1. Two Sum

Given an array of integers nums and an integer target, return indices of the two numbers such that they add up to target.

You may assume that each input would have exactly one solution, and you may not use the same element twice.

You can return the answer in any order.

Example 1:

Input: nums = [2,7,11,15], target = 9

Output: [0,1]

Explanation: Because nums[0] + nums[1] == 9, we return [0, 1].

Example 2:

Input: nums = [3,2,4], target = 6

Output: [1,2]

Example 3:

Input: nums = [3,3], target = 6

Output: [0,1]

Constraints:

● 2 <= nums.length <= 104

● -109 <= nums[i] <= 109

● -109 <= target <= 109

● Only one valid answer exists.

```python
def two_sum(nums, target):
    num_map = {}
    for i, num in enumerate(nums):
        complement = target - num
        if complement in num_map:
            return [num_map[complement], i]
        num_map[num] = i
    return []
nums1 = [2, 7, 11, 15]
target1 = 9
print(two_sum(nums1, target1))
```

```
Python 3.12.2 (tag
64)] on win32
Type "help", "copy
>>>
= RESTART: C:/
[0, 1]
>>>
```

2. Add Two Numbers

You are given two non-empty linked lists representing two non-negative integers. The

digits are stored in reverse order, and each of their nodes contains a single digit. Add the

two numbers and return the sum as a linked list.

You may assume the two numbers do not contain any leading zero, except the number 0

itself.

Example 1:

Input: l1 = [2,4,3], l2 = [5,6,4]

Output: [7,0,8]

Explanation: 342 + 465 = 807.

Example 2:

Input: l1 = [0], l2 = [0]

Output: [0]

Example 3:

Input: l1 = [9,9,9,9,9,9,9], l2 = [9,9,9,9]

Output: [8,9,9,9,0,0,0,1]

Constraints:

● The number of nodes in each linked list is in the range [1, 100].

● 0 <= Node.val <= 9

● It is guaranteed that the list represents a number that does not have leading zeros.

```python
class ListNode:
    def __init__(self, val=0, next=None):
        self.val = val
        self.next = next
def add_two_numbers(l1, l2):
    dummy = ListNode()
    current, carry = dummy, 0
    while l1 or l2 or carry:
        val1 = (l1.val if l1 else 0)
        val2 = (l2.val if l2 else 0)
        carry, out = divmod(val1 + val2 + carry, 10)
        current.next = ListNode(out)
        current = current.next
        l1 = (l1.next if l1 else None)
        l2 = (l2.next if l2 else None)
    return dummy.next
def to_linked_list(lst):
    prev = dummy = ListNode()
    for elem in lst:
        prev.next = ListNode(elem)
        prev = prev.next
    return dummy.next
def to_list(node):
    lst = []
    while node:
        lst.append(node.val)
        node = node.next
    return lst

l1 = to_linked_list([2, 4, 3])
l2 = to_linked_list([5, 6, 4])
result = add_two_numbers(l1, l2)
print(to_list(result))  # Output: [7, 0, 8]
```

```
Python 3.12.2 (tags/
64)] on win32
Type "help", "copyri
>>>
= RESTART: C:/Us
[7, 0, 8]
>>>
```

3. Longest Substring without Repeating Characters

Given a string s, find the length of the longest substring without repeating characters.

Example 1:

Input: s = "abcabcbb"

Output: 3

Explanation: The answer is "abc", with the length of 3.

Example 2:

Input: s = "bbbbb"

Output: 1

Explanation: The answer is "b", with the length of 1.
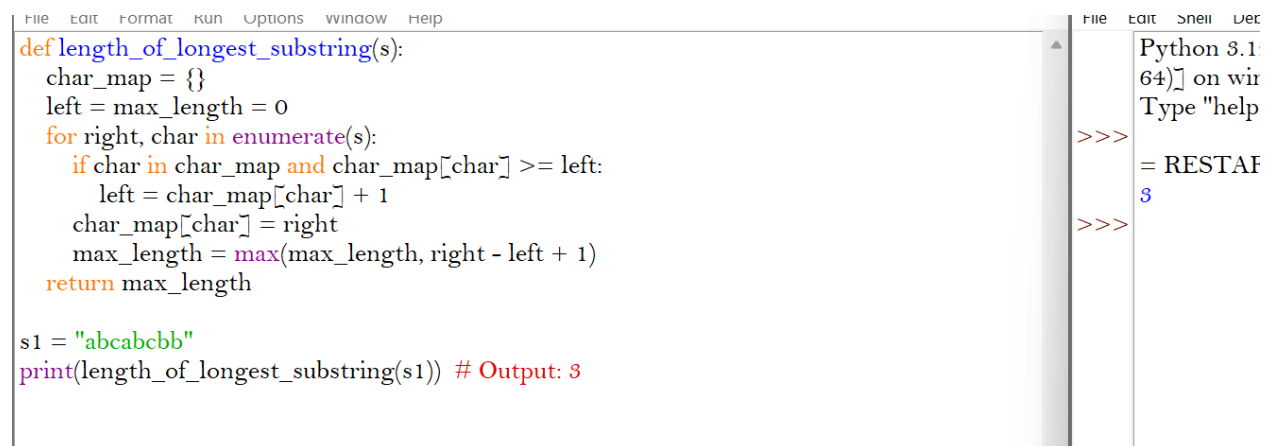
Example 3:

Input: s = "pwwkew"

Output: 3

Explanation: The answer is "wke", with the length of 3.

Notice that the answer must be a substring, "pwke" is a subsequence and not a substring.

Constraints:

● 0 <= s.length <= 5 * 104

● s consists of English letters, digits, symbols and spaces.

```python
def length_of_longest_substring(s):
    char_map = {}
    left = max_length = 0
    for right, char in enumerate(s):
        if char in char_map and char_map[char] >= left:
            left = char_map[char] + 1
        char_map[char] = right
        max_length = max(max_length, right - left + 1)
    return max_length

s1 = "abcabcbb"
print(length_of_longest_substring(s1))  # Output: 3
```

4. Median of Two Sorted Arrays

Given two sorted arrays nums1 and nums2 of size m and n respectively, return the median of the two sorted arrays.

The overall run time complexity should be O(log (m+n)).

Example 1:

Input: nums1 = [1,3], nums2 = [2]

Output: 2.00000

Explanation: merged array = [1,2,3] and median is 2.

Example 2:

Input: nums1 = [1,2], nums2 = [3,4]

Output: 2.50000

Explanation: merged array = [1,2,3,4] and median is (2 + 3) / 2 = 2.5.

Constraints:

● nums1.length == m

● nums2.length == n

● 0 <= m <= 1000

● 0 <= n <= 1000

● 1 <= m + n <= 2000

● -106 <= nums1[i], nums2[i] <= 106

```python
def find_median_sorted_arrays(nums1, nums2):
    merged = sorted(nums1 + nums2)
    n = len(merged)
    if n % 2 == 1:
        return merged[n // 2]
    else:
        return (merged[n // 2 - 1] + merged[n // 2]) / 2
nums1 = [1, 3]
nums2 = [2]
print(find_median_sorted_arrays(nums1, nums2))  # Output: 2.0
```

```
Python 3.12.2 (tags/v3.12
64)] on win32
Type "help", "copyright",
>>>
= RESTART: C:/Users/9
2
>>>
```

5. Longest Palindromic Substring

Given a string s, return the longest palindromic substring in s.

Example 1:

Input: s = "babad"

Output: "bab"

Explanation: "aba" is also a valid answer.

Example 2:

Input: s = "cbbd"

Output: "bb"

Constraints:

● 1 <= s.length <= 1000

● s consist of only digits and English letters.

```python
def longest_palindrome(s):
    if len(s) < 2:
        return s
    start, max_length = 0, 1
    for i in range(1, len(s)):
        odd = s[i - max_length - 1:i + 1]
        even = s[i - max_length:i + 1]
        if i - max_length - 1 >= 0 and odd == odd[::-1]:
            start = i - max_length - 1
            max_length += 2
        elif even == even[::-1]:
            start = i - max_length
            max_length += 1
    return s[start:start + max_length]
s1 = "babad"
print(longest_palindrome(s1))  # Output: "bab" or "aba"
```

```
Python 3.12.2 (tags/v3.12.2:6abd
64)] on win32
Type "help", "copyright", "credit
>>>
= RESTART: C:/Users/91984/
bab
>>>
```

6. Zigzag Conversion

The string "PAYPALISHIRING" is written in a zigzag pattern on a given number of

rows like this: (you may want to display this pattern in a fixed font for better legibility)

P A H N

A P L S I I G

Y I R

And then read line by line: "PAHNAPLSIIGYIR"

Write the code that will take a string and make this conversion given a number of rows:

string convert(string s, int numRows);

Example 1:

Input: s = "PAYPALISHIRING", numRows = 3

Output: "PAHNAPLSIIGYIR"

Example 2:

Input: s = "PAYPALISHIRING", numRows = 4

Output: "PINALSIGYAHRPI"

Explanation:

P I N

A L S I G

Y A H R

P I

Example 3:

Input: s = "A", numRows = 1

Output: "A"

Constraints:

● 1 <= s.length <= 1000

● s consists of English letters (lower-case and upper-case), ',' and '.'.

● 1 <= numRows <= 1000

```python
def convert(s, numRows):
    if numRows == 1 or numRows >= len(s):
        return s
    zigzag = [''] * numRows
    row, step = 0, 1
    for char in s:
        zigzag[row] += char
        if row == 0:
            step = 1
        elif row == numRows - 1:
            step = -1
        row += step
    return ''.join(zigzag)
s1 = "PAYPALISHIRING"
numRows1 = 3
print(convert(s1, numRows1))  # Output: "PAHNAPLSIIGYIR"
```

```
Python 3.12.2 (tags/v3.12.2:6a
64)] on win32
Type "help", "copyright", "cre
>>>
= RESTART: C:/Users/9198-
PAHNAPLSIIGYIR
>>>
```

7. Reverse Integer

Given a signed 32-bit integer x, return x with its digits reversed. If reversing x causes the

value to go outside the signed 32-bit integer range [-231, 231 - 1], then return 0.

Assume the environment does not allow you to store 64-bit integers (signed or unsigned).

Example 1:

Input: x = 123

Output: 321
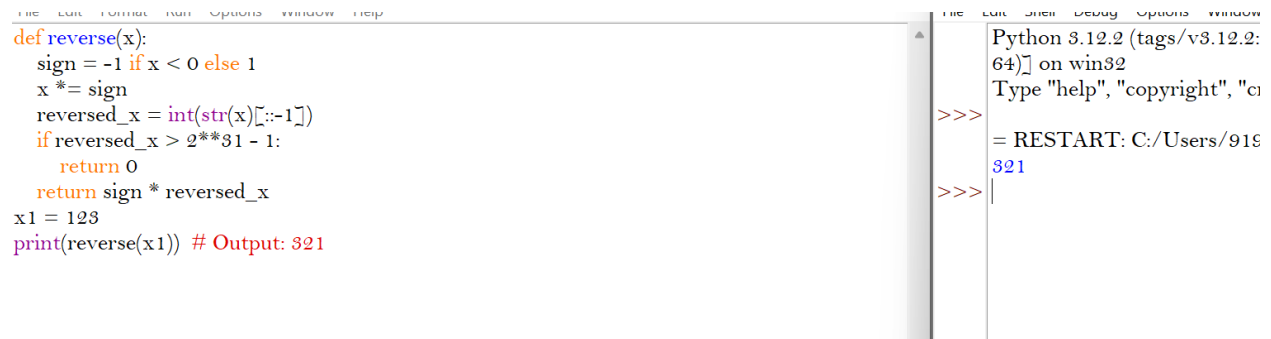
Example 2:

Input: x = -123

Output: -321

Example 3:

Input: x = 120

Output: 21

Constraints:

● -231 <= x <= 231 – 1

```python
def reverse(x):
    sign = -1 if x < 0 else 1
    x *= sign
    reversed_x = int(str(x)[::-1])
    if reversed_x > 2**31 - 1:
        return 0
    return sign * reversed_x
x1 = 123
print(reverse(x1))  # Output: 321
```

```
Python 3.12.2 (tags/v3.12.2:
64)] on win32
Type "help", "copyright", "cr
>>>
= RESTART: C:/Users/919
321
>>>
```

8. String to Integer (atoi)

Implement the myAtoi(string s) function, which converts a string to a 32-bit signed integer (similar to C/C++'s atoi function).

The algorithm for myAtoi(string s) is as follows:

1. Read in and ignore any leading whitespace.

2. Check if the next character (if not already at the end of the string) is '-' or '+'. Read this character in if it is either. This determines if the final result is negative or positive respectively. Assume the result is positive if neither is present.

3. Read in next the characters until the next non-digit character or the end of the input is reached. The rest of the string is ignored.

4. Convert these digits into an integer (i.e. "123" -> 123, "0032" -> 32). If no digits were read, then the integer is 0. Change the sign as necessary (from step 2).

5. If the integer is out of the 32-bit signed integer range [-231, 231 - 1], then clamp the integer so that it remains in the range. Specifically, integers less than -231 should be clamped to -231, and integers greater than 231 - 1 should be clamped to 231 - 1.

6. Return the integer as the final result.

Note:

● Only the space character ' ' is considered a whitespace character.

● Do not ignore any characters other than the leading whitespace or the rest of the string after the digits.

Example 1:

Input: s = "42"

Output: 42

Explanation: The underlined characters are what is read in, the caret is the current reader position.

Step 1: "42" (no characters read because there is no leading whitespace)

^

Step 2: "42" (no characters read because there is neither a '-' nor '+')

^

Step 3: "42" ("42" is read in)

^

The parsed integer is 42.

Since 42 is in the range [-231, 231 - 1], the final result is 42.

Example 2:

Input: s = " -42"

Output: -42

Explanation:

Step 1: " -42" (leading whitespace is read and ignored)

^

Step 2: " -42" ('-' is read, so the result should be negative)

^

Step 3: " -42" ("42" is read in)

^

The parsed integer is -42.

Since -42 is in the range [-231, 231 - 1], the final result is -42.

Example 3:

Input: s = "4193 with words"

Output: 4193

Explanation:

Step 1: "4193 with words" (no characters read because there is no leading whitespace)

^

Step 2: "4193 with words" (no characters read because there is neither a '-' nor '+')

^

Step 3: "4193 with words" ("4193" is read in; reading stops because the next character is
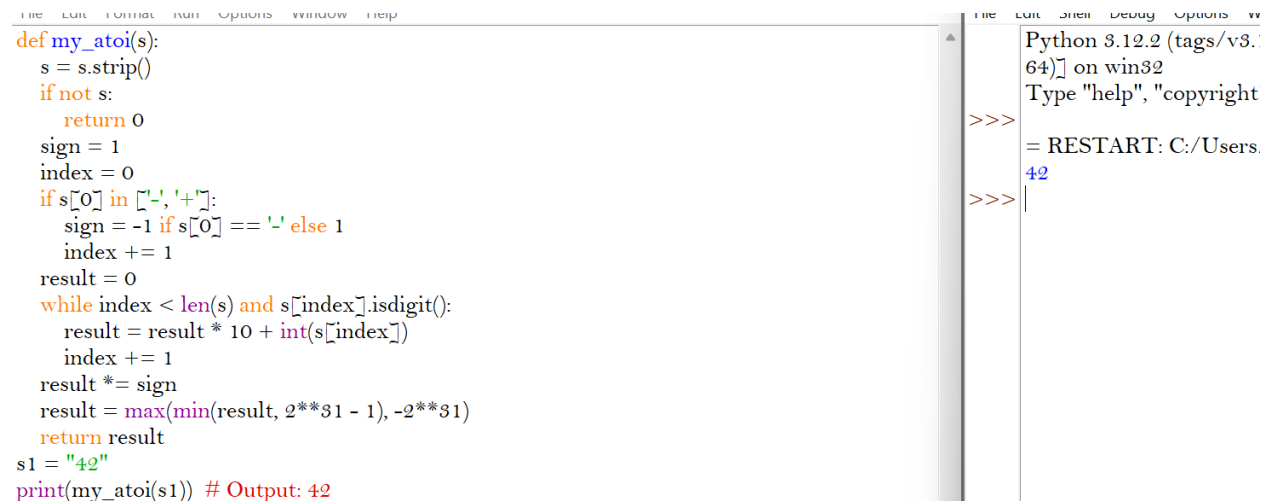
a non-digit)

^

The parsed integer is 4193.

Since 4193 is in the range [-231, 231 - 1], the final result is 4193.

Constraints:

● 0 <= s.length <= 200

● s consists of English letters (lower-case and upper-case), digits (0-9), ' ', '+', '-',

and '.'.

```python
def my_atoi(s):
    s = s.strip()
    if not s:
        return 0
    sign = 1
    index = 0
    if s[0] in ['-', '+']:
        sign = -1 if s[0] == '-' else 1
        index += 1
    result = 0
    while index < len(s) and s[index].isdigit():
        result = result * 10 + int(s[index])
        index += 1
    result *= sign
    result = max(min(result, 2**31 - 1), -2**31)
    return result
s1 = "42"
print(my_atoi(s1))  # Output: 42
```

```
Python 3.12.2 (tags/v3.
64)] on win32
Type "help", "copyright
>>>
= RESTART: C:/Users.
42
>>>
```

9. Palindrome Number

Given an integer x, return true if x is a palindrome, and false otherwise.

Example 1:

Input: x = 121

Output: true

Explanation: 121 reads as 121 from left to right and from right to left.

Example 2:

Input: x = -121

Output: false

Explanation: From left to right, it reads -121. From right to left, it becomes 121-.
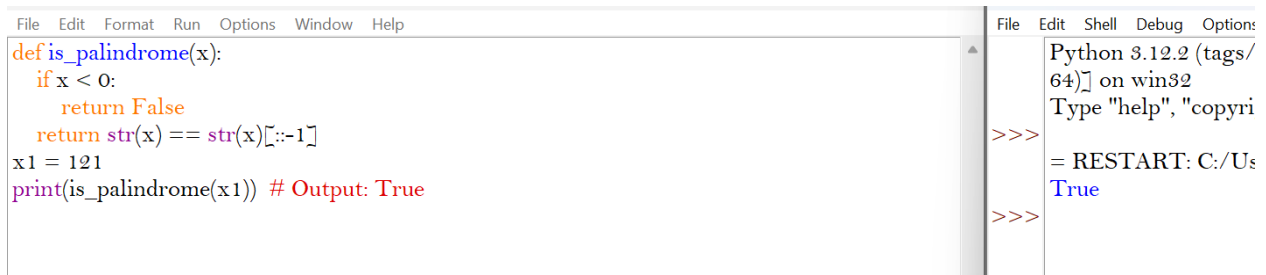
Therefore it is not a palindrome.

Example 3:

Input: x = 10

Output: false

Explanation: Reads 01 from right to left. Therefore it is not a palindrome.

Constraints:

● -231 <= x <= 231 – 1

```
File  Edit  Format  Run  Options  Window  Help
def is_palindrome(x):
    if x < 0:
        return False
    return str(x) == str(x)[::-1]
x1 = 121
print(is_palindrome(x1))  # Output: True
```

```
File  Edit  Shell  Debug  Options
Python 3.12.2 (tags/
64)] on win32
Type "help", "copyri
>>>
= RESTART: C:/Us
True
>>>
```

10. Regular Expression Matching

Given an input string s and a pattern p, implement regular expression matching with support for '.' and '*' where:

● '.' Matches any single character.

● '*' Matches zero or more of the preceding element.

The matching should cover the entire input string (not partial).

Example 1:

Input: s = "aa", p = "a"

Output: false

Explanation: "a" does not match the entire string "aa".

Example 2:

Input: s = "aa", p = "a*"

Output: true

Explanation: '*' means zero or more of the preceding element, 'a'. Therefore, by repeating

'a' once, it becomes "aa".

Example 3:

Input: s = "ab", p = ".*"

Output: true

Explanation: ".*" means "zero or more (*) of any character (.)".

Constraints:

● 1 <= s.length <= 20

● 1 <= p.length <= 30

● s contains only lowercase English letters.

● p contains only lowercase English letters, '.', and '*'.

● It is guaranteed for each appearance of the character '*', there will be a previous

valid character to match.

```python
def is_match(s, p):
    dp = [[False] * (len(p) + 1) for _ in range(len(s) + 1)]
    dp[0][0] = True
    for j in range(2, len(p) + 1):
        dp[0][j] = dp[0][j - 2] if p[j - 1] == '*' else False
    for i in range(1, len(s) + 1):
        for j in range(1, len(p) + 1):
            if p[j - 1] in {s[i - 1], '.'}:
                dp[i][j] = dp[i - 1][j - 1]
            elif p[j - 1] == '*':
                dp[i][j] = dp[i][j - 2] or (dp[i - 1][j] if p[j - 2] in {s[i - 1], '.'} else False)
    return dp[-1][-1]
s1 = "aa"
p1 = "a*"
print(is_match(s1, p1))  # Output: True
```

```
Python 3.12.2 (tags/v3.12.2
64)] on win32
Type "help", "copyright", "c
>>>
= RESTART: C:/Users/919
True
>>>
```

11. Container With Most Water

You are given an integer array height of length n. There are n vertical lines drawn

such that the two endpoints of the ith line are (i, 0) and (i, height[i]).

Find two lines that together with the x-axis form a container, such that the

container contains the most water.

Return the maximum amount of water a container can store.

Notice that you may not slant the container.

Example 1:

Input: height = [1,8,6,2,5,4,8,3,7]

Output: 49

Explanation: The above vertical lines are represented by array [1,8,6,2,5,4,8,3,7].

In this case, the max area of water (blue section) the container can contain is 49.

Example 2:

Input: height = [1,1]

Output: 1

Constraints:

● n == height.length

● 2 <= n <= 105

● 0 <= height[i] <= 104

```python
def max_area(height):
    left, right = 0, len(height) - 1
    max_water = 0
    while left < right:
        max_water = max(max_water, min(height[left], height[right]) * (right - left))
        if height[left] < height[right]:
            left += 1
        else:
            right -= 1
    return max_water
height1 = [1,8,6,2,5,4,8,3,7]
print(max_area(height1))  # Output: 49
```

```
Python 3.12.2 (tags/v3.12.2:
64)] on win32
Type "help", "copyright", "cr
>>>
= RESTART: C:/Users/919
49
>>>
```

12. Integer to Roman

Roman numerals are represented by seven different symbols: I, V, X, L, C, D and M.

Symbol Value

I 1

V 5

X 10

L 50

C 100

D 500

M 1000

For example, 2 is written as II in Roman numeral, just two one's added together. 12 is written as XII, which is simply X + II. The number 27 is written as XXVII, which is XX + V + II.

Roman numerals are usually written largest to smallest from left to right. However, the numeral for four is not IIII. Instead, the number four is written as IV. Because the one is before the five we subtract it making four. The same principle applies to the number nine, which is written as IX. There are six instances where subtraction is used:

● I can be placed before V (5) and X (10) to make 4 and 9.

● X can be placed before L (50) and C (100) to make 40 and 90.

● C can be placed before D (500) and M (1000) to make 400 and 900.

Given an integer, convert it to a roman numeral.

Example 1:

Input: num = 3

Output: "III"

Explanation: 3 is represented as 3 ones.

Example 2:

Input: num = 58

Output: "LVIII"

Explanation: L = 50, V = 5, III = 3.

Example 3:

Input: num = 1994

Output: "MCMXCIV"

Explanation: M = 1000, CM = 900, XC = 90 and IV = 4.

Constraints:

● 1 <= num <= 3999

```python
def int_to_roman(num):
    val = [
        1000, 900, 500, 400,
        100, 90, 50, 40,
        10, 9, 5, 4,
        1
    ]
    syms = [
        "M", "CM", "D", "CD",
        "C", "XC", "L", "XL",
        "X", "IX", "V", "IV",
        "I"
    ]
    roman_num = ''
    for i in range(len(val)):
        while num >= val[i]:
            num -= val[i]
            roman_num += syms[i]
    return roman_num
num1 = 1994
print(int_to_roman(num1))  # Output: "MCMXCIV"
```

```
Python 3.12.2 (tags/v3.12.2:
64)] on win32
Type "help", "copyright", "c:
>>>
= RESTART: C:/Users/919
MCMXCIV
>>>
```

13. Roman to Integer

Roman numerals are represented by seven different symbols: I, V, X, L, C, D and M.

Symbol Value

I 1

V 5

X 10

L 50

C 100

D 500

M 1000

For example, 2 is written as II in Roman numeral, just two ones added together. 12 is written as XII, which is simply X + II. The number 27 is written as XXVII, which is XX + V + II.

Roman numerals are usually written largest to smallest from left to right. However, the numeral for four is not IIII. Instead, the number four is written as IV. Because the one is before the five we subtract it making four. The same principle applies to the number nine, which is written as IX. There are six instances where subtraction is used:

● I can be placed before V (5) and X (10) to make 4 and 9.

● X can be placed before L (50) and C (100) to make 40 and 90.

● C can be placed before D (500) and M (1000) to make 400 and 900.

Given a roman numeral, convert it to an integer.

Example 1:

Input: s = "III"

Output: 3

Explanation: III = 3.

Example 2:

Input: s = "LVIII"

Output: 58

Explanation: L = 50, V= 5, III = 3.

Example 3:

Input: s = "MCMXCIV"

Output: 1994

Explanation: M = 1000, CM = 900, XC = 90 and IV = 4.

Constraints:

● 1 <= s.length <= 15

● s contains only the characters ('I', 'V', 'X', 'L', 'C', 'D', 'M').

● It is guaranteed that s is a valid roman numeral in the range [1, 3999].

```python
def roman_to_int(s):
    roman = {'I': 1, 'V': 5, 'X': 10, 'L': 50, 'C': 100, 'D': 500, 'M': 1000}
    integer = 0
    for i in range(len(s)):
        if i > 0 and roman[s[i]] > roman[s[i - 1]]:
            integer += roman[s[i]] - 2 * roman[s[i - 1]]
        else:
            integer += roman[s[i]]
    return integer
s1 = "MCMXCIV"
print(roman_to_int(s1))  # Output: 1994
```

```
Python 3.12.2 (tags/v3.12
64)] on win32
Type "help", "copyright",
>>>
= RESTART: C:/Users/9
1994
>>>
```

14. Longest Common Prefix

Write a function to find the longest common prefix string amongst an array of strings.

If there is no common prefix, return an empty string "".

Example 1:

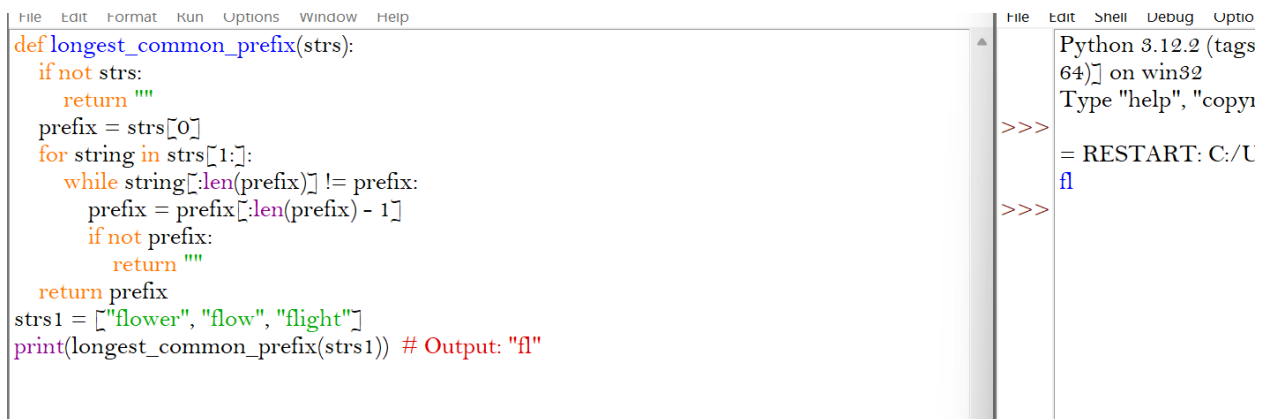Input: strs = ["flower","flow","flight"]

Output: "fl"

Example 2:

Input: strs = ["dog","racecar","car"]

Output: ""

Explanation: There is no common prefix among the input strings.

Constraints:

● 1 <= strs.length <= 200

● 0 <= strs[i].length <= 200

● strs[i] consists of only lowercase English letters.

```python
def longest_common_prefix(strs):
    if not strs:
        return ""
    prefix = strs[0]
    for string in strs[1:]:
        while string[:len(prefix)] != prefix:
            prefix = prefix[:len(prefix) - 1]
            if not prefix:
                return ""
    return prefix
strs1 = ["flower", "flow", "flight"]
print(longest_common_prefix(strs1))  # Output: "fl"
```

```
Python 3.12.2 (tags
64)] on win32
Type "help", "copyr
>>>
= RESTART: C:/U
fl
>>>
```

15. 3Sum

Given an integer array nums, return all the triplets [nums[i], nums[j], nums[k]] such that i

!= j, i != k, and j != k, and nums[i] + nums[j] + nums[k] == 0.

Notice that the solution set must not contain duplicate triplets.

Example 1:

Input: nums = [-1,0,1,2,-1,-4]

Output: [[-1,-1,2],[-1,0,1]]

Explanation:

nums[0] + nums[1] + nums[2] = (-1) + 0 + 1 = 0.

nums[1] + nums[2] + nums[4] = 0 + 1 + (-1) = 0.

nums[0] + nums[3] + nums[4] = (-1) + 2 + (-1) = 0.

The distinct triplets are [-1,0,1] and [-1,-1,2].

Notice that the order of the output and the order of the triplets does not matter.

Example 2:

Input: nums = [0,1,1]

Output: []

Explanation: The only possible triplet does not sum up to 0.

Example 3:

Input: nums = [0,0,0]

Output: [[0,0,0]]

Explanation: The only possible triplet sums up to 0.

Constraints:

● 3 <= nums.length <= 3000

● -105 <= nums[i] <= 105

```python
def three_sum(nums):
    nums.sort()
    result = []
    for i in range(len(nums) - 2):
        if i > 0 and nums[i] == nums[i - 1]:
            continue
        left, right = i + 1, len(nums) - 1
        while left < right:
            total = nums[i] + nums[left] + nums[right]
            if total < 0:
                left += 1
            elif total > 0:
                right -= 1
            else:
                result.append([nums[i], nums[left], nums[right]])
                while left < right and nums[left] == nums[left + 1]:
                    left += 1
                while left < right and nums[right] == nums[right - 1]:
                    right -= 1
                left += 1
                right -= 1
    return result
nums1 = [-1, 0, 1, 2, -1, -4]
print(three_sum(nums1)) # Output: [[-1, -1, 2], [-1, 0, 1]]
```

```
Python 3.12.2 (tags/v3.12.2:6abddd9, Fel
64)] on win32
Type "help", "copyright", "credits" or "lie
>>>
= RESTART: C:/Users/91984/AppData
[[-1, -1, 2], [-1, 0, 1]]
>>>
```

16. 3Sum Closest

Given an integer array nums of length n and an integer target, find three integers in nums

such that the sum is closest to target.

Return the sum of the three integers.

You may assume that each input would have exactly one solution.

Example 1:

Input: nums = [-1,2,1,-4], target = 1

Output: 2

Explanation: The sum that is closest to the target is 2. (-1 + 2 + 1 = 2).

Example 2:

Input: nums = [0,0,0], target = 1

Output: 0

Explanation: The sum that is closest to the target is 0. (0 + 0 + 0 = 0).

Constraints:

● 3 <= nums.length <= 500

● -1000 <= nums[i] <= 1000

● -104 <= target <= 104

```python
def three_sum_closest(nums, target):
    nums.sort()
    closest = float('inf')
    for i in range(len(nums) - 2):
        left, right = i + 1, len(nums) - 1
        while left < right:
            total = nums[i] + nums[left] + nums[right]
            if abs(target - total) < abs(target - closest):
                closest = total
            if total < target:
                left += 1
            elif total > target:
                right -= 1
            else:
                return total
    return closest
nums1 = [-1, 2, 1, -4]
target1 = 1
print(three_sum_closest(nums1, target1))  # Output: 2
```

```
Python 3.12.2 (tags/
64)] on win32
Type "help", "copyri

>>>
= RESTART: C:/Us
2
>>>
```

17. Letter Combinations of a Phone Number

Given a string containing digits from 2-9 inclusive, return all possible letter combinations

that the number could represent. Return the answer in any order.

A mapping of digits to letters (just like on the telephone buttons) is given below. Note

that 1 does not map to any letters.

Example 1:

Input: digits = "23"

Output: ["ad","ae","af","bd","be","bf","cd","ce","cf"]

Example 2:

Input: digits = ""

Output: []

Example 3:

Input: digits = "2"

Output: ["a","b","c"]

Constraints:

● 0 <= digits.length <= 4

● digits[i] is a digit in the range ['2', '9'].

```python
def letter_combinations(digits):
    if not digits:
        return []
    phone_map = {
        '2': 'abc', '3': 'def', '4': 'ghi', '5': 'jkl', '6': 'mno',
        '7': 'pqrs', '8': 'tuv', '9': 'wxyz'
    }
    result = [""]

    for digit in digits:
        temp = []
        for combination in result:
            for letter in phone_map[digit]:
                temp.append(combination + letter)
        result = temp

    return result
digits1 = "23"
print(letter_combinations(digits1))  # Output: ["ad","ae","af","bd","be","bf","cd","ce","cf"]
```

```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 6
64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: C:/Users/91984/AppData/Local/Programs/Python/Python:
['ad', 'ae', 'af', 'bd', 'be', 'bf', 'cd', 'ce', 'cf']
>>>
```

18. 4Sum

Given an array nums of n integers, return an array of all the unique quadruplets

[nums[a], nums[b], nums[c], nums[d]] such that:

● 0 <= a, b, c, d < n

● a, b, c, and d are distinct.

● nums[a] + nums[b] + nums[c] + nums[d] == target

You may return the answer in any order.

Example 1:

Input: nums = [1,0,-1,0,-2,2], target = 0

Output: [[-2,-1,1,2],[-2,0,0,2],[-1,0,0,1]]

Example 2:

Input: nums = [2,2,2,2,2], target = 8

Output: [[2,2,2,2]]

Constraints:

● 1 <= nums.length <= 200

● -109 <= nums[i] <= 109

● -109 <= target <= 109

```python
def four_sum(nums, target):
    nums.sort()
    result = []
    for i in range(len(nums) - 3):
        if i > 0 and nums[i] == nums[i - 1]:
            continue
        for j in range(i + 1, len(nums) - 2):
            if j > i + 1 and nums[j] == nums[j - 1]:
                continue
            left, right = j + 1, len(nums) - 1
            while left < right:
                total = nums[i] + nums[j] + nums[left] + nums[right]
                if total < target:
                    left += 1
                elif total > target:
                    right -= 1
                else:
                    result.append([nums[i], nums[j], nums[left], nums[right]])
                    while left < right and nums[left] == nums[left + 1]:
                        left += 1
                    while left < right and nums[right] == nums[right - 1]:
                        right -= 1
                    left += 1
                    right -= 1
    return result
nums1 = [1, 0, -1, 0, -2, 2]
target1 = 0
print(four_sum(nums1, target1))  # Output: [[-2, -1, 1, 2], [-2, 0, 0, 2], [-1, 0, 0, 1]]
```

```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2
64) on win32
Type "help", "copyright", "credits" or "license
>>>
= RESTART: C:/Users/91984/AppData/Loc
[[-2, -1, 1, 2], [-2, 0, 0, 2], [-1, 0, 0, 1]]
>>>
```

19. Remove Nth Node From End of List

Given the head of a linked list, remove the nth node from the end of the list and return its head.

Example 1:

Input: head = [1,2,3,4,5], n = 2

Output: [1,2,3,5]

Example 2:

Input: head = [1], n = 1

Output: []

Example 3:

Input: head = [1,2], n = 1

Output: [1]

Constraints:

● The number of nodes in the list is sz.

● 1 <= sz <= 30

● 0 <= Node.val <= 100

● 1 <= n <= sz

```python
class ListNode:
    def __init__(self, val=0, next=None):
        self.val = val
        self.next = next

def remove_nth_from_end(head, n):
    dummy = ListNode(0)
    dummy.next = head
    first = second = dummy
    for _ in range(n + 1):
        first = first.next
    while first:
        first = first.next
        second = second.next
    second.next = second.next.next
    return dummy.next
def to_linked_list(lst):
    prev = dummy = ListNode()
    for elem in lst:
        prev.next = ListNode(elem)
        prev = prev.next
    return dummy.next

def to_list(node):
    lst = []
    while node:
        lst.append(node.val)
        node = node.next
    return lst

head = to_linked_list([1, 2, 3, 4, 5])
n = 2
result = remove_nth_from_end(head, n)
print(to_list(result))  # Output: [1, 2, 3, 5]
```

```
Python 3.12.2 (tags/v3.12.2
64)] on win32
Type "help", "copyright", "c
>>>
= RESTART: C:/Users/91
[1, 2, 3, 5]
>>>
```

20. Valid Parentheses

Given a string s containing just the characters '(', ')', '{', '}', '[' and ']', determine if the

input string is valid.

An input string is valid if:

1. Open brackets must be closed by the same type of brackets.

2. Open brackets must be closed in the correct order.

3. Every close bracket has a corresponding open bracket of the same type.

Example 1:

Input: s = "()"

Output: true

Example 2:

Input: s = "()[]{}"

Output: true

Example 3:

Input: s = "(]"

Output: false

Constraints:

● 1 <= s.length <= 104

● s consists of parentheses only '()[]{}'.

```python
def is_valid(s):
    stack = []
    mapping = {")": "(", "}": "{", "]": "["}
    for char in s:
        if char in mapping:
            top_element = stack.pop() if stack else '#'
            if mapping[char] != top_element:
                return False
        else:
            stack.append(char)
    return not stack
s1 = "()[]{}"
print(is_valid(s1))  # Output: True
```

```
Python 3.12.2 (tags/v3.12.2
64)] on win32
Type "help", "copyright", "c
>>>
= RESTART: C:/Users/91
True
>>>
```