OU1 - Mandatory Exercise 1

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Logic and vectors

Temperature readings

A problem: processing measurement data

Temperature readings are taken in one and the same place for a couple of weeks. The readings are taken regularly — the same number of readings each week.

At the end of the measurement period the collected data is to be processed: for each week the least, the greatest and the average temperature is to be determined. The least, greatest and average temperature for the whole period is also to be computed.

A solution to the problem — incomplete

The program below reads the temperatures och displays them. Then the least, greatest and average temperature for each week is computed and stored. These results are printed on the standard output device. Finally, the least, greatest and average temperature over the whole measurement period is decided. These results are also printed on the standard output device.

```
import java.util.*;     // Scanner, Locale

class Temperatures
{
    public static void main (String[] args)
    {
        System.out.println ("TEMPERATURES\n");

        // input tools
        Scanner    in = new Scanner (System.in);
        in.useLocale (Locale.US);

        // enter the number of weeks and measurements
        System.out.print ("number of weeks: ");
        int    nofWeeks = in.nextInt ();
```

```
        System.out.print ("number of measurements per week: ");
        int    nofMeasurementsPerWeek = in.nextInt ();

        // storage space for temperature data
        double[][]    t = new double[nofWeeks + 1][nofMeasurementsPerWeek + 1];

        // read the temperatures
        for (int week = 1; week <= nofWeeks; week++)
        {
            System.out.println ("temperatures - week " + week + ":");
            for (int reading = 1; reading <= nofMeasurementsPerWeek; reading++)
                t[week][reading] = in.nextDouble ();
        }
        System.out.println ();

        // show the temperatures
        System.out.println ("the temperatures:");
        for (int week = 1; week <= nofWeeks; week++)
        {
            for (int reading = 1; reading <= nofMeasurementsPerWeek; reading++)
                System.out.print (t[week][reading] + " ");
            System.out.println ();
        }
        System.out.println ();

        // the least, greatest and average temperature - weekly
        double[]    minT = new double[nofWeeks + 1];
        double[]    maxT = new double[nofWeeks + 1];
        double[]    sumT = new double[nofWeeks + 1];
        double[]    avgT = new double[nofWeeks + 1];

        // compute and store the least, greatest and average
        // temperature for each week.
        // *** WRITE YOUR CODE HERE ***

        // show the least, greatest and average temperature for
        // each week
        // *** WRITE YOUR CODE HERE ***

        // the least, greatest and average temperature - whole period
        double    minTemp = minT[1];
        double    maxTemp = maxT[1];
        double    sumTemp = sumT[1];
        double    avgTemp = 0;

        // compute and store the least, greatest and average
        // temperature for the whole period
        // *** WRITE YOUR CODE HERE ***

        // show the least, greatest and average temperature for
        // the whole period
        // *** WRITE YOUR CODE HERE ***
    }
}
```

week	meas. 1	meas. 2	meas. 3	minT	maxT	sumT	avgT
1	12.0	15.0	9.0	9.0	15.0	36.0	12.0
2	10.0	13.0	15.0	10.0	15.0	38.0	12.67
3	14.0	17.0	19.0	14.0	19.0	50.0	16.67
4	16.0	18.0	17.0	16.0	18.0	51.0	17.0
				minT	maxT	sumT	avgT
				9.0	19.0	175.0	14.58

Table 1: Template for temperature table

Exercises on temperature readings

1. Create a table to hold possible temperatures, both measured and computed. The table should have the format shown in table 1.

2. Complete the Temperatures program: add code to determine and show the least, greatest and average temperatures. Run the program several times with different data och verify that the results are accurate.

3. Draw the vector that stores the measured temperatures. How do you access a certain datapoint in this vector? Also draw the vectors and variables where the computed results are stored.

When a vector is drawn its references, memory cells and stored data must all be present. It must be shown how the references are named. When a variable is drawn the data it contains and the name of the variable must be shown.

4. Which strategy is being used to determine the least temperature? Illustrate this strategy: draw a sequence of images to show how the least temperature is arrived at.