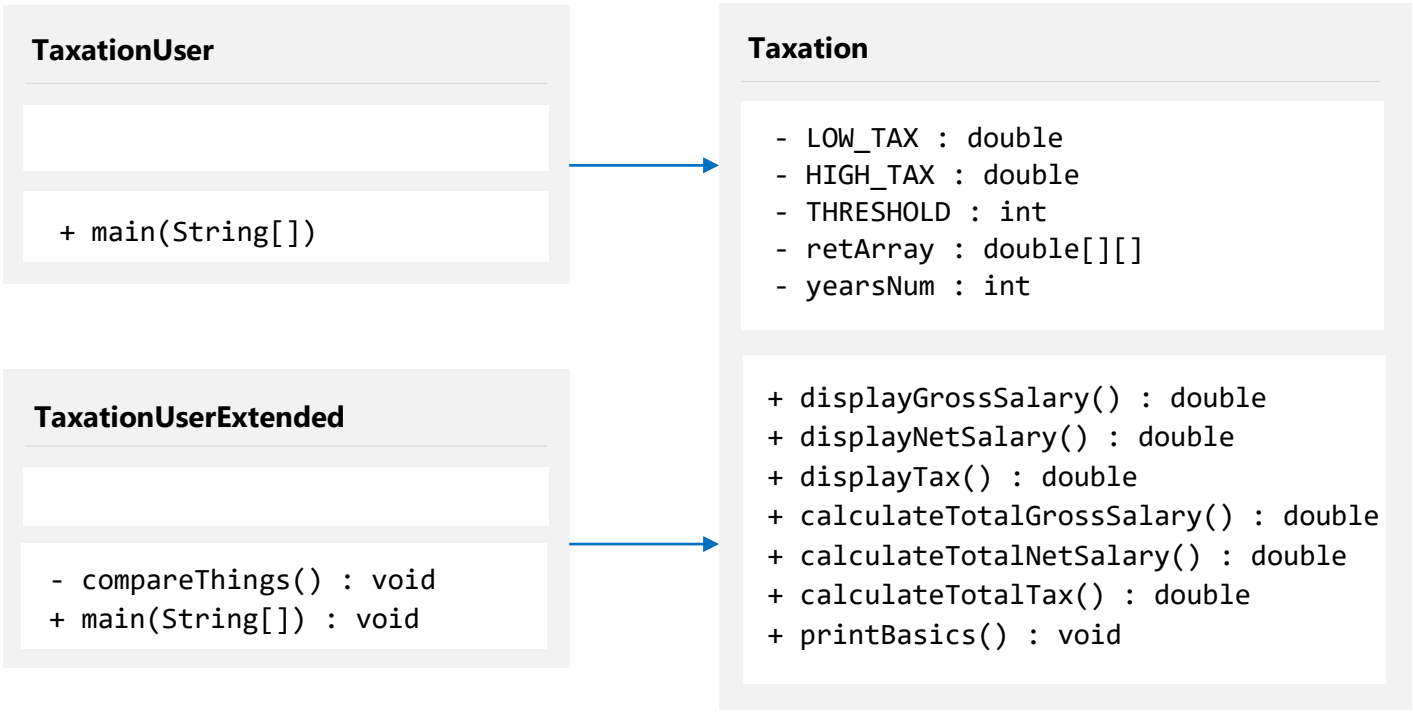
I wrote this program in three classes. `TaxationUser` – the user class of `Taxation` class, `TaxationUserExtended` – it does extended requirements and `Taxation` where the main core of the program is.

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



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)
```

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	Display error message and allow to re-enter values

```
boundaryLimit1 = -30000
lowTaxRate2 = -3
highTaxRate2 = -35
boundaryLimit2 = 20000
```

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.
```

CONSOLE

```
...
 Give me the starting salary (>0): 0


 You entered incorrect data

Give me the starting salary (>0):
...
```

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.
```

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