16.4. Homework 1.1 (10 Points)

Objective: Compilation of a Java program, designing, implementing, and testing of an algorithm.

Grading:
Correctness: You can lose up to 40% if your solution is not correct
Quality: You can lose up to 80% if your solution is poorly designed
Testing: You can lose up to 50% if your solution is not well tested
Explanation: You can lose up to 100% if your solution if you can not explain your solution during the grading session

Homework Description:

All homework are submitted as a team of 2.

Definition: NumberEqualCube

A number *n* is a *NumberEqualCube* number if *n* has the following property:

•

$$n = n_1 n_2 \cdots n_k$$

•

$$n = \sum_{i=1}^{k} {n_i}^k$$

Explanation:

Assume n = 153, then n is a number which meets the property, because 153 = 1^3 + 5^3 + 3^3 = 1 + 125 + 27.

Assume n = 154, then n is a number which does not meet the property, because 154 ≠ **1**^3 + **5**^3 + **4**^3 = 190.

Your Work:

My program produces the following output for all integers between 1 and 100000.

```
% java NumberEqualCube
1   =   1^1
2   =   2^1
3   =   3^1
4   =   4^1
5   =   5^1
6   =   6^1
7   =   7^1
8   =   8^1
```

```
9   =   9^1
153 =   1^3 + 5^3 + 3^3
370 =   3^3 + 7^3 + 0^3
371 =   3^3 + 7^3 + 1^3
407 =   4^3 + 0^3 + 7^3
1634    =   1^4 + 6^4 + 3^4 + 4^4
8208    =   8^4 + 2^4 + 0^4 + 8^4
9474    =   9^4 + 4^4 + 7^4 + 4^4
54748   =   5^5 + 4^5 + 7^5 + 4^5 + 8^5
92727   =   9^5 + 2^5 + 7^5 + 2^5 + 7^5
93084   =   9^5 + 3^5 + 0^5 + 8^5 + 4^5
```

You have to design and implement your design. This migth be helpful:

```
char[] nAsCharcters = ("" + 153).toCharArray();
```

Your output does not have to be identical to mine, but similar.

Idea for a Solution:

• Design your algorithm on paper

• Run your algorithm on paper

• Only if you are sure it works, implement it

Requirements:

• You have to name your program NumberEqualCube.java

• You can only use control flow statements, basic arithmetic operations, casting, boolean expressions, print statements, basic types, and native arrays.

• Your program has to compute the numbers with the desired property.

• You can not use any Java class besides String.

Submission:

Submit your files via myCourses.

Solution:

(This solution serves as the basis for the discussion in class. Sometimes there will be errors introduced to show common mistakes)

Source Code: Src/21/NumberEqualCube.java_sol