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Introduction to Computer Programming, Spring Term 2017
Practice Assignment 9

Discussion: 13.5.2017 - 18.5.2017

Exercise 9-1   Subset

Write a Java method `subset` that takes two arrays of integers as parameters and **returns true** if and only if the first array is a subset of the second array, otherwise the method should return `false`. Assume that the arrays do not consist of duplicates. For example:

```
subset({1,2,3}, {1,2,3,5,6}) returns true
subset({1,2,3}, {2,4,5,1,3}) returns true
subset({}, {1,2,3,5,6}) returns true
subset({1,2,3}, {2,4,5,1}) returns false
```

Write a `main` method to test your program. The `main` method should display either

```
Array 1 is a subset of  Array 2
```

or

```
Array 1 is not a subset of Array 2
```


Exercise 9-2   Matrix Addition
                      To be discussed in the Labs

Matrix addition involves taking two 2-D arrays of the same height and width (let us call them A and B) and then, for each position in the matrices, adding the value from `A` in that position to the value from `B` in that position and placing it is a third matrix, `C`, in that position. Thus, matrix addition takes this form (for two 3×3 matrices):

$$\begin{pmatrix} A_1 & A_2 & A_3 \\ A_4 & A_5 & A_6 \\ A_7 & A_8 & A_9 \end{pmatrix} + \begin{pmatrix} B_1 & B_2 & B_3 \\ B_4 & B_5 & B_6 \\ B_7 & B_8 & B_9 \end{pmatrix} = \begin{pmatrix} A_1 + B_1 & A_2 + B_2 & A_3 + B_3 \\ A_4 + B_4 & A_5 + B_5 & A_6 + B_6 \\ A_7 + B_7 & A_8 + B_8 & A_9 + B_9 \end{pmatrix}$$

Write a method that accepts 3 2-D arrays of `double` (that is, three matrices). This method should determine whether one of the matrices is the result of matrix addition of the other two.

Hint: Break your solution into several methods.

Exercise 9-3   2-D Arrays

Write a Java program that given a two-dimensional array, reorders the rows such that the row with the highest row sum is the first row.

If the program will be called with the following array:

```
1  3  5  9
2  100
2  2  3
```

then the output should be

```
2  100
1  3  5  9
2  2  3
```

The following steps should be performed:

a) Calculate row sum

b) Find index of row with maximum sum

c) Swap row of maximum sum with row 0

Exercise 9-4 Two-dimensional array evaluation - Final Spring 2012
To be discussed in Tutorial

Given a two-dimensional, possibly ragged, array of booleans, write a method that evaluates the array such that the value of every row is the conjunction (logical AND) of all values in the row, and the value of the complete array is the disjunction (logical OR) of all row values

Exercise 9-5 Pattern Sequence - Final Spring 2013
To be discussed in Tutorial

Write a java method `isPatternSequence`, which tells if its array argument is an example of the sequence

```
{{1},{2,2},{3,3,3},{4,4,4,4}....}
```

ending with an array with k copies of value k, for some k.

Example:

```
Call:isPatterSequence({{1}})
Output: true

Call:isPatterSequence({{1},{2,2}})
Output: true

Call:isPatterSequence({{1},{2,2},{3,3,3},{4,4,4,4}})
Output: true

Call:isPatterSequence({{1},{2,2},{3,3,3,3}})
Output: false

Call:isPatterSequence({{1},{2,2},{3,3,3},{4,4,3,4}})
Output: false
```

Exercise 9-6 Decimal to Binary

Write a Java program `DecToBin` to convert a decimal number to binary. Using a command-line argument,

input a positive decimal integer. Convert the decimal number to binary and output the result on the console. Name your class `DecToBin`. For example:

```
PROMPT>java DecToBin 2567
Binary: 101000000111
Thank you
```

Your solution should include basic input verification, as illustrated in the following examples.

Hint You may use `boolean isDigit(char ch)` that determines if the specified character `ch` is a digit.

```
PROMPT>java DecToBin 26 104
Usage: java DecToBin positive_decimal_number
```

```
PROMPT:>java DecToBin 25abc
Argument format error
```