Concepts of programming language (Fall 2018)

Assignment #1

Guidelines:

- Assignment total grade is 100 mark
- This assignment is a team of two from the same lab assignment
- Please submit your solutions via acadox
- You should submit a zip file (name this file with your id), put in these files "py" files (codes) for each problem

Problem #1 (10 marks) Median

Given: A positive integer and an array $A[1..n]$ of integers a positive number $k \leq n$
Return: The k-th smallest element of A

Sample Input
11
2 36 5 21 8 13 11 20 5 4 1
8

Sample Output
13

Problem #2 (20 marks) Find Factors of Number

Write a program that get factors of a number and display it.
Input
>> 20
Output

The factors of 20 are:
1
2
4
5
10
20

Problem #3 (20 marks) Find Armstrong Number in an Interval

A positive integer is called an Armstrong number of order n if
abcd... = an + bn + cn + dn + ...
For example,
153 = 1*1*1 + 5*5*5 + 3*3*3 // 153 is an Armstrong number.

Your program will take start and end interval as input then print all Armstrong number in this interval

Input
>> 100 2000

Output
153
370
371
407
1634

Problem #4 (20 marks) Convert Number

Convert number from base a to base b
Your program will take number in base a then convert it to base b

Input

Enter number
>> 234
Enter Number base
>> 6
Convert it to base
>> 8

Output
136

Problem#5 (30 marks) Addition Using BCD

Binary Coded Decimal (BCD) is a form of decimal representation represent the 10 decimal digits in terms of binary numbers each number in four bits.
Through Addition calculation for any invalid entry (any BCD digit greater than 1001) exists, 6 is added to generate a carry bit and cause the sum to become a valid entry. The reason for adding 6 is that there are 16 possible 4-bit BCD values (since $2^4 = 16$), but only 10 values are valid (0000 through 1001). So adding 6 to the invalid entries results in the following:

```
 1001 1000 1011 1111
   9    8   11   15
+ 0000 0000 0110 0110
   0    0    6    6
= 1001 1001 0010 0101
   9    9    2    5
```

ex.

To add 124 + 196 you need to follow these steps

a) Convert number to BCD representation
   (124) = (0001 0010 0100)
   (195) = (0001 1001 0110)
b) Adding BCD
   Carry   1   1
          0001 0010 0100

```
                                    +
            0001 1001 0111
    -----------------------------------
    Carry       1 1111 11
            0010 1011 1011
                                    +
            0000 0110 0110
    -----------------------------------
            0011 0010  0001
```

c) Convert result to decimal digit again
   (0011 0010 0001) = (321)

Input
Enter First Number
>> 124
Enter Second Number
>> 197

Output
321