Part 05 # Strings

---------- COUNTING ----------

1. Write a program that allows users to enter a sentence. The program will count and display the number of uppercase letters , the number of lowercase letters, and the number of digits.

Example 1:
```
Please enter a sentence: The PRF192 subject is very importance
The number of uppercase alphabets is 4
The number of lowercase alphabets is 25
The number of digits              is 3
```

Example 2:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
The number of uppercase alphabets is 5
The number of lowercase alphabets is 13
The number of digits              is 4
```

2. Write a program that allows users to enter a sentence. The program will count and display the number of vowel letters *(includes a, e, i, o, u, y)*, and the number of consonant letters.

Example 1:
```
Please enter a sentence: The PRF192 subject is very importance
The number of vowel     alphabets is 10
The number of consonant alphabets is 19
```

Example 2:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
The number of vowel     alphabets is 7
The number of consonant alphabets is 11
```

3. Write a program that allows users to enter a sentence and a letter **A**. The program will count and display the number of occurrences of letter A in the entered sentence.

Example 1:
```
Please enter a sentence: ThE PRF192 subject is vEry importance
Letter to find: $
Character '$' is not a letter. Accept letter only!
```

Example 2:
```
Please enter a sentence: ThE PRF192 subject is very Easy
Letter to find: e
The letter 'e' appears 4 times in the entered sentence
```

Example 3:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
Letter to find: x
The character 'x' was not found in the entered sentence
```

4. Write a program that allows users to enter a sentence and a letter **A**. The program will count the number of occurrences of letter A in the sentence and ***show where the letter A is found***.

Example 1:
```
Please enter a sentence: ThE PRF192 subject is vEry importance
Letter to find: $
Character '$' is not a letter. Accept letter only!
```

Example 2:
```
Please enter a sentence: ThE PRF192 subject is very Easy
Letter to find: e
The letter 'e' appears 4 times in the sentence in the indexes:
[2], [15], [23], [27]
```

Example 3:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
Letter to find: x
The character 'x' was not found in the entered sentence
```

5. Write a program that allows users to enter a sentence. The program will count the number of words of the sentence.

Example 1:
```
Please enter a sentence:    ThE     PRF192    subject is     vEry importance
There are 6 words in the sentence
```

Example 2:
```
Please enter a sentence: The     Result Of    2    Power 5    Is    32!
There are 5 words in the sentence
```

---------- CONVERTING ----------

6. Write a program that allows the user to enter a sentence. The program normalizes the sentence according to the following rules:
   - Converts all letters to lowercase letters.

Example 1:
```
Please enter a sentence: The PRF192 subject is very easy
The normalized sentence is "the prf192 subject is very easy"
```
Example 2:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
The normalized sentence is "the result of 2 power 5 is 32!"
```

7. Write a program that allows the user to enter a sentence. The program normalizes the sentence according to the following rules:
   - Converts all letters to uppercase letters.

Example 1:
```
Please enter a sentence: The PRF192 subject is very easy
The normalized sentence is "THE PRF192 SUBJECT IS VERY EASY"
```
Example 2:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
The normalized sentence is "THE RESULT OF 2 POWER 5 IS 32!"
```

8. Write a program that allows the user to enter a sentence. The program normalizes the sentence according to the following rules:
   - Converts all uppercase letters to lowercase letters.
   - Converts all lowercase letters to uppercase letters.

Example 1:
```
Please enter a sentence: The PRF192 subject is very easy
The normalized sentence is "tHE prf192 SUBJECT IS VERY EASY"
```
Example 2:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
The normalized sentence is "tHE rESULT oF 2 pOWER 5 iS 32!"
```
9. Write a program that allows the user to enter a sentence. The program normalizes the sentence into capitalize sentence according to the following rules:
   - Converts the first letter of all words to uppercase letter.
   - Converts all other letters to lowercase letters.

Example 1:
```
Please enter a sentence: The PRF192 subject is very easy
The normalized sentence is "The Prf192 Subject Is Very Easy"
```
Example 2:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
The normalized sentence is "The Result Of 2 Power 5 Is 32!"
```

---------- REMOVING & REPLACING ----------

10. Write a program that allows the user to enter a sentence. The program normalizes the sentence according to the following rules:
    - Removes all spaces on the left side of sentence.
    - Removes all spaces on the right side of sentence.
    - Removes all extra spaces inside sentences (keeps only 01 space between words).

Example 1:
```
Please enter a sentence:     C   language  is   easy
The normalized sentence: C language is easy
```
Example 2:
```
Please enter a sentence: But   the     algorithm   is   not
The normalized sentence: But the algorithm is not
```

11. Write a program that allows the user to enter a sentence. The program normalizes the sentence according to the following rules:
    - Removes all digits of the sentence.

Example 1:
```
Please enter a sentence: The PRF192 subject is very easy
The normalized sentence is "The PRF subject is very easy"
```
Example 2:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
The normalized sentence is "The Result Of  Power  Is !"
```

12. Write a program that allows the user to enter a sentence and a letter **A**. The program normalizes the sentence according to the following rules:
    - Removes all letter A of the sentence.

Example 1:
```
Please enter a sentence: The PRF192 subject is very easy
Letter to remove: e
The normalized sentence is "Th PRF192 subjct is vry asy"
```
Example 2:
```
Please enter a sentence: The Result Of 0011 plus 0111 is 1010
Letter to remove: 1
The normalized sentence is "The Result Of 00 plus 0 is 00
```
Example 3:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
Letter to remove: *
The character '*' was not found in the entered sentence
```

13. Write a program that allows the user to enter a sentence and letter **old**, and letter **new**. The program normalizes the sentence according to the following rules:
    - Replaces all letter old by letter new.

Example 1:
```
Please enter a sentence: The PRF192 subject is very easy
Letter to find: e
Letter to replace: 0
The normalized sentence: Th0 PRF192 subj0ct is v0ry 0asy
```
Example 2:
```
Please enter a sentence: The Result Of 0011 plus 0111 is 1010
Letter to find: 0
Letter to replace: 9
The normalized sentence: The Result Of 9911 plus 9111 is 1919
```
Example 3:
```
Please enter a sentence: The Result Of 2 Power 5 Is 32!
Letter to find: 8
The character '8' was not found in the entered sentence
```

14. Write a program that allows the user to enter a sentence. The program normalizes the sentence according to the following rules:
    - Reverses all characters of the sentence.

Example:
```
Please enter a sentence: The FPT University campus Can Tho
The normalized sentence: ohT naC supmaC ytisrevinU TPF ehT
```

15. Write a program that allows the user to enter a sentence. The program normalizes the sentence according to the following rules:
    - Reverses all words of the sentence.

Example:
```
Please enter a sentence: We love U <3
The normalized sentence: <3 U love We
```

16. Write a program that allows the user to enter a text. The program will check if the entered text is a palindrome text or not.

Example 1:
```
Please enter any text: ab1221ab
The text "ab1221ba" is a palindrome text
```
Example 2:
```
Please enter any text: 12ada21000
The text "12ada21000" is not a palindrome text
```

---------- ADVANCED ----------

17. Full name extracting

Write a program that allows the user to enter their full name. The program will extract first name and middle name, and last name base on the full name.

Example 1:
```
Please enter your full name: Ronaldo Luis Nazario de Lima
The first  name is Ronaldo
The middle name is Luis Nazario de
The last   name is Lima
```

Example 2:
```
Please enter your full name: Tom Hanks
The first  name is Tom
The last   name is Hanks
```

18. The giddy boy

Leonardo often goes out but does not ask his family's permission.

One day LeO went all day and got lost. Because he was lost many times, he tried to remember the way he has passed.

He messaged his family a line containing the characters N (north), S (south), W (west), E (east).

LeO's house is located at coordinates (0,0). Please help the poor parent determine location of the giddy boy.

Example 1:
```
Please enter the message: NNNEESSSSSEE
The location of LeO is (4, -2)
```

Example 2:
```
Please enter the message: EESSEESSWWNNNNWWNNS
The location of LeO is (0, 1)
```

19. The King and the girl

In a certain Arab kingdom there was a king who was very kind and wise. One day a pretty girl came to the palace and claimed to be the king's daughter. The courtiers wanted to kill her to avoid damaging the king's reputation. But since he was a good king, he wanted to know if she really was his daughter and then made his decision.

A doctor was invited into the palace to conduct a DNA test of the king and that girl. DNA is a sequence of nucleotides A, T, C, G. Two people are considered to be related if the DNA sequence of the first person appears at least 03 times in the DNA sequence of the second person.

Write a program that checks how many times the girl's DNA sequence appears in the king's DNA sequence. The results will help to conclude whether the girl is the king's daughter or not. For example, after analyzing a hair sample, the girl's DNA is ATAT and the king's DNA is GCATATCACGTATATATGCATATATCC. The analysis result is 05 times, so the girl is exactly the king's biological daughter.

Example 1:
```
Please enter the king's DNA: GCATATCACGTATATATGCATATATCC
Please enter the girl's DNA: ATAT
Analysis results: 5 times
The girl is the king's biological daughter
```

Example 2:
```
Please enter the king's DNA: ATXCDF
Only accept A, T, C, G for king's DNA!
```

Example 3:
```
Please enter the king's DNA: ACTCACTCACTCACTCACTC
Please enter the girl's DNA: CFTDFG
Only accept A, T, C, G for girl's DNA!
```

Example 4:
```
Please enter the king's DNA: ACGTGCACGTGCACGTGCA
Please enter the girl's DNA: GCACG
Analysis results: 2 times
She lied and was sentenced to prison
```

20. Backspace *(https://open.kattis.com/problems/backspace)*

Shortly before the programming contest started, Bjarki decided to update his computer. He didn't notice anything strange until he started coding in his favorite editor, Bim (Bjarki IMproved). Usually when he's writing in an editor and presses the backspace key a single character is erased to the left. But after the update pressing that key outputs the character <. He's tested all the editors on his machine, Bmacs, Neobim, bjedit, NoteBjad++ and Subjark Text, but they all seem to have the same problem. He doesn't have time to search the web for a solution, and instead decides to temporarily circumvent the issue with a simple program.

Help Bjarki write a program that takes as input the string that was written in the text editor, and outputs the string as Bjarki intended to write it. You can assume that Bjarki never intended to write the character <, and that Bjarki never pressed the backspace key in an empty line.

Input: the message $(1 \leq |s| \leq 10^6)$, and it will only contain lowercase letters from the English alphabet as well as the character <.

Output: One line containing the string as Bjarki intended to write it.

Example 1:
```
Please enter the message: a<bc<
The final message is "b"
```

Example 2:
```
Please enter the message: foss<<rritun
The final message is "forritun"
```

Example 3:
```
Please enter the message: a<a<a<aa<<
The final message is ""
```

21. Apaxiaaaaaaaaaaaans! *(https://open.kattis.com/problems/apaxiaaans)*

The ancient and mysterious Apaxian civilization, which we most certainly did not make up, continues to confound the researchers at the Oriental Institute. It turns out that the Apaxians had a peculiar naming system: the more letters in your name, the higher your status in society. So, in Apaxian society, robert was probably a lowly servant, and robertapalaxiamethostenes was likely a High Priest or Minister. Even more than that, Apaxians valued the number of adjacent letters that were the same in a name. So, while robert continues to be an unimpressive name, roooooooooobert probably elicited cheers and applause wherever he went.

Unfortunately, this makes the task of reading Apaxian scrolls very cumbersome, especially when you consider that a particularly famous Apaxian queen had ten thousand consecutive a's in her name. Legend has it that she was already two years old by the time the Royal Herald finished announcing her birth.

To make the Oriental Institute's life easier, the Department of Computer Science has offered to convert the Apaxian scrolls into a more readable format. Specifically, we will be taking Apaxian names and replacing all consecutive runs of the same letter by a single instance of such letter.

So, for example, the compact version of roooobert would be robert, where the four consecutive o's have been replaced with a single o. Similarly, the compact version of rrrooobbbert would also be robert. On the other hand, the compact version of robert is still robert.

Input: a single name $(1 \leq |s| \leq 250)$ which contains only lowercase letters (a–z), no whitespace.

Output: the compact version of the name: any time the same letter appears two or more times in sequence, it must be replaced by a single instance of that letter.

Example 1:
```
Please enter the name: robert
The compact version of the name: robert
```

Example 2:
```
Please enter the name: rooobert
The compact version of the name: robert
```

Example 3:
```
Please enter the name: roooooobertapalaxxxxios
The compact version of the name: robertapalaxios
```

22. Quick Brown Fox *(https://open.kattis.com/problems/quickbrownfox)*

A pangram is a phrase that includes at least one occurrence of each of the 26 letters, 'a'…'z'. You're probably familiar with this one: "The quick brown fox jumps over the lazy dog."

Your job is to recognize pangrams. For phrases that don't contain every letter, report what letters are missing. We'll say that a particular letter occurs in the phrase if it occurs as either upper case or lower case.

Input: a single phrase *(1≤ |s| ≤ 100)*, possibly containing upper and lower case letters, spaces, decimal digits and punctuation characters '.', ',', '?', '!', ''' and '"'.

Output: output "pangram" if it qualifies as a pangram. Otherwise, output the word "missing" followed by a space and then the list of letters that didn't occur in the phrase. The list of missing letters should be reported in lower case and should be sorted alphabetically.

Example 1:
```
Please enter the phrase: The quick brown fox jumps over the lazy dog
The test result: pangram
```

Example 2:
```
Please enter the phrase: ZYXW, vu TSR Ponm lkj ihgfd CBA.
The test result: missing eq
```

Example 3:
```
Please enter the phrase: .,?!'" 92384 abcde FGHIJ
The test result: missing klmnopqrstuvwxyz
```

23. Caesar cipher

In the heyday of the Roman empire, Caesar was a very good military king. He was the creator of cipher which making the army invincible.

With the alphabet referred to numbers according to the following rules:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

With x is the original character and integer K is the encryption key, the encryption is done simply based on the formula $f(x) = (x + K) \% 26$

To make encryption quickly, you must write a program that allows the user to enter the original message and an encryption key K. The program will encrypt and display the encrypted message.

Example 1:
```
Please enter the original message: the prf192 subject is very easy
Please enter the encryption key  : 1
The encrypted message: uif qsg192 tvckfdu jt wfsz fbtzl
```

Example 2:
```
Please enter the original message: 1 2 3  a pokemon is flying!
Please enter the encryption key  : -2
The encrypted message: 1 2 3  y nmickml gq djwgle!
```

Example 3:
```
Please enter the original message: uif qsg192 tvckfdu jt wfsz fbtzl
Please enter the encryption key  : -1
The encrypted message: the prf192 subject is very easy
```