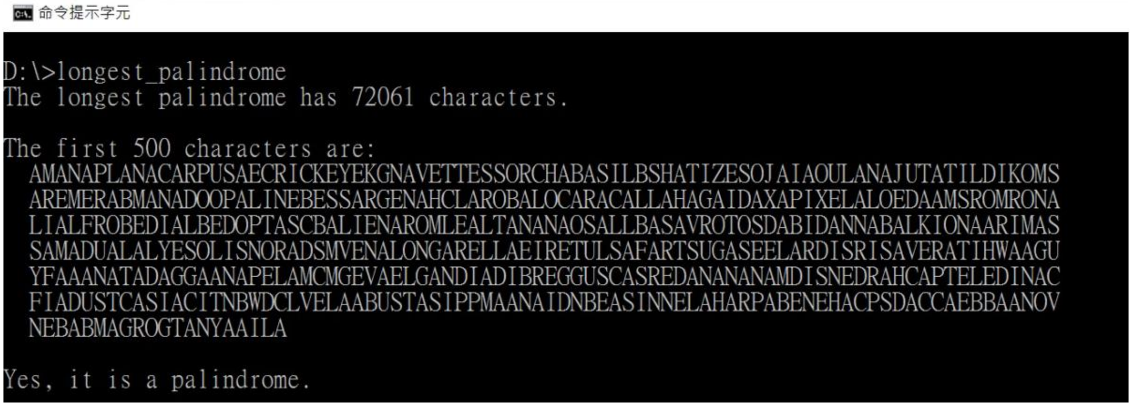
# Programming Practice: Palindromes

1. A palindrome is a word, phrase, number, or other sequence of symbols or elements, whose meaning may be interpreted the same way in either forward or reverse direction. Examples of palindrome are abcdedcba, vollov, and 945626549. Many interesting palindromes can be found in the web page http://www.palindromelist.net/ (after removing spaces and punctuation). Write a C program to repeatedly read a string and to check whether it is a palindrome or not. The program stops when the input string is "000". Program solutions: palindrome_iterative.c and palindrome_recursive.c.

2. The text in file longest_palindrome_in.txt is said to be the world longest palindrome.Write a C program to perform the following steps and verify the text is indeed a palindrome:
   a. Input data from file longest_palindrome_in.txt and store it in a data buffer using dynamic memory.
   b. Remove space and non-alphabetical characters and convert all English letters to uppercase letters.
   c. Print the length of the modified text, and print the first 500 characters, 80 characters in a line, of the modified text on the monitor.
   d. Check if the text is a palindrome or not and print the results.
   e. Output the modified text to a file named longest_palindrome_out.txt (sample execution output file) and release the data buffer from dynamic memory.

   Program solution longest_palindrome.c. Program execution example:



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D:\>longest_palindrome
The longest palindrome has 72061 characters.

The first 500 characters are:
  AMANAPLANACARPUSAECRICKEYEKGNAVETTESSORCHABASILBSHATIZESOJAIAOULANAJUTATILDIKOMS
  AREMERABMANADOOPALINEBESSARGENAHCLAROBALOCARACALLAHAGAIDAXAPIXELALOEDAAMSROMRONA
  LIALFROBEDIALBEDOPTASCBALIENAROMLEALTANANAOSALLBASAVROTOSDABIDANNABALKIONAARIMAS
  SAMADUALALYESOLISNORADSMVENALONGARELLAEIRETULSAFARTSUGASEELARDISRISAVERATIHWAAGU
  YFAAANATADAGGAANAPELAMCMGEVAELGANDIADIBREGGUSCASREDANANANAMDISNEDRAHCAPTELEDINAC
  FIADUSTCASIACITNBWDCLVELAABUSTASIPPMAANAIDNBEASINNELAHARPABENEHACPSDACCAEBBAANOV
  NEBABMAGROGTANYAAILA

Yes, it is a palindrome.
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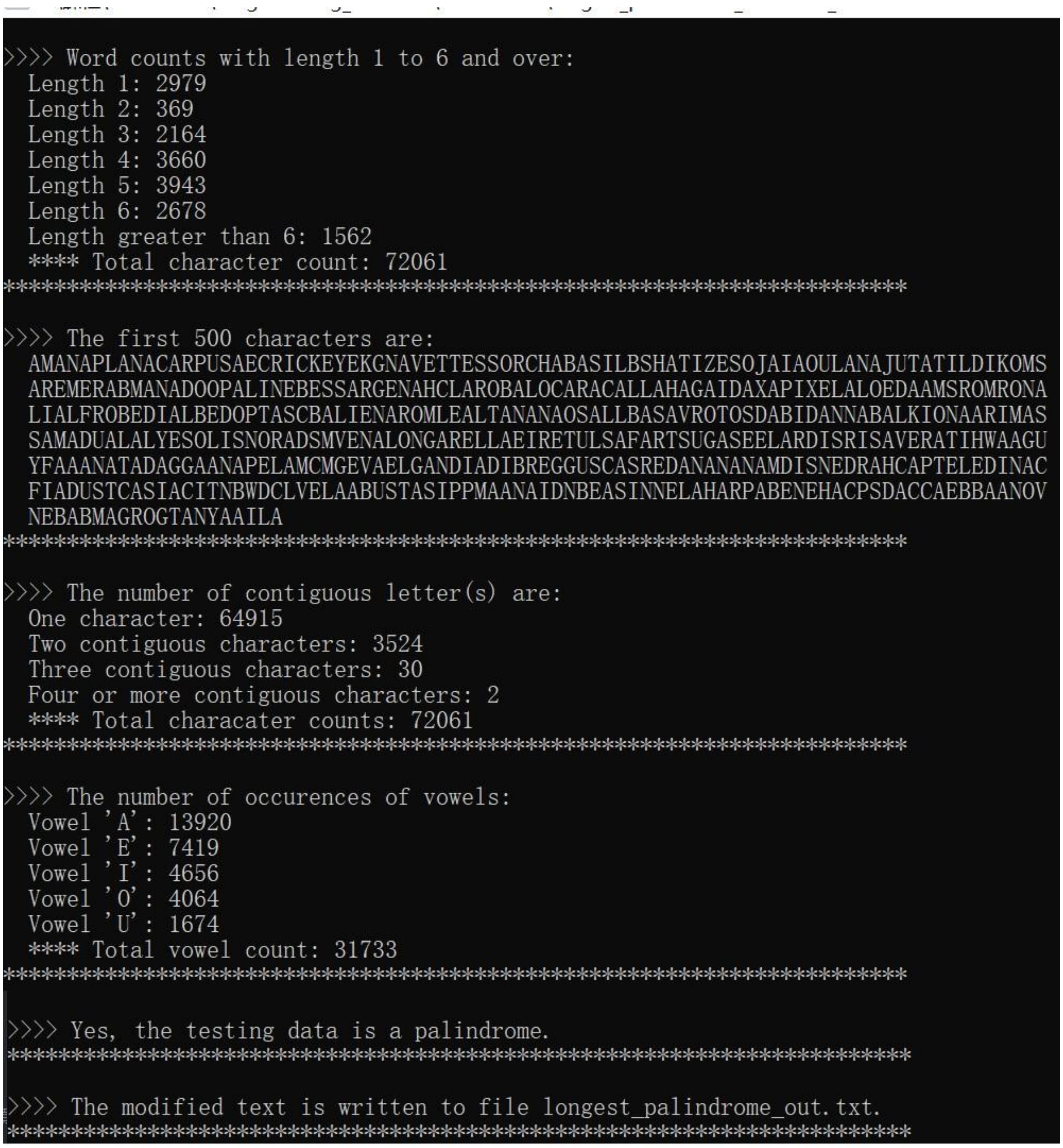
3. Repeat Question 2 using a character stack. Write a C program to perform the following steps and verify the text is indeed a palindrome:
   a. Input data from file longest_palindrome_in.txt and store it in a data buffer using dynamic memory.
   b. Remove space and non-alphabetical characters and convert all English letters to uppercase letters.
   c. Print the length of the modified text, and print the first 500 characters, 80 characters in a line, of the modified text on the monitor.
   d. Construct two stacks, say S and T, where S contains all characters of the modified text and T is the reverse of S.
   e. Check if the text is a palindrome or not using stacks S and T. Print the results.
   f. Output the modified text to a file named longest_palindrome_out.txt (sample execution output file) and release the data buffer from dynamic memory.

   No program solution is provided.

4. Write a C program to perform the following steps and verify the text is indeed a palindrome:
    a. Input data from file longest_palindrome_in.txt and store it in a string buffer using dynamic memory.
    b. Convert all English lowercase letters to uppercase letters.
    c. Count and report the number of words with length 1 to 6 and over 6 and print the length of the modified text. Note that a word is a sequence of English letters separated by a non-English character such as space, punctuation symbol, and newline.
    d. Remove space and non-English characters.
    e. Print the first 500 characters of the modified text on the monitor, 80 characters in a line.
    f. Count and report the number of one character letter, two contiguous character letters, three contiguous character letters, and four or more contiguous character letters.
    g. Count and report the number of each occurrence of vowels, 'A', 'E', 'I', 'O', and 'U'. Print the total vowel count.
    h. Check if the text is a palindrome or not and print the results.
    i. Write the modified text to a file named longest_palindrome_out.txt (sample output file). Also, release the string buffer.

    In this problem, you will practice the usage of string functions in library <string.h> and you are required **NOT** to use library <ctype.h>. Program solution: longest_palindrome_character_count.c. Program execution example:



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>>>> Word counts with length 1 to 6 and over:
  Length 1: 2979
  Length 2: 369
  Length 3: 2164
  Length 4: 3660
  Length 5: 3943
  Length 6: 2678
  Length greater than 6: 1562
  **** Total character count: 72061
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>>>> The first 500 characters are:
  AMANAPLANACARPUSAECRICKEYEKGNAVETTESSORCHABASILBSHATIZESOJAIAOULANAJUTATILDIKOMS
  AREMERABMANADOOPALINEBESSARGENAHCLAROBALOCARACALLAHAGAIDAXAPIXELALOEDAAMSROMRONA
  LIALFROBEDIALBEDOPTASCBALIENAROMLEALTANANAOSALLBASAVROTOSDABIDANNABALKIONAARIMAS
  SAMADUALALYESOLISNORADSMVENALONGARELLAEIRETULSAFARTSUGASEELARDISRISAVERATIHWAAGU
  YFAAANATADAGGAANAPELAMCMGEVAELGANDIADIBREGGUSCASREDANANANAMDISNEDRAHCAPTELEDINAC
  FIADUSTCASIACITNBWDCLVELAABUSTASIPPMAANAIDNBEASINNELAHARPABENEHACPSDACCAEBBAANOV
  NEBABMAGROGTANYAAILA
***********************************************************************

>>>> The number of contiguous letter(s) are:
  One character: 64915
  Two contiguous characters: 3524
  Three contiguous characters: 30
  Four or more contiguous characters: 2
  **** Total characater counts: 72061
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>>>> The number of occurences of vowels:
  Vowel 'A': 13920
  Vowel 'E': 7419
  Vowel 'I': 4656
  Vowel 'O': 4064
  Vowel 'U': 1674
  **** Total vowel count: 31733
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>>>> Yes, the testing data is a palindrome.
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>>>> The modified text is written to file longest_palindrome_out.txt.
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