CMPS 150
Fall 2021
Programming Assignment #5

Date Assigned: Friday, October 29, 2021
Due Date: 11:55 PM, Friday, November 5, 2021

Objectives:
- File input, repetition statements, selection, formatted output

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1) Include the following information as comments at the beginning of your source code. Name it **pa5.py**
   BE SURE it *__lines up__* nicely as you see it below.

```
# Author:           Type-Your-Name
# ULID:             Type-Your-ULID
# Course/Section:   CMPS 150 - Lecture Section # ___
# Assignment:       pa5
# Date Assigned:    Friday, October 29, 2021
# Date/Time Due:    Friday, November 5, 2021 -- 11:55 pm
#
# Description:      This program reads ISBN numbers from an input file and
#                   determines if the number is valid.  Results are displayed in a
#                   formatted table.
#
# Certification of Authenticity:
# I certify that this assignment is entirely my own work.
```

2) Description

When a book is published, it is assigned an ISBN (International Standard Book Number) number. Originally ISBN numbers were 10-digits long, but now 13-digit numbers are issued. This program reads ISBN numbers from an input file and determines if they are valid.

Processing: Valid ISBN numbers must have either 10 or 13 digits. The last digit is a "check digit", which is used to ensure that a number is entered correctly when typing it. It is calculated by a weighted sum of the digits.

- **10-digit ISBN:** To determine if a 10-digit ISBN number is valid, multiply each digit by its position and sum these values. If the sum modulus 11 is 0, then the number is valid. If the result of the modulus operation is NOT 0, then it is NOT a valid ISBN.

  Example: ISBN # 0321884914

Digit	0	3	2	1	8	8	4	9	1	4
Position	1	2	3	4	5	6	7	8	9	10

  Note: the positions values for these calculations start at 1, not 0 like we use in Python.

  The sum of these digits is $(position \times digit)$:

  $(1 \times 0) + (2 \times 3) + (3 \times 2) + (4 \times 1) + (5 \times 8) + (6 \times 8) + (7 \times 4) + (8 \times 9) + (9 \times 1) + (10 \times 4) = 253$

  Since 253 % 11 equals 0, it is a valid ISBN.

Because the mod 11 calculation can produce a result of 10, it is possible that the check digit (i.e., the last digit) would also require a value of 10. To represent a check digit of 10, the value of **X** is used as the last digit. This **only applies to 10-digit ISBN numbers**. The 13-digit numbers do not contain an X.

Example: `ISBN # 078976055X`

$(1 \times 0) + (2 \times 7) + (3 \times 8) + (4 \times 9) + (5 \times 7) + (6 \times 6) + (7 \times 0) + (8 \times 5) + (9 \times 5) + (10 \times \mathbf{10}) = 330$

Since 330 % 11 equals 0, it is a valid ISBN.

- **13-digit ISBN**

    To determine if a 13-digit ISBN number is valid, multiply each digit by either a 1 or 3 depending on its position, and sum these values. Odd positions multiply the digit by 1; even positions multiply the digit by 3. If the sum modulus 10 is 0, then the number is valid. If the result of the modulus operation is NOT 0, then it is NOT a valid ISBN.

    Example: `ISBN #  9781861972712`

Digit	9	7	8	1	8	6	1	9	7	2	7	1	2
Position	1	2	3	4	5	6	7	8	9	10	11	12	13

    For the odd positions multiply the digit by 1; for the even positions, multiply the digit by 3.

    The sum of these digits is:

$$(\mathbf{1} \times 9) + (\mathbf{3} \times 7) + (\mathbf{1} \times 8) + (\mathbf{3} \times 1) + (\mathbf{1} \times 8) + (\mathbf{3} \times 6) + (\mathbf{1} \times 1) + (\mathbf{3} \times 9) + (\mathbf{1} \times 7) + (\mathbf{3} \times 2)$$
$$+ (\mathbf{1} \times 7) + (\mathbf{3} \times 1) + (\mathbf{1} \times 2) = 120$$

    Since 120 % 10 is 0, it is a valid ISBN.

Input: The name of the input file is **ISBNdata.py**. It contains an **unknown** number of ISBN records. You will continue to read from the file and process until you read a value of -**1** (sentinel value). The file may contain invalid ISBN numbers, but these numbers will not exceed 14 digits.

Formatted Output: This program will produce a neatly formatted table of data where data is aligned in columns. The output must include the ISBN number (not to exceed 14 digits), how many digits are in the ISBN number (not to exceed 2 digits), the value of the check digit, the weighted sum of the digits (not to exceed 3 digits), and whether or not the ISBN number is valid. If the number of digits is NOT 10 or 13, the program will display "N/A" for the check digit and sum (see sample run).

3) Sample Run

```
ISBN            #Digits   Check#    Sum    Validity
---------------------------------------------------
0321884914         10        4      253    Valid
0132747189         10        9      297    Valid
9780590353403      13        3      100    Valid
9781627792134      13        4      110    Valid
0385732554         10        4      242    Valid
2323232323232      13        2       68    Not valid
078976055X         10        X      330    Valid
125004443X         10        X      231    Valid
125004444X         10        X      240    Not Valid
100                 3       N/A      N/A    Not valid
```

4) *Upload to Moodle*

- Get in a browser and login to Moodle.
- Go to your Lecture Section on the Moodle site.
- Click on the submission link for Programming Assignment #5.
- Select to "Add a Submission" then "Upload a File"
- Select to "Choose a File" and go about the process of browsing/finding "**pa5.py**" on the computer.
- Select to "Upload this File"
- **When returned to the Upload screen, MAKE SURE to click on the "Save Changes" button.**
- You will be returned to the "Programming Assignment #5" screen.
- This time you should see your source code file listed on it.

5) *Logout of Moodle*

You can turn in programs

up to 24 hours late for a maximum of 75% credit

or up to 48 hours late for a maximum of 50% credit