Problem	Status	Diffculty		Topics	Takeswaye	Aradysis	How I can come with the solution(Cinity if you read editorial)
					If you are chart a condition that searce hard	We reserved the months of even	
htps:/latcoder.jp/contexts/abc262/tasks/abc262_e	Difficuly in coding up the solution			Graph	y you can deduce a condition from li using some equation and then by to work on it. This could be much exaster to be sometimes.	The Content and Line Contractor of Reven number of Galage between blass and read vertices to that the sum of degrees of read vertices the vertices the vertice	
					In dp problems we can reduce one for loop continues if we are going to a new state from a faced amount of different states and they controls do in its a states are we	Instant of Instance a astro-loss for installions	
https://eekode.com/problems/new-21-game/	Done	Leetcode medium		DP, Probability	We can make in a running product or sum and update it accordingly.	was maintained a turning autoration of strandonton, was maintained a turning autoration and calculated probability using that.	
						We used a dp to maintain the the prefix,	
https://wicoder.jo/content/s/abc2102/taxiss/abc2102_d	Done	Hard		Dp	dr If is a question, you are given a choice for two operations. -Hif the given problem is too hard solve an easier one	number of elements and remainder.	
https://wicoder.jo/contents/ads/252/taxio/ads/252_f	Not Done	Hard		Athoc	We can by the problem by just doing one operation only.		
					In dp problems sometimes we can store another dimension	In this problem instead of forming	
https://codeforces.com/problemat/problem/47840	Done	2000		Dp	which is very large in a another small dimension and we can retrieve it using two dimensions together.	dg/j[g] we did dp[h][r] and retrieved g from h and r.	
bitps://codeforces.com/gym/100605/problem/1	Done			Interactive	In Interactive problems we could use a function that we would have and just call it.	Here we made a function that compare values in a merge step.	
					In problems where path is changing i.e you cannot just apply do as the substates are changing think about	In this publism we observe that whenever we are past a certain all the portials	I will have to notice certain properties of the paths, maybe it doesn't change at all, maybe it revvenes
htps://codeforces.com/problemat/problem/15528	Done	22	20	Dp	whether there is something about the paths which is constant and or by to apply dp to the subproblems. Observation is key	baltind us are closed. This leads to the observation that we can apply do to the ataleas. In this periodicity we draw a BCK true	or maybe it follows the certain properties like it does in this case is either path is always same. All the portals are open.
					In problems where we need to construct something, we need of make observations. Like what properties does the actives need to have in comfirm the experiment.	We made a closervation that if this graph has a bridge we work the able to do it. Now we looked at the edges. We observed	
htps:/kodeforces.com/content/118/poblem/E	Done	20	20	Graph	Doars some of the edges need to be tree edges or backward edges? Observation is key.	that the downward edges about! point in that decision and backward edges upward no we can do from acuros to	
					When we need of find x and y that satisfy screething If is a good idea to separate x and y on LMS and RMS and see if you could do and/ther problem which is much	We converted $2^n x + 2^n y + x^n y = K$ to $x = (k+4)(k+2) - X$ . We meed to do now is find $y + 2$ such that $K + 4$ is divisible	
https://www.codechef.com/AUG221Diproblems/HLEQN	Done			Maths	easier wrt to time complexity When we think about maximizing MCD. Just try to find the	by y + 2 and see if its greater than 2.	
					(if we are indired bit of x).		
					When we need to find the lower bound we can use a amy latead of set if the values are arrait enough. Three complexities of harmonic numbers can be decieving.	We first constructed a table for array. We Elemate through every all and found maximum value for every 21 to M	When we think about maximizing MOD. Just try to find the closes element to k*x - t(inclusive)
https://codeforces.com/broblemast/broblem/484.62	Done	22	10	Maths		where M is twice the maximum element.	(If we are finding MOD of a).
						Do should be constructed so as to have	
https://codeforces.com/content/1719/problem/D1	Not DOne			Dp		amaleut number of dimensions possible. Some time we don't have to everything till we can don't lik 1-1 and that film too.	
					In dp problems when you are pushing and you might need	Here we went from i + 1 to i + 255. As	
https:/kodeforces.com/contest/1720/croblem/D1	Done			De	to push from i + 1 to n-1 it coul be possible that maybe you don't need to go Hi - 1. it is possible that we can go Hi + c and that is sufficient. This could be dependent on the nature of incut.	Input is bound to be less than or equal to 200. When we will apply not number grawter than 1 + 255 we will be guarated that we cart of al lower zor score.	Try to see how pattern in the input can make our bounds annalier.
						Here we used dp(g)] as the maximum datance we can travel from station i	
hites (lastroda remiterblamsteininen, sumbas disabalise, airea)					In some question some times we could change the dp instead of what the problem statement is because of some input constraints. We cruck these a surveyord immediate measure and chark	an didopping at jatatona. Aderwards was exclusived ans as the minimum value of j for which doph-193 == 0. Wa only main termilipse if is nonabha	
(Solution 1)	Done			Dp	the given condition after calculation dp.	to do so.	We first made a observation that we should just keep goin gand reliaf if we cant get to the next station,
							the problem with this was we might need to have at earlier positions. The acutation for this we go as far as we can. We don't welly need to be able to using a car.
bipa ilaa koda comipoblama inizimum aumbas, of sakadino akona'					In some problems we don't need to make a greedy choice at that	Here we keep going until we run out of fuel and we fail when we rely need to from the biggest faul pump possible which we also in a priority	When we are of able to get further we aslect the one with maximum fuel and keep going. We don't need to make a choice fold row, recardly fuel on un
(Solution 2)	Done			Priority queue	apot. We can make a choc retractively. Similar to 4, The key to seeing this type of patterns is to realize they ou are using a to toop for some iterations	queue.	We can refrective disclose regarding their regiment primery up We can refrective disclose regimentation. Just hink about how you can use a for loop, the key to aveing it is that we are
biza ileekade combroblemale inverse caire army	Done			Dp	and the sensorie are just gening and or multiply by a constant amount. You can maintain a perfork sum which will do this. In some it might seem like there are a lot of possible state, but	we recuce a cumulative sum op to reduce one for loop. If the second one for loop. If the second out a lot states are repeating and	just adding climan amount of indices using a tor koop lenion could be done using prefixSum.
https://advoider.jp/contentia/adv2055/assistable2055_a	Done			Do.	It can be that is bit of tables are repeating which is not inhultive bud you don't know the search tables and constructing a fractional dp array might not work. In these type of questions one are user are as a dn	there are only C(n <sup>+</sup> 2) status at any given point we used a map as a do hasked of hashlional dp as the dp array will be humangus and a lot of whate are beinder, analem	It could seem that there are a lof atales. Try to analyse exactly the number of unique states in the quastion. New If the dimension for the dp anomy is going happ and a lot of atales will neverbe reached you can think whose using a number of atales and neverbe reached you can think
feedback ()				-,			
					When it seems like the dimensions of a dp will go out of bounds think about how you can represent the state where you want transitions from using other variables which will nearly in lower	We used dph(b(d)) and the sumebr of ways to do n transitions such there are x final signs, y accord sleges and n - (x+y) third steps. Now	When the dimension bounds are going out of line think about how you can represent in another dimension which will reduce the bounds .
https://arcoder.jp/contesta/abc205/test/s.labc205_a (Solution 2)	Done			Dp	bounds. We used this idea in problem 7(Different options) When you tried this question it seemed neally hard to determine	we calculate ou current position and make the transitions.	This happens when we are doing different type of transitions which can take us to a different place.
hites (Jaalmula remiterblamataciona.cs).bu.alashaal	Done	Lastrois madum		Granth	the number of connected components because it was quite hard to deal with "and ". We ended up partitioning the graph into 4 parts and that made it really easy to move across.	We partitioned the graph into 4 parts and found that a unbar of promotion of the second state of the secon	When it seems hard to traverse a graph think about how you can manipulate the graph such that it becomes easier. Here instead of taking a box as a vertex. We pretingent the how initial name and then service disk.
	Lun			unapr.	1) The problem that involves time. You need to think that to reach	TALIN UN TRANSPORTATION CONJUNIES.	The particular of the case of a set of the apprendice.
					a casemanch the time required was be the time required to do the maximum of all the things. If you need to reach a destination which has a burdle at distance x, the time taken will be maxidizatance/apead, hurdle opening time.		
https://codeforces.com/content/17/6/problem/C	Done	20	10		<ul> <li>distance leftitipeed)</li> <li>To calculate maxing() +x) for a lot of x, you can just calculate maxing() and then add x while answering.</li> </ul>	We used answer + molprefDurTme+2*sultargth, forwardSArewer + sultargth, backwardsSulArswer)	When a problem insulter time. You need to think that to reach a destination the time nequired will be the time nequired to do the maximum of all the things
https://codeforces.com/croblemast/croblem/182/D	Done	14	10	Strings	<ol> <li>When you think about checking every thing think about the constraints that question imposes</li> </ol>	Here we only need to check for prefixes whose length divide the length of the atrino	
					This is similar to multi knapsack problem. In multi knapp sack problem Instead of deciding how many times we need that thing which will		
					lead to logn transitions we can just give a option to do it again Instead of opting from dp(2)-40(5), dp(71, dp(5), dp(11) We can add dp(5) to dp(5) and when we from dp(5) to dp(7) we have already added dp(5) to dp(5) and when we from dp(5) to dp(7) we have	Here instead of deciding how many times we take a particular item we decide how big of a jump we	Next time when you have to add a thing to multiplex of numbers consider doing
https://codeforces.com/content/17/5/problem/D	Done	20	20	Dp	In the quantizons where we have to satisfy some inequality think about the only cases where this will be true. Most of the times there will be	should make using a value. A cool question Here the only possible numbers are (x, x), (x, 2x)	that to the same layer and the rest of it will take care of it itself.
https://selands.com/problems/secs-cat/	Done	Leetcode hard		dp.ttr's	When it seem like it is hard to find a topological order, think BFS.	(A, any	
					depling = ministransolupp)+10-11_depl+2001)+400_massiphepith-22_depl=10-10+4001 in particular accounted, it was not observe any dense likely arrange the logar that the string	We used dp[[0]] as the dp regarding who wins if the configuration was as 1. Dance as use that encounch.	
https://codeforces.com/contest/1728/problem/D	Done	180	10	Game theory, dp	fir to instant appoint in that includes an oney wanty include the one that both makes sums along from manifold (in [1]) [1], (b) [2] (would be the one that both makes sum along gets. ALlow's string doesn't neversually correlate with bob.	consignation was ap-11 where we can and approximate and deal with the cases where there is a draw carefully.	
					One observation you can make is that you wont need to make the step more than 2 times. Second observation is if no arrays are equal you wort; need to o anything Third observation is not one in the foregoing the step of		
https://codeforces.com/contest/1728/problem/C	Done	14	20	greedy	is a number that is equal to it, if not you apply the function to the number.		
					In problems which involve some probabilities or say loo paths of equal probabilities are not the second statement to be an another and the second statement of the second stat	Here we asked if Been is a edge belowen 1 and i here 19 inner melen nil folgelasherhik.	
https://codeforces.com/content/1722/problem/E	Done	180	20	Interactive	or kay the answe in anexatr try to come with a sourcer that won't work aways out will belivery very needs.	about 25 thmea and we will tak with proceeding 2*-25 which is really low.	
					In questions where we can play around with one edge(ary (a, v) while computing distances. It is useful to calculate to calculate distance for every uthom source to zero) and hore every up breat. To calculate distance we want us to save."	We computed distance to every vertex u for the source	
htps://www.filproblemant/hask/1155 (Solution using 2 djkstras)	Done			Graph	<ul> <li>Diplate for the revenued graphs, no declares waters in view you to target, we can nut and or Diplate for the revenued graphs and tart from target.</li> <li>Now we can consider every edge and play around.</li> </ul>	Then we computed distance for every vertice to n Then for every edge (L, v) we minimized (dist[1] = dist[0] = w(L, v[2])	
https://www.codechef.com/submit/REMONE	Failing 1 test case				In problems where a number is added to a subaartsy, rember that the difference between adjacent elements doesn't change.	Here we used it to find a missing element	
					Hist 1: When there is a problem in which we have to optimize a meeting point think servery asserts? Hist 2: If there is a problem in which a block function (increases then decreases or demants the increases it is increased which we can assert		
hips ikodeforos conkonisti 1733 problem B	Done			Ternary Search	Hint 3: When the problem implies some kind of precision checking hink binary and termary search	Here we just terrary searched on the optimal position	
						We form a sugement tree where each node consists the mastum	
htps:/kodeforces.com/content/1473/problem/D	Done			Segement Tree	venen mere are some queries and you can somehow merge 2 halves, think segment bee.	væve u ver atter, minimum value 0 vill attein and the final value FCr a given node answer vould be maximum - minimum + 1/	
					When you are asked to qury(L, R) it could be that we can do it using queries(0, L-1) and (R + 1, n-1). If that, the case think dp.	We used two dps and merged it using int lower.imit = min(#if.finit, right.finit = value[]1]); int upperLimit = man(#if.ascord; right.secord = value[]1]);	
https:/kodeforces.com/content/1473/cooblem/(2) (Sol 2)	DOne			dp.	When the value increases or decreases by 1. The number of unique values it takes are max - min + 1	and the answer is constant of the state of t	
					1) When there is a simulation in which some elements are getting deleted or array is changing length, it is a good idea to use stack or two stacks to simulate the process. In this case ware not entally simulating the process but at stack could be	look at the byo of the stack. If it is greater we know this is it we set the time to 0 and push it to the stack. If the signment is a starting of the stack with the start of	
						amouse works to reach there, increase we way pop until we reach there and calculate the first required to neach there which is man(time)Tafkach, trend(Stop()) The reason we can pop the settern it because we know that	You need to observe that we will get killed by the time we mach next greater element
htps://codeforces.com/content/112/problem/11 (Sol 1)	Done			Stack	3) When we need the next greater element or stuff like that stack is a good idea.	this will kill no element on the right	on the left. When a question involves something liek next greater or previous grater element stack is a good idea.
https://codeforces.com/content/310/problem/8 (Sol 2)	Done			Set, Simulation	1) When there is a simulation, think about how you could do it fast In questions that involve games, you need to realise what is going on. Ask these questions:		
htps://codeforces.com/content/1738/problem/C	Done			Set	(1) Does everyoes were to just maximise things for themeselves? 2) Or is the goal to make sure that the other guy doesn? (achieve anything You will need to use different dp for both cases.	We used dpp[]]] and oddDpp[]]] to calculate if alice can get sum even and odd.	
					Here II was really hard to decide at which apol you want to cut a tree. When we have a hard time moving forward, we should think the problem in a opposite to backward way We can activate forw uch cut ad one meed to get a three with held winnes! If Alem we		
					binary search for minium height with at most k operations. Note that height possible is monolencea with number of operations as as number of operations increases height docreases		
https://codeforces.com/content/1723/problem12	Time Limit Exceeded			Trees, Binary Search Binary Search	www.www.ch.otem vorea when we are asked teh minimum health equited and staff to be arases When it assess hard to move forward in minimum and maximum problems it is effent a coord late to do binnyr Saarch for the araver	Here we binary searched for the maximum number of binne	
				ay analys			
					venen a question involves a chess board please open one on <u>chess com</u> some experimentation In questions like these we should always do a lot of experiments and write down observations		
https://codeferens.com/codas#11713/wwhatevi7	Done			Athos	When we want to find a number that has occured just once and other has occured halos use nor Be very candul of occere cause in these questions If the problem involves chase thinks color		
https://codeforces.com/context/174/Voroblem/E	Done				In some problems when you are required to remove the for loop in dp problems, If could be helpful to do both forward and from back ward transitions at the same times.	We were using a for loop to check if $  A_i   ==  -i-1\rangle$ for every j instead of that for ever i we checked if $  A_i   =   A_i  + 1 $ in the	
	-				In a tree when you are asked for a subtree query, you can use segment trees(overvill if they ask for no updates). Now L and R for the segment tree can be calculated usign the		
htps://www.fiproblemanillask/1127	Done			Trees, Segment Tree	sear area ere sme while using dh. Keep in mind of not use vector in a map as it is very slow Array for the segment here can be calucided usign preProcess order and preprocess order can done using shart time or just do it within dh.		
blips /kness //problemsel/lask/1053/	Done			Dp	Somelimes in order to reduce a for loop we can store 2 objects in our dp answer	Here we used pair-II, IP- in our dp. dp.finit aloned the minimum number of elevator rides for our bitmask. dp.aecord aloned the minimum weight possible.	
bilga ilizoideforena com kontesti 1742/problem 11	Done				in processms that involve adding up score powers to adjacent elements. Think about the end state is also (Wash tappers when the it all add does. Here there would be a element at the end whose III worth be added. So we just takes the sum and maximes this hid or minimal time.		

and the second sec				When pproblems involve subsegments. Think about how you can form one without affecting	We saw that odd lengthd won't be able to from such segments.		
	Done			others, you need to see to first observe when you can't make a segment.	Now with even lengths every lengths os 2 will have a answer		
				This is very hard to come up with. But it really helps tot visualiz the end state. Suppose number of zeroes is k			
him (Investment cominential) (1753/weblam)	Dove			What happens? We end up with k amous in the first k positions if a transition happens outside of the first k positions if doesn't help us. So what is important that has happened to be. Number of zeroes in the first k positions. From here you can enable main formations.	Later 2 init (min m) Ten dilitianti (initia)		
	Dune			can easily make transitions. A way instructive problem: When we need to find a final number that is greater than a particular number, my idea was to do a recursive function but we will need a maxium	Las prize (grise) (grise) (frish), inten oppigrishoppig (shiphoppigrish) p. To achieve this we used segment trees, RMQ would work if there		
				or weeky angement queep.	rece to govern.		
biles Jonisfores, com/codes/ 1740/problem/C	Done			SOmetimes it can be dangerous to make assumptions and draw geometry in a symmetric ways to by to consider all cases. And think of the entremetes when minaking floares while trying to solve geometry problems.			
				Now dp[]] be the number of rolls it takes to take us from i to $i-1$ difference. dp[] = 1 + (n-i)n(dp[] + dp[+1])			
https://codeforces.com/problemet/problem/54510	Done						
				You will have to realise that the answer will be the Longest Increasing Subsequence. The way to see it would be that for indices 11, 12, 13, 14, 15, A1, A2, A5			
https://codeforces.com/content/343/problem/D	Done			will for a independent set if for d and e d < e and Ad < Ae. Hence proved.	New we list charled that whether a number ran be not by		
blas /kass Narobierseitlask/1081	Done			When the output has some limit, we can just bruteforce the answer	brute force. In this problem we observed that whenever there is a 0 on the array the side wins. 50 the gay who gets to 0 first will win.		
https://codeficerum.com/content/1747/conbinen/C	Done			In the problems that involve games, You need to start with the final state. Think about what the final state will look like and think about the moves leading up to it.	Allow will choose the minimum number on lab right alde of the array. If it is smaller than A(1), she wins else she losses.		
				Whenever we update a range like add some number to the range. ALways think about what we will do in the equivalent difference array. It can be much easier. As when we do some when to the news it difference stress that are an end to the start and right and which on difference of the stress stress that are stress that are stress that and stress that and stress that the stress of the stress of the stress of the stress stress that are stress th	We create a difference array. Like [2,3, 5, 7, 9]. The difference array would be [2, 1, 2, 2, 2] When we word in add 3 to [1, 3] if would be [2, 5, 2, -1, 3]. And in rat is notice for mother we		
htps:/kass.filonblemastflash/1651	Done			be updated in constant time. In this question if fell liek time colpesity would be huge if you use inclusion exclusion but if tume, rol that a subset of normal participants from the field.	just find the sum (0, () to get the value at index i.		
https://codeficerum.com/content/1755/conbiners/D	Done		Number Theory	Remeber that 213°59 terms > 1e0. And As A() will reduce by a one of the primes every time the quotient will not tasks value more than 11 more than 9 times in these types of cuantulant is unally imposited to note what is the invariant			
				Here if is not obvisious at all What is happening is everytime we do the operation (1111111) is getting scored to A*8. I don't think is could focure this out	So if sor of the arrays is not 0000000 or 111111 we could achieve the goal. As (11111) will only change the signs. So we find check if it is complement of A or is same. Now we just make env A to and check if it is in (0000) or (11111). If it is the latter.	When things complimentary things are fipping in 2 AArrays check what is happening to the xcr, product, sum of the combusied array. Navbe they remain constant, maybe they are setting chanced by a fixed constant.	
https://codeforces.com/contest/1753/problem/C	Done		Constructive Algorithms	the privates triangle-free graph with the maximum number of edges is a complete, bipartie graph in which the numbers of vertices on each side of the bipartition	we could just to thDese 3 operation(1, 1), (1, n), (2, n)	Finding the invariant is key in these type of questions.	
https://codeforces.com/problemast/problem/41/E	Done			are as scient as conside. Our algorithm which involved always selecting the one with smallest number of edge also worked by lack.			
https://www.filpstalianserilask/1653/	Done			This question involves suler tour. The key property of suler tour is it always goe after smalles distance from one node to other bull it will also visit some other subsamys. To find LCA we found the finismum height to the required interval.			
				This was a beaufful quantion. We ere having a problem desailing with the prime factors that are desards in the research k			
https://codeforces.com/content/1225/problem/D	Not able to debug		Number Theory	For all all to be x*k, for every prime p the number of times it divides all and all should be divisible by k. To deal with the above thigh we could just take modulo of every priem factor. Just beautiful		Next time you have a problem dealing with extra prime factors think about whether taking a god or mobile will help.	
http://taes.filondolerreelflask/1130	Done		da, trees	When you are asked to consider every edge separately in a dp on trees question. You can have soem kind of prefix sum of all the edges. Then do scentifying for the particular edge and add the remaining.	Here we considered every edge separately to calculate dp1[u]. We did de1tul = maxide1tub, de2tv1 = 1 = de2tu1 = maxide2tu1, de1tv10		
				A very instructive problem. It is a common technique to calculate two dp arrays for some dp on			
				trees problems. Unually one array is responsible for calculating results within the subtree noted if it The other departy calculates result cutside of the subtree noted at it. Cree key idea is when we have to consider every vertex. Maybe we need maximum of			
bilge sitemen Riproblemmetilhenk (1132)	Done		dp, trees	an une verse versions or surt or au the other vertices. We can use ideas like second maximum and total sum.	We calculated the biggest path of subtree at root I and other than at root I and took the maximum.		
https://codeforces.com/oroblemasi/broblem/19338	Done		graph, construction	I we want which is that the answer could be only 1 and 2. Note that we can choose a square on the corner which will have at most 2 neighbours and deconnect it.	Now we just tan dfs fr every cell cand checked it converting it to . makes the graph disconnected.	In questions where is involves cancementing graph or in salmest any question as yourself there is a upper limit for the answer. Also ask yourself if there is a upper limit until which you would loop.	
				I reak you covervation is that we don't need to iterate for a length more than 100 for any I. This is because every character can appear maximum 10 times as there are 10 distinct number Whanswer there are all in advantator or time to be interest the			
https://codeforces.com/content/1745/problem/10	Done			versewave seve are aren aprazees or ogen involved thit about the maximum amount of times you will need to iterate. Think about whether the answer is capped.	This is trivial		
				In some same queries problems where we are not griver in reviews values. It reads has a proof	Here we process queries from right to left sorted with respect to left index. We update a array B such $BB = 1$ and if that element has already occurred, we set in removing value to $D'$	The reason this works is we will never have to process a query lowards right so we will never miss anything. 50 you will need to realize its ghere something anxiety never than having ***	
https://taxes.filproblemastitask/1122	Done		Range Queries	Idea to process them in some order liek Mots algorithm.	TO answer a query we use segment tree and calculate sum(1, 0, n-1, 1 r)	leftmost index is enough.	
				In games problems where it assers very difficult to calculate different states, think about how you got any enterestivation on minimum difficult.		Think about whether you could create a position where for every move of some player the similar tended with the second s	ery move of 5 there is a move of A.
bilze /inodeforces.com/problemes/problem/1973A	Done		Games	coue use symmetry arguments.	in ma process we placed a circle a the center. Now for every move of B there is a mirror image of a move of A.	now must if moves first there isn't always a move for B as there might not be enough space but if there is move possibility for B there will always be one for A.	
				In problems think about how much you can take greedily. (1) if $\pi 350 = r 1$ is implies that god(a, b) = 1 (2) if $\pi \sqrt{3}$ , b) is 1 then $\pi 350$ will allow be 1 or exceeded will be concises with n			
ake	Done			3)If we divide a by this remainder than altern%b = 1.			
https://codeforces.com/context/472/problem/D	Done		Graph	When you have the length of al possible paths. If you take the kth minimal path, if it does not the connect corresponding vertices in the graph created til now it must be a edge of a minimum spanning tree.			
https://codeforces.com/coblemat/coblem/1542C	Done		Probability	Too anous three of expected value as a dra tree in a lot or queetions, rou can prostorce through it in it is finite. If it is infile you can form some recursive relation and find the value mathematically.			
	_			In interactive problems if you have more queries than you can have think about how you will	Here initial we come up with this 0101111222333 The idea was to reverse the effect of the previous query		
https://codefores.com/content/1765/problem/D	Done		Number Theory	merge teem There are not more than log2(n) prime divisors of a number n. If we know one prime divisor for every number from 1 to n we can know ever prime divisor of a numbe in log2(n).	Now we just merge them (0*0) = (0*1) = (1*2) = (2*3) = (3*4)		
https://codeforces.com/content/1762/problem/D	Done		Interactive	In problems where you are asked to output two values and any of them could be correct. Think about how you could start with 2 numbers, take every number onces and eliminate one of them			
				When you are required to visit some vertices in a tree, you can eliminate all the leaves that you are not going to visit. Need to be careful here. Method 2: We can just determine if a vertex is important. To do this we need to know if we have a important			
Problem - F - Codeforces Problem - C - Codeforces	Done		Tree	vertec in a subtree. This can be done using set or colons. In questions that involve binary ating to think about prefix and suffix, by to make observationswith regards to consecutive 1 or 0 in sufficiently.			
				When you are makign exchanges between stuff to make things balanced. You might by a greedy approach where if things are unbalanced you just balance there in a greedy way. There will alwave be a soot for which you have 1-0 if you call have a different count of ones.			
Problem - D - Codebross	Done		Constructive	because you have target - 1 and target + 1 count of 1s. That is all. In problems that involve chance a rance to a caratin number. Think of extrems principle i.e. focus the	Here it was observed that we can always change a array greater than 3 su ch the every element is a number.		
			Constructive	biggest and smallest element. We could think of a invariant here after every slep.	Cases with n = 2 and n = 3 were done using brute force.		
Perbian - C - Codeforma	Done			Invariant: The difference between the largest and ith largest number rever increase after every step.			
Peoblem - C - Codebores	Done			Now during the same how we continue exactly hisk towers left, as our effort would be in vair. This would happen when the difference between largest n%k + 1 the number doesn't decrease ever. This will happen when the difference served			
Postern - C - Codebras	Done		Constructive	Now campt the set round in we contraine excerpt must been set, as our ends would be in van. This would happen if they all ne equal. Note that this would happen if they all ne equal. Note that this would fill happen that must be in less than rounds as it will be reduced to zero before and we would be able to get infikitores.			
Polan, C., Coldenna	Done		Constructive	The work speen sets in a difference is always from the first in the scale start of the set of the s	In the question bit first charronizion is the value would be bigger for header 1 and , Maxmum value the landscare on the scheme is when it will any first first prime for string another 15 coefficient 5 the another scheme is a scheme in the scheme in the scheme is a scheme in the scheme in the scheme is a scheme in the scheme in the scheme in the scheme is a scheme in the scheme		
Dalar G. Colema Talar S. Colema	Done		Constructive	This avail bigger than the difference of the second provide the difference of the second disk rest average of the second disk	In this question with the classrowidts in the value would be ligger for baseler ( and ). Maximum value, the measurem measing can take a board of greater than the monomum value that contains when it is $-1$ and it.		
Rahan L. Sakkan Panan R. Sakkan Rahan 1956 Jakkan	Done Done		Constructive Démandra	The sharehold provide the second seco	In the quarter with the distance is the value and its larger to heater i and ). Between values the second	And make charmy shore, that when the function fails that matchings when And make these well and ( contribute. We free you shot is follow some proceedings?	
Rosen G. Coldman	Done		Constructive Bitmaska	The sample provides the difference bases (figure 2014) if the source bases of the same of	In the quarters with the discretizent is the only and its logar to heaver (see). Montoon values the second	Just miss shear allow fait when the Justice states the maximum value And main how will and y contracts. Will have much tables were precedited?	
Rosen-G. Soldense Robert - R. Soldense Parker - 1938 - Dokkonse Man Souderse constanter (17) Souderso	Done Done		Constructive Bitmaska Bitmay Search	The sharehold provide the destinated bases (transformed as the first include the share of the sharehold the share of the sharehold the shareho	In this spectrum table but discretisfies it the value much tai togger for header (and ). Montoon values the spectrum of the s	Just miss descentions that where this functionalises the measurem values And make there will i and j contributes. Will they would to failers once a percentilise?	
Rassa G. Sakkan Palan J. Coleksa Rass 1996 . Sakkan Markadama amtantat (Tilandam) Markadama amtantat (Tilandam)	Done Done Done Done Done Done Done Done		Constructive Elemantes Binnary Search Constructive Mathe, dy	The sharehold provide the strength of the sharehold provide the strength of the sharehold provide the strength of the sharehold provide the sharehold prov	The bandwise the first description is the radius from the steps of the transmission of the steps of the step	Jud nek deen blir fel ske tij hodoridate by nektrer ske Ant ske ter al i anj onfelde. Wil hy ned is blev one produktio?	
Calas - C-Calasa Calas - C-Calasa Calas - U-Calasa Calas - U-Calasa San -	Done Done Done Done Done Done Done Done		Constructive Bitmaska Bitmary Search Constructive Matha, dy	The second property of the first sector density of the second property of the second proper	The structure is the isocherspectra is the point much the topp in the structure of the structure is the structure isocherspectra is the structure isocherspectra isochersp	And make allower think the solution is a metallow when And make how all ( and ) contributes Well they word is failed on two proceedings?	
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Marker, J., Sokkara       Parker, R., Sokkara       Parker, S., S	Date       Date <td></td> <td>Creduction  Ennotes  Ennotes Enn</td> <td>The sharehold section of the sharehold section</td> <td>In the states is the is described in the in the in the intervence of the state is the intervence of the states and intervence of the</td> <td></td> <td></td>		Creduction  Ennotes  Ennotes Enn	The sharehold section of the sharehold section	In the states is the is described in the in the in the intervence of the state is the intervence of the states and intervence of the		

			It can be shown that f(1) = 2*n - 1 Lefs suppose that we knee doing the process. Now in already state each state is repeated in 1.bi steps.			
			Here pi = 1/2*n. Now that state with zero difference will repeat on average 2*n steps. Now to from 0 to 1 difference we will get in 1 step always. SO to go from 1 to 0 it will take on average			
https://codeforces.com/content/177///problem/D (Solution 2)	Done	Dp, Markov chains	2*n - 1 steps. Now we have ((0) = 0. f(1) = 2*n - 1. We have a relation between f(1), f(i-1), f(i-2) we can do this			
			Now dp() be the number of rolls it takes to take us from i to i -1 difference. dp() = 1 + (n-i)(n(dp() + dp()+1))		Whenever we are supposed to reduce some stuff from i. Try to also come with	
(Solution 3)	Done	Dpr			atuff that how many steps will it take us to go from I to i-1 and then do the sum	
				The idea here is we split it into pairs of a and afx as much as possible and the remaining one is also a subsequence with so 0 and we merge it into one of them.		
			When you have in writt thinks into some number of subsequences, think should in writt them	The maximum amount of sussequences possible are number of values with bits as the highest bit of x New for any such value afre will be smaller than them to us can always constant as many subsequences.		
bilge - Voodeforges, gom kontest/1787/problem T	Done	Constructive	into maximum or minimum number of subsequences and then split or combine them Now subsequences and subarrays of size 1, 2 and 3 are really special so look out for them always.			
				In this question we can see that for any subset with size k > 3 any subset of this subset of size will have the value preader than or equal to 8.		
				Consider any subset s of size k+3		
				. Let I be any number such that the I		
				-th bit is set in at least k=2 elements of s		
				. If we pick any 3 elements of this subset, then by Pigeonhole principle the i		
			<ol> <li>Always remember that subsequences of length 1, 2, 3 are special. Always be on the lookout for them.</li> <li>Think about what the solution will look like? What characteristics it would have.</li> </ol>	-th bit would also be set in at least one of these elemental If this is not true then the there are 3 elements in a		
https://codeforces.com/problemest/problem/13656	Done	Constructive	Now wrenever this is automay partitions autoparties aways think about how you can reduce a and if reducing doesn't affect the solution. Just lay around it.	-th bit set, which is not possible.		
			Lefs say we are able to i1, j1 from I0, j0. Now jo + R - L = j1, R = L + j1 - j0. This means that whenever Lis minimum R will also be minimum.			
Nine (Invisiones controlast/1984/wohlers)D	Draw	Granth	So minimizing one would minimize the other. This could be does with 0-1 BTS. Dilette would very likely fell			
blipe (leicoder pricontesta/dp/leska/dp_m	Done	Dp	1) When you adding sum of continuous segment in a dp problem. Remember prefix sum always			
			later size of size h			
			Observation 1: if max(r, g, b) - min(r, g, b) $i = 1$ , answer = (r + g = b)/3 Observation 2: if b $i = 2^n(r + g)$			
			answer = r + g Now here we can guess during the contest theat answer will be r + g if condition is valid else sum 3.			
			Now One thing more			
			max(r, g, b) - secondMax(r, g, b) <= 2 if we substract 2 from maxoimum and 1 from secondMax. Now first we take as many times 2 flowers from the highest and 1 second highest until the difference between			
			men a z		First make them as abalnoed as possible.	
			Eventually we reach a situation where it is either (1, 1, 0) or (a, 0) where a += 2. This is reach a situation		Now the invariant is the beautiful part.	
Problem - 478C - Codeforces	Done	Matha			Take 2 from amximum and one from second maximum.	
			When there are two number involved and the calculation depends on both. Think about whether you can senarche the test case into n is m and n is m			
Problem - 5728 - Codefrance	Done		Here he case n > m can be solved usign pigeonhole principle and n <= m could be soled using dp			
		+	When you have to find a maximum over a range in a dp problem you can use segment tree.			
			THis might not always be trivial liek from 0 to i-1, it may be somethign liek for values below A(), here you will have to find explanate from 0. All 10			
			Longest investigation Schedularte problem could be done this way. But we will problem need to some			
hipe //wicoder.jp/contenta/dp/baska/dp_g	Done	dp, segment tree	kind of coordinate compression or something.			
Problem - 339D - Codeforces	Done	segment tree	when in tartistion type range from every evenuse par-vin, into current-cange an even and update mem accordingly			
			Observation 1: For full array, the answer would the adjacent dots moving towards each other.			
			Now for any subset the answer would be the same.		I think this should always be there in your mind. We have to find for every subset how	
Problem - D - Codebross	Done	Constructive			What if for every stopping point if we can calate all the subset a associated with it.	
			when you have to crear things in a cartain way, lake two things, ask yourser what will be th econdston such that find will be amaler.			
https://codeforces.com/content/632/problem/C	Done	Sorting	The thought process is similar to exchange arguments.			
			Whenever the exact value doesn't matter but the relative ordering does, do coordinate compression first as it can help to deal with a lot of things much easier.			
Problem - 1472E - Codebross	Done	Coordinate Compression	In this question things would be very meany indeed without contribute compression. Always be careful while doing it maybe the ordering of x and y does matter like in this question.			
			Instead of finding good characters for every subarray. For every character c we can find the number of subar it is good for. This is a very common problem solving technique.	ala		
			wherever you have to numebr of good substrings, always keep the cnt map technique in mind.			
htps://www.codechel.com/problems/DASHA7tabvalatement	Done		which is pretty cool.			
			In these type of procestra the quartery required is generally less than 3 or 4. Now always start observing patterns in the simple stuff liek "assess".			
			There are even "a"			
			Even 'saa' Od 'saaa'			
			Now what if the length is "aaa" odd			
			There are odd "a" even "aa"			
Problem - 1554D - Codeforces	Done		How can we combine so that result is odd.			
https://ee/code.com/problems/populating-neut-right-pointers-in-eech-node/	Done		In Inked lat and tree questions always take care of examples that give NULL as value The key idea is that if any bit is on in more than 2 numbers, answer is 3.			
			Now if you want to find if a cycle exits between node u and node v. Just delete that edge and run bits. BFS will also find the smallest cycle.			
Problem - 12058 - Codeforces	DOne		Note that you can;t find all cycles, only the cycles with minimum size. Remeter that whenver you are required to find ocd(a + k, b+ k) it can only take value of divisors of (b - a).			
			Just always remember that if you are required to find god(s, b), it can take values of divisors of a and b. Here we just iterated through all the divisors of b - s. Calculated the minimum k and then got the lom.			
Problem - 1152C - Codeforces	Done		Laso if eyou have to find minimum k such that a + k id divisible by d. It is (d - a%d)%d.			
			The first observation is there are going to be useless elements and they don't don't affect the answer. Now there is going to be array that represents the final state before we apply operation 2 in succession.			
			In this array B, either Bi is Bi-1 or Bi is Bi-1 + 1. When Bi is Bi-1, that element is useles and if you observe carerefully this happens only when Ai = B/			
			in there are no useless elements never is sum(A) - $m^{1}(m + 1)/2$ . NOw to determine if there is useless element, we will have array 8 which will have value x at index x			
https://codeforces.com/problemet/problem/1784/C	Done		instally. And it was some x - kx where kx is number of elements not exceeding k. Now it is just handling updates which is also very tricky.			
Lu Lui			in mese type of problems we need o form a relation using a map and then use a very standard technique. We need to form a relation between i and j, the idea is really cool We multiply bothsides by (ai - a)			
Problem - 12420 - Codebroas	Done		And then put as on one side and all on other side. DSU is a standard technique to find connected components of a complement graph.			
			One of the cocleat question I have ever seen. Solution Approach: Suppose there exists such a solution, what will it look like? What characteristics it will have	a7		
			Lefs say there is such array b. NOw for every al, there exists bj, bk, such that bj - bk = al			
			Now this means there are n edges and n vertices. This implies there will be a cycle. What will the cycle look like. Here bv1 - bv2 + bv - bv3 = 0			
Editorial of Global Round 15 - Codeforces	Done		It will sum to zero in some order(order means order of signs), right? Now we just iterate over all the substetes of all possible signs 3'n and check if sum is ever equal to 0.			
			Avery common technique. For every element we can just calculate the number o concatentaions it is a part of New to anticipate the second of every element. We will read up the loss are up of a second or the loss of the second	,		
Problem - C - Codeforces	Done		accordingly.			
			First we will solve this question when all characters are different. At every point we can choose whether In take this character or not an answer doll a 211 Now the problem occurs when there is a separation			
Mine change and comparable and DSI BSEC/	ADME		character. To deal with that we store the position of a the last occuring charceter and do dnll as 2'dnllastill - 11 since these will not recented w.			
			A very educational problem.			
			You can possibly create a function that depends on R, L. Now you can create f(L) store it in a multiset. Here we considered has here of create			
			tat Where length is not greater than k 2nd where length is greater than k			
			We solved these 2 cases using multiset So yet always remember if you have to maximise some subarray, write afunction, involving it			
Poblem - D - Codebross	Done		and the do it The main problem was on how to compute the sum. We used do to do that, dol'ITI represents that			
			we select j of the ith numbers to be prime numbers that represents the factorisation.			
https://codeforces.com/context/1794/problem/D	Done		I would say you were on the right path.			
			Lesson 1: If you want to check if the given number of things exists in a two sets. Take or and see if it equals.			
			Here we need two sums to be odd. This would only be possible if one is odd and one is even			
			We take xor in this case. If they are both odd or even we get zero else we get 1.			
			Lesson 2. If we want to store information that if a characters occurs and if it does it occurs even number			
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	Done		of times we can use two integers to represent it. A very cool application of pigeonhole principle.		So if we have to found some stuff of same value. Think about whether that value	
https://www.codechef.com/problems/CENDFTREE	Done		of times we can use two integers to represent it. A very cost application of pipershole principle. xov/while of any path would be between 0 and 2*20. So if we get more than 2*20 paths one of them is bound to match	Easy implementation details	So if we have to found some stuff of same value. Think about whether that value is bounded in some way. If yes you can generate that thin groze than that and by pigeonhole principle you have your answer.	
https://www.codechef.com/problems/CINDFTREE	Done		of times we can use to integrate to represent it. A wary cost application of piperchelp intropida. Sofialis of any path would be between 0 and 2°20. Sof we get more than 2°20 paths one of them is board to make 1) You can see that in 10°11. So maybe the algorithm has something to do with aprily).	Easy implementation details	So if we have to found some shaft of same value. Think about whether that value to bounded in some way. If yes you can generate that thin gmore than that and by signorhole principle you have your answer.	
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Problems Links(Number Theory)	Status	Last Attempted	Problem Links(Combinatorics)	Status	Problem LinksCSES(DP)	Status	Last Attempted and Total Attempts
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Problem Links (Dp on Trees)							
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1) If the given problem is too hard, solve an easier one.

2) Techniques in which we do some operations

-> Think about the process in reverse if it is hard to think i forward direction

-> Think about the final state

-> Think about each operation individually and see

if two operations combined give rise to some different operation

3) When questions involve time you will very likely need to take maximum of stuff

4) When problem ask for N <= 40 but you can do N <= 20, Try MEET IN THE MIDDLE

Main Link	https://discuss.codechef.com/t/data-structures-and-algorithms/6599								
KMP article									

Invariants	Pigeonhole	Extremal Principle	Coordinate Compression
https://codeforces.com/problemset/problem/1747/D	Problem - 577B - Codeforces	Problem - 1478C - Codeforces	Problem - 1472E - Codeforces
Problem - 478C - Codeforces			