**3.  Longest Palindromic Substring**

+ use DP and consider even(i-1,i) and odd(i-1,i+1) substrings as polyndrom.

**4. Product of Array Except Self**

+ Use resulting array to calculation. First get product(i) = product(i-1)\*num(i-1) product(0) = 1. Then product(n-1) = right \* product(n-1) where right = 1 for n-1,then right = right \* num(i)

**5.Find the Duplicate Number**

+ Sort the items and find same adjacent items.

**6.Intersection of Two Linked Lists**

class ListNode {  
 int val;  
 ListNode next;  
  
 ListNode(int x) {  
 val = x;  
 next = null;  
 }  
  
 ListNode(int x, ListNode n) {  
 this(x);  
 this.next = n;  
 }  
}  
  
public class IntersectionTwoLinkedLists {  
 private int lenOf(ListNode head) {  
 int len = 0;  
 while (head != null) {  
 len += 1;  
 head = head.next;  
 }  
 return len;  
 }  
  
 public ListNode getIntersectionNode(ListNode headA, ListNode headB) {  
 //boundary check  
 if (headA == null || headB == null) return null;  
  
 ListNode a = headA;  
 ListNode b = headB;  
  
 //if a & b have different len, then we will stop the loop after second iteration  
 while (a != b) {  
 //for the end of first iteration, we just reset the pointer to the head of another linkedlist  
 a = a == null ? headB : a.next;  
 b = b == null ? headA : b.next;  
 }  
 return a;  
 }  
}

- make while until list1 != list2 list1 = list1.next and list2 = list2.next,

If list1 == null list1 = head1 and if list2 == null list2 = head2 Floyd algorithm????? – fix it!!!

**7.Symmetric Tree**

Create method for x and y to compare x.left and y.right and x.right and y.left. To pass (root, root) as first parameters to this method.

**8.Binary Tree Vertical Order Traversal**

public List<List<Integer>> verticalOrder(TreeNode root) {

List<List<Integer>> res = new ArrayList<>();

if (root == null) {

return res;

}

Map<Integer, ArrayList<Integer>> map = new HashMap<>();

Queue<TreeNode> q = new LinkedList<>();

Queue<Integer> cols = new LinkedList<>();

q.add(root);

cols.add(0);

int min = 0;

int max = 0;

while (!q.isEmpty()) {

TreeNode node = q.poll();

int col = cols.poll();

if (!map.containsKey(col)) {

map.put(col, new ArrayList<Integer>());

}

map.get(col).add(node.val);

if (node.left != null) {

q.add(node.left);

cols.add(col - 1);

min = Math.min(min, col - 1);

}

if (node.right != null) {

q.add(node.right);

cols.add(col + 1);

max = Math.max(max, col + 1);

}

}

for (int i = min; i <= max; i++) {

res.add(map.get(i));

}

return res;

**Graph Valid Tree:**

Use union-find algorithm with rank and path-compression

**9.Alien Language**

**import** collections  
**class** Solution:  
 **def** alienOrder(self, words):  
 pre = collections.defaultdict(set)  
 suc = collections.defaultdict(set)  
  
 **for** pair **in** zip(words, words[1:]):  
 **for** a, b **in** zip(\*pair):  
 **if** a != b:  
 suc[a].add(b)  
 pre[b].add(a)  
 **break** chars = set(**''**.join(words))  
 *#get first char without predecesesor* charToProcess = chars - set(pre)  
 order = **''  
 while** charToProcess:  
 ch = charToProcess.pop()  
 order += ch  
 **for** b **in** suc[ch]:  
 pre[b].discard(ch)  
 **if not** pre[b]: *# if processed all predecesesors let's add curret char to charToProcess* charToProcess.add(b)  
 **return** order \* (set(order) == chars)

**Kth Largest Element in an Array**

**class** Solution:  
 **def** quick\_select(self, arr, l, r, k):  
 **if** 0 < k <= r - l + 1:  
 pos = self.partition(arr, l, r)  
 **if** pos - l == k - 1:  
 **return** arr[pos]  
 **if** pos - l > k - 1:  
 **return** self.quick\_select(arr, l, pos - 1, k)  
 **return** self.quick\_select(arr, pos + 1, r, k - pos + l - 1)  
  
 **def** partition(self, arr, l, r):  
 i = l  
 x = arr[r]  
 **for** j **in** range(l, r):  
 **if** arr[j] > x:  
 arr[i],arr[j] = arr[j],arr[i]  
 i += 1  
 arr[i], arr[r] = arr[r], arr[i]  
 **return** i  
  
 **def** findKthLargest(self, nums, k):  
 **return** self.quick\_select(nums, 0, len(nums) - 1, k)  
  
sol = Solution()  
print(sol.findKthLargest([3,2,1,5,6,4], 2))

**11. WordLadder2**

**import** scala.collection.mutable.ListBuffer  
  
**case class** WordNode(word: String, numSteps: Int, pre: WordNode = **null**)  
  
**object** FindLaddersApp **extends** App {  
 **private def** log(last: WordNode): Unit = {  
 **val** sbf = **new** StringBuilder()  
 **var** cur = last  
 **while**(cur != **null**){  
 sbf.insert(0, s"**$**{cur.word}(**$**{cur.numSteps})")  
 cur = cur.pre  
 }  
 *println*(sbf.result())  
 }  
  
 **def** findLadders(beginWord: String, endWord: String, wordList: List[String]): List[List[String]] = {  
 **var** result = *List*.*empty*[List[String]]  
 **var** queue = *List*.*empty*[WordNode]  
 queue = *WordNode*(beginWord,1) :: queue  
 **var** minStep = 0  
 **var** visited = *Set*.empty[String]  
 **var** unvisited = *Set*.empty[String]  
 unvisited = unvisited ++ wordList  
 **var** preNumSteps = 0  
 **while**(queue.nonEmpty){  
 **var** top = queue.head  
 queue = queue.tail  
 **val** word = top.word  
 **val** currNumSteps = top.numSteps  
 *log*(top)  
 *println*(s"currNumStep = **$**currNumSteps")  
 **var** continue = **false  
 if**(word == endWord){  
 **if**(minStep == 0) minStep = top.numSteps  
 **if**(top.numSteps == minStep && minStep !=0) {  
 //nothing  
 **val** t = **new** ListBuffer[String]()  
 t += top.word  
 **while**(top.pre !=**null**){  
 t.+=:(top.pre.word)  
 top = top.pre  
 }  
 result = result :+ t.toList  
 continue = **true** }  
 }  
 **if**(!continue){  
 **if**(preNumSteps < currNumSteps){  
 unvisited = unvisited -- visited  
 }  
 *println*(s"preNumSteps = **$**preNumSteps")  
 preNumSteps = currNumSteps  
 **val** arr = word.toArray  
  
 **for**(i <- 0 until arr.length) {  
 **for**(c <- 'a' to 'z'){  
 **val** temp = arr(i)  
 **if**(arr(i) != c){  
 arr(i) = c  
 }  
  
 **val** newWord = String.*valueOf*(arr)  
 **if**(unvisited.contains(newWord)) {  
 queue = queue :+ *WordNode*(newWord, top.numSteps + 1, top)  
 visited = visited + newWord  
 }  
 arr(i)=temp  
 }  
 }  
  
 }  
 }  
 result  
 }  
 *println*(*findLadders*("hit", "cog", *List*("hot","dot","dog","lot","log","cog")))  
}

**12.Best Time Buy Sell Stock**

def maxProfit(prices: Array[Int]): Int = {

if (prices.isEmpty) 0

else {

var maxprofit = 0

var minprice = Int.MaxValue

for (i <- 0 to prices.length - 1) {

if (minprice > prices(i)) {

minprice = prices(i)

}

else if ((prices(i) - minprice) > 0) {

maxprofit = (prices(i) - minprice) max maxprofit

}

}

maxprofit

}

}

**Design HitCounter**

class HitCounter {

private val elapsedPeriod = 300

private val times = Array.ofDim[Int](elapsedPeriod)

private val hits = Array.ofDim[Int](elapsedPeriod)

/\*\* Record a hit.

@param timestamp - The current timestamp (in seconds granularity). \*/

def hit(timestamp: Int) {

val index = timestamp % elapsedPeriod

if(times(index) != timestamp){

times(index) = timestamp

hits(index) = 1

} else hits(index) += 1

}

/\*\* Return the number of hits in the past 5 minutes.

@param timestamp - The current timestamp (in seconds granularity). \*/

def getHits(timestamp: Int): Int = {

times.zip(hits).filter(th => timestamp - th.\_1 < elapsedPeriod).map(\_.\_2).sum

}

}

**Binary Search Tree Iterator**

public class BSTIterator {

private List<TreeNode> stack = new LinkedList<>();

public BSTIterator(TreeNode root) {

pushAll(root);

}

/\*\*

\* @return whether we have a next smallest number

\*/

public boolean hasNext() {

return !stack.isEmpty();

}

public int next() {

TreeNode tmpNode = stack.remove(stack.size()-1);

pushAll(tmpNode.right);

return tmpNode.val;

}

private void pushAll(TreeNode node) {

for (; node != null; stack.add(node), node = node.left);

}

}

**10. Find a celebrity**

public int findCelebrity(int n) {  
 int canditate = 0;  
 for(int i = 1; i< n;i++){  
 if(knows(canditate,i)){  
 canditate = i;  
 }  
 }  
 for(int i = 0; i< n;i++){  
 if((i!=canditate) &&(knows(canditate,i) || !knows(i, canditate))) return -1;  
 }  
 return canditate;  
}

**Minimum Sliding Window**

public static String minWindow(String s, String t) {  
 if(s == null || t == null || s.length() < t.length()) return "";  
 int map[] = new int[128];  
 for(int i = 0; i< t.length(); i++){  
 map[t.charAt(i)] += 1;  
 }  
 int counter = t.length();  
 int begin = 0,end = 0;  
 int d = Integer.*MAX\_VALUE*;  
 int head = 0;  
 while(end < s.length()){  
 if(map[s.charAt(end)] > 0) counter -=1;  
 map[s.charAt(end)] -= 1;  
 end += 1;  
 while(counter == 0){  
 if(end - begin < d) {  
 d = end - begin;  
 head = begin;  
 }  
 if(map[s.charAt(begin)] == 0) counter += 1;  
 map[s.charAt(begin)] += 1;  
 begin += 1;  
  
 }  
 }  
 return d == Integer.*MAX\_VALUE* ? "": s.substring(head, head + d);  
}

**GenerateParentheses**

GenerateParentheses

**private def** generate(s: Array[Char], pos:Int,n: Int,open:Int,close:Int, res:ListBuffer[String]):Unit = {  
 **if**(close == n) {  
 res += s.mkString("")  
 }  
 **else** {  
 **if**(open > close){  
 s(pos) = ')'  
 *generate*(s, pos + 1, n, open, close + 1, res)  
 }  
 **if**(open < n){  
 s(pos) = '('  
 *generate*(s, pos + 1, n, open + 1, close, res)  
 }  
 }  
}  
  
**def** generateParenthesis(n: Int): List[String] = {  
 **val** res = **new** ListBuffer[String]()  
 *generate*(Array.*ofDim*[Char](2\* n),0, n, 0, 0,res)  
 res.toList  
}

**99. Evaluate Division**

1. x/y = 2 x → y is edge with weight 2.

2. create the graph with x/y and y/x edges.

3. Use DFS to find a/c path and calculate the path weight.

**91. Decode Ways**

1. Represent num\_Decoding(s) = num\_Decoding(s,1:k) +

num\_Decoding(s,k+1,n)

2. Use memoization to cache num\_Decoding for a substring

3. Take into account to consider 01 and 100… as invalid string

**621. Task Scheduler**

1. Sort the tasks by its frequences. Let start from bigger frequencies and run the inner loop by the cooling time taking the pending tasks from 25 — i task and increase the time by 1,

2. Again sort the frequences array in the descending order in each cycle iteration.

3. Run outer loop until the arr[25] is 0

**560. Subarray Sum Equals K**

1. Consider sum(subarray(0,j)) + k = sum(subarray(0, i)) for j < i.

2. Store a frequency of sum(subarray) in map.

3. if sum(subarray) — k in map to sum up frequency of it with total.

**468. Validate IP Address**

Use regular expression to extract IP parts:

res = re.match(r'^([0-9]{1,3})\.([0-9]{1,3})\.([0-9]{1,3})\.([0-9]{1,3})$', ip)

res = re.search('^([0-9abcdefABCDEF]{1,4}):([0-9abcdefABCDEF]{1,4}):([0-9abcdefABCDEF]{1,4}):([0-9abcdefABCDEF]{1,4}):([0-9abcdefABCDEF]{1,4}):([0-9abcdefABCDEF]{1,4}):([0-9abcdefABCDEF]{1,4}):([0-9abcdefABCDEF]{1,4})$', ip)

Check that there is no leading zeros in IP4: 001 and Ip address has to start from a > 0.

**289. Game of Life**

1. Allocate a buffer for calculating with 2 rows in size.

2. Put i-th row in a buffer. If a buffer reached size of 2 rows it would copy 0-row back to original array and append new row from array.

**46. Permutations**

1.create the function backtrack(first):

- check if first = len of arr then it returns

- iterate from first to end:

a) swap i and first and call backtrack recursively

b) swap i and first back

**151. Reverse Words in a String**

1. copy a string in inverse order.

2. iterate through the string and push the char to a stack

3. if it meets space then to pop the chars to result list — if the result list is not empty, it appends space before chars.

4. join the result result

**127. Word Ladder**

1. Use BFS for search endWord from beginWord

2. Store visited words to a dict to prevent repeative using of it.

3. Store in a queue a tuple (word,length)

4. When adding new neighbours to a queue it add theirs to visited dict and check if added word is endWord.