**Problem 1**

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 lower-case English letters.

**Problem 2**

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.

Example 1:

```
Input: s = "()"
```

```
Output: true
```

Example 2:

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

```
Output: true
```

Example 3:

```
Input: s = "(]"
```

```
Output: false
```

Constraints:

- `1 <= s.length <= 10^4`
- `s` consists of parentheses only `'()[]{}'`.

**Problem 3**

You are given a large integer represented as an integer array `digits`, where each `digits[i]` is the `ith` digit of the integer. The digits are ordered from most significant to least significant in left-to-right order. The large integer does not contain any leading `0`'s.

Increment the large integer by one and return *the resulting array of digits*.

Example 1:

```
Input: digits = [1,2,3]

Output: [1,2,4]

Explanation: The array represents the integer 123.

Incrementing by one gives 123 + 1 = 124.

Thus, the result should be [1,2,4].
```

Example 2:

```
Input: digits = [9]

Output: [1,0]

Explanation: The array represents the integer 9.

Incrementing by one gives 9 + 1 = 10.

Thus, the result should be [1,0].
```

Constraints:

- `1 <= digits.length <= 100`
- `0 <= digits[i] <= 9`
- `digits` does not contain any leading `0`'s.

**Problem 4**

Given an integer `n`, return *`true` if it is a power of three. Otherwise, return `false`*.

An integer `n` is a power of three, if there exists an integer `x` such that `n == 3x`.

Example 1:

```
Input: n = 27

Output: true
```

Example 2:

```
Input: n = 0

Output: false
```

Example 3:

```
Input: n = 9

Output: true
```

Constraints:

- $-2^{31} <= n <= 2^{31} - 1$

Follow up: Could you solve it without loops/recursion?

**Problem 5**

You are given two integer arrays `nums1` and `nums2`, sorted in non-decreasing order, and two integers `m` and `n`, representing the number of elements in `nums1` and `nums2` respectively.

Merge `nums1` and `nums2` into a single array sorted in non-decreasing order.

The final sorted array should not be returned by the function, but instead be *stored inside the array* `nums1`. To accommodate this, `nums1` has a length of `m + n`, where the first `m` elements denote the elements that should be merged, and the last `n` elements are set to `0` and should be ignored. `nums2` has a length of `n`.

Example 1:

```
Input: nums1 = [1,2,3,0,0,0], m = 3, nums2 = [2,5,6], n = 3

Output: [1,2,2,3,5,6]

Explanation: The arrays we are merging are [1,2,3] and [2,5,6].

The result of the merge is [1,2,2,3,5,6] with the underlined elements coming from nums1.
```

Example 2:

```
Input: nums1 = [1], m = 1, nums2 = [], n = 0

Output: [1]

Explanation: The arrays we are merging are [1] and [].

The result of the merge is [1].
```

Example 3:

```
Input: nums1 = [0], m = 0, nums2 = [1], n = 1

Output: [1]
```

```
Explanation: The arrays we are merging are [] and [1].

The result of the merge is [1].

Note that because m = 0, there are no elements in nums1. The 0 is only there to
ensure the merge result can fit in nums1.
```

Constraints:

- `nums1.length == m + n`
- `nums2.length == n`
- `0 <= m, n <= 200`
- `1 <= m + n <= 200`
- `-10^9 <= nums1[i], nums2[j] <= 10^9`

Follow up: Can you come up with an algorithm that runs in `O(m + n)` time?

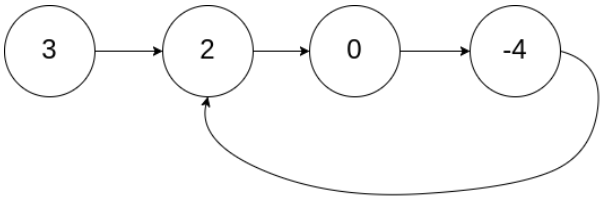
**Problem 6**

Given `head`, the head of a linked list, determine if the linked list has a cycle in it.

There is a cycle in a linked list if there is some node in the list that can be reached again by continuously following the `next` pointer. Internally, `pos` is used to denote the index of the node that tail's `next` pointer is connected to. Note that `pos` is not passed as a parameter.

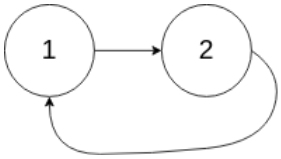
Return `true` *if there is a cycle in the linked list*. Otherwise, return `false`.

Example 1:




```
Input: head = [3,2,0,-4], pos = 1
Output: true
Explanation: There is a cycle in the linked list, where the tail connects to
the 1st node (0-indexed).
```

Example 2:




```
Input: head = [1,2], pos = 0
Output: true
Explanation: There is a cycle in the linked list, where the tail connects to
the 0th node.
```

Example 3:

```
Input: head = [1], pos = -1
Output: false
Explanation: There is no cycle in the linked list.
```

Constraints:

- The number of the nodes in the list is in the range $[0, 10^4]$.
- $-10^5 <= Node.val <= 10^5$
- pos is -1 or a valid index in the linked-list.

Follow up: Can you solve it using $O(1)$ (i.e. constant) memory?