

## Letter Case Permutation

Given a string S, we can transform every letter individually to be lowercase or uppercase to create another string. Return a list of all possible strings we could create.

### Examples:

**Input:** S = "a1b2"

**Output:** ["a1b2", "a1B2", "A1b2", "A1B2"]

**Input:** S = "3z4"

**Output:** ["3z4", "3Z4"]

**Input:** S = "12345"

**Output:** ["12345"]

### Note:

- S will be a string with length at most 12.
- S will consist only of letters or digits.

## Solution 1

When I saw a problem, my first step is to draw a figure. See the figure below:

```
abc
abc Abc 0
abc aBc Abc ABc 1
abc abC aBc aBC Abc AbC ABc ABC 2
```

There we go! Is that a typical BFS/DFS problem? Yes, you are right!  
Be careful to check whether a character is a digit or a letter(lower case or upper case).

```
class Solution {
    public List<String> letterCasePermutation(String S) {
        if (S == null) {
            return new LinkedList<>();
        }

        Queue<String> queue = new LinkedList<>();
        queue.offer(S);

        for (int i = 0; i < S.length(); i++) {
            if (Character.isDigit(S.charAt(i))) continue;
            int size = queue.size();
            for (int j = 0; j < size; j++) {
                String cur = queue.poll();
                char[] chs = cur.toCharArray();

                chs[i] = Character.toUpperCase(chs[i]);
                queue.offer(String.valueOf(chs));

                chs[i] = Character.toLowerCase(chs[i]);
                queue.offer(String.valueOf(chs));
            }
        }

        return new LinkedList<>(queue);
    }
}
```

written by [flagbigooffer](#) original link [here](#)

## Solution 2

Let N be the number of letters in input, for each letter, we can toggle its case to get a new string. That is, there are 2 options for each letter: upper and lower cases.

Therefore, we can generate  $2^N$  strings totally.

The details are as follows:

1. Add input into list.
2. Iterate through input string, when encountering a) a letter, toggle the case of the corresponding letter in all strings in the current list and append all new strings to list; b) a digit, ignore it.

```
public List<String> letterCasePermutation(String S) {  
    List<String> ans = new ArrayList<>(Arrays.asList(S));  
    for (int i = 0; i < S.length(); ++i) { // Traverse string S.  
        for (int j = 0, sz = ans.size(); S.charAt(i) > '9' && j < sz; ++j) { //  
            S.charAt(i) > '9': letter, not digit.  
                char[] ch = ans.get(j).toCharArray(); // transform to char[] the st  
ring @ j of ans.  
                ch[i] += ch[i] < 'a' ? 'a' - 'A' : 'A' - 'a'; // toggle case of cha  
rAt(i).  
                ans.add(String.valueOf(ch)); // append to the end of ans.  
            }  
        }  
    }  
    return ans;  
}
```

written by [rock](#) original link [here](#)

## Solution 3

Hello!

Here's a standard DFS/Backtracking solution done in Java. To make it more understandable for beginners, I made the code extremely modularized and made sure to comment out the functions of the methods. I hope you guys like my solution :)

The idea is to recurse through each individual character in the String and add the `changeCase()` version of it as well as retaining the original letter. You then loop through each character via recursion until the end condition is satisfied, as described in `runCheck()`.

```
public static List<String> letterCasePermutation(String s) {
    int len = s.length();
    List<String> list = new ArrayList<>();
    list.add(s);
    // BackTrack solution
    backtrack(s, list, new String(), 0);
    // Lists are passed by reference, so return list in this function
    return list;
}

public static void backtrack(String s, List<String> list, String curr, int index){
    if(runCheck(list, curr, s.length())){
        return;
    }
    // StringBuffer to manipulate immutable Strings
    StringBuffer str = new StringBuffer();
    str.append(curr);
    for(int i = index; i < s.length(); i++){
        int num = (int) s.charAt(i);
        boolean check = (64 < num && num < 91) || (96 < num && num < 123);
        // If the character is an upper/lower case letter
        if(check){
            // Add change-cased letter
            str.append(changeCase(num));
            backtrack(s, list, str.toString(), i+1);
            // Delete new letter and revert (so both permutations included)
            str.delete(str.length()-1, str.length());
            str.append(s.charAt(i));
            // If end conditions are satisfied, add to list
            if(runCheck(list, str.toString(), s.length())){
                return;
            }
        }
    }
    // ELSE accounts for non-letter characters 0-9
    else {
        // Appends the number
        str.append(s.charAt(i));
        // If end conditions are satisfied, add to list
        if(runCheck(list, str.toString(), s.length())){
            return;
        }
    }
}
```

```

    }
}
// Passes in ASCII index number
// Returns upper case if num is lower case index, vice versa
public static char changeCase(int num){
    char c;
    // 'A'-'a' = 32
    if(64<num && num<91){
        num+=32;
    }
    else{
        num-=32;
    }
    c = (char) num;
    return c;
}

// Checks if list contains String s and if s is the correct length
public static boolean runCheck(List<String> list, String s, int n) {
    if(!list.contains(s) && s.length() == n) {
        list.add(s);
        return true;
    }
    return false;
}

```

written by [matthewwang2020](#) original link [here](#)

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