杭银理财

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浙江工业大学第19届“杭银理财杯”
大学生程序设计竞赛暨全国邀请赛

Problem A. Grammy Wants to Earn Big Money

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Grammy wants to earn big money recently. She goes to hzbank every day, and deposits money on Mondays, Tuesdays, Wednesdays, Thursdays, and Fridays. In Saturdays and Sundays, she learns about wealth management in the bank. Today is Sunday. You want to know the number of days Grammy will deposit money in the next n days (including today).

Input

Input contains a single integer $n(1 \leq n \leq 30\,000)$, the total number of consecutive days Grammy will go to the bank.

Output

Output a single integer x, indicating the total number of days Grammy will deposit money.

Example

standard input	standard output
3	2

Problem B. Puzzle

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Grammy is solving an interesting puzzle. She has three positive integer sequences A, B and C of length n. She can do the following operations arbitrary number of times.

- Replace $A_1, A_2, A_3, \ldots, A_n$ with $A_2, A_3, \ldots, A_n, A_1$.
- Replace $B_1, B_2, B_3, \ldots, B_n$ with $B_2, B_3, \ldots, B_n, B_1$.

Note that the index is still $1, 2, 3 \ldots, n$ after one operation.

Assume each operation takes 1 second. Now Grammy wonders the minimum number of seconds to make $A_i + B_i = C_i$, for all positive integer i between 1 and n (inclusive).

Please help her to determine the minimum time. If Grammy can't make the condition satisfied, output -1.

Input

The first line contains one integer $n(1 \le n \le 100\,000)$, denoting the length of the sequences.

Each of the following three lines contains n integers, denoting the sequence A,B, and $C(1 \le A_i, B_i, C_i \le 10^9)$.

Output

If the answer does not exist, output -1.

Otherwise output one integer, the minimum number of second(s) to satisfy the condition.

Examples

standard input	standard output
3 2 1 3 3 1 2 3 6 3	3
3 1 2 3 3 2 1 2 4 6	-1

Note

For the first example, Grammy can do one operation on sequence A and two operations on sequence B.

The new sequence A is $1, 3, 2$, and the sequence B is $2, 3, 1$

Now we have $A_1 + B_1 = 3 = C_1$, $A_2 + B_2 = 6 = C_2$, and $A_3 + B_3 = 3 = C_3$.

For the second example, we can prove that there is no possible way to make the condition satisfied.

Problem C. Terrible Additive Number Theory Problem

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Define P_i as the i-th prime.

Find the number of solutions x such that $x = \prod_{i=l}^{r} P_i = 2^k P_{r+1} - 1$, where $l, r, k \in \mathbb{N}^+, 1 \le l \le r$, and $x \le n$.

Input

Input contains a single integer n ($1 \le n \le 10^{18}$)

Output

Output a single integer, indicating the number of solutions less than or equal to n.

Example

standard input	standard output
100	0

Problem D. Interstellar

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Grammy is travelling through wormholes! There are n wormholes in the space. Grammy is located at the first wormhole and her target is to reach the n-th wormhole. Travelling through wormholes consumes energy. The i-th wormhole has energy value a_i.

Assume Grammy is at the i-th wormhole, she can travel to a wormhole j if $i < j \leq n$ by consuming $(j-i)^3 \times a_j$ energy. The total energy consumed during the whole process is the summation of the energy consumed by travelling through wormholes.

Please help Grammy to determine the minimum total energy consumed by travelling from the first wormhole to the n-th one.

Input

The first line contains a single integer $n(1 \leq n \leq 100\,000)$, denoting the number of wormholes.

The following line contains n integers. the i-th integer denotes $a_i(1 \leq a_i \leq 100\,000)$.

Output

Output a single integer denoting the minimum total energy consumed.

Example

standard input	standard output
5 10 1 10 1 10	19

Note

The following is one of the best ways Grammy can choose:

Travel from wormhole 1 to wormhole 2, consuming $(2-1)^3 \times 1 = 1$ energy.

Travel from wormhole 2 to wormhole 4, consuming $(4-2)^3 \times 1 = 8$ energy.

Travel from wormhole 4 to wormhole 5, consuming $(5-4)^3 \times 10 = 10$ energy.

The total energy consumed is $1 + 8 + 10 = 19$.

Problem E. Recharge Cycle

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Grammy is playing her favorite video game. There are 4 skills and 4 types of energy in the game, and the storage limit of energy type i is c_i. Skill i can only be activated if its corresponding type of energy is full. Activating skill i will use up all energy of type i and then produce a_{ij} energy of type j.

At the beginning, every type of energy is fully recharged to its own limit.

Grammy wants to find a strategy to activate the skills $11^{45^{14}}$ times, but she does not want to make it too complicated, so she decides to make every four consecutive skills to be pairwise distinct.

Can you tell Grammy if a valid ordering exists?

Input

The first line contains 4 integers $c_1, c_2, c_3, c_4 (1 \le c_i \le 80)$, representing energy needed for each skill.

In the next 4 lines, the i-th line contains 4 integers $a_{i1}, a_{i2}, a_{i3}, a_{i4} (0 \le a_{ij} \le 80)$, representing the recharge parameter of each skill.

Output

If a valid ordering exists, output "Yes" in one line, otherwise, output "No" in one line. (without quotes)

Examples

standard input	standard output
20 20 20 20 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10	Yes
80 80 80 80 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10	No
40 40 40 40 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10	Yes

Problem F. Tree Game

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	256 megabytes

Grammy has a tree with n white vertices. She wants to color k vertices black, and she does not want **more than one** vertex to be ugly. A vertex is considered ugly if and only if the following conditions are met.

- The vertex is black.
- At least one of its neighbors is white.
- At most one of its neighbors is black.

Can you help her to color the nodes?

Input

The first line contains 2 integers $n, k (1 \leq k \leq n \leq 300\,000)$, indicating the number of vertices and the number of black vertices needed.

Each of the next $n-1$ lines contains 2 integers $u, v (1 \leq u, v \leq n)$, indicating that there is an edge between vertex u and vertex v. It is guaranteed that these edges form a tree.

Output

If a painting scheme exists, print k integers in one line, indicating the black vertices after painting. Otherwise print -1.

Example

standard input	standard output
5 3 2 1 5 2 2 4 1 3	1 2 3

Problem G. Resource Calculator

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	256 megabytes

Grammy is playing her favorite video game. The characters in that game have multiple ascension levels, normal levels, and 3 talent levels.

A Character can upgrade its normal level by gaining experience. We assume that the only way for a character to gain experience is to feed it with coins and the following 3 types of experience materials. A "Wanderer's Advice" can provide 1 000 experience to a character, while an "Adventurer's Experience" can provide 5 000, a "Hero's Wit" can provide 20 000. Whenever a character gain 1 experience, 0.2 coins will be spent as upgrade cost. The amount of experience needed is in the following table.

Level	**To Next**	**Level**	**To Next**	**Level**	**To Next**
1	1000	31	30650	61	108950
2	1325	32	32250	62	112050
3	1700	33	33875	63	115175
4	2150	34	35550	64	118325
5	2625	35	37250	65	121525
6	3150	36	38975	66	124775
7	3725	37	40750	67	128075
8	4350	38	42575	68	131400
9	5000	39	44425	69	134775
10	5700	**40**	46300	**70**	138175
11	6450	41	50625	71	148700
12	7225	42	52700	72	152375
13	8050	43	54775	73	156075
14	8925	44	56900	74	159825
15	9825	45	59075	75	163600
16	10750	46	61275	76	167425
17	11725	47	63525	77	171300
18	12725	48	65800	78	175225
19	13775	49	68125	79	179175
20	14875	**50**	70475	**80**	183175
21	16800	51	76500	81	216225
22	18000	52	79050	82	243025
23	19250	53	81650	83	273100
24	20550	54	84275	84	306800
25	21875	55	86950	85	344600
26	23250	56	89650	86	386950
27	24650	57	92400	87	434425
28	26100	58	95175	88	487625
29	27575	59	98000	89	547200
30	29100	**60**	100875	**90**	MAX

A Character can upgrade its ascension level at normal level $20, 40, 50, 60, 70$, and 80. Before upgrading its ascension level at the corresponding normal level, the character cannot gain any more normal experience. If the amount of experience that a character can gain is less than the amount that an experience material can provide, the overflown part of experience are wasted, and will not spend coins. Additionally, extra ascension materials and coins are needed for upgrading the character's ascension level.

The first type of ascension materials is gems (Agnidus Agate, Prithiva Topaz, Shivada Jade, Vajrada

Amethyst, Varunada Lazurite, Vayuda Turquoise, and Brilliant Diamond). Each type of gemstone has 4 rareness levels: sliver, fragment, chunk, and gemstone.

The second type of ascension materials is boss drops, which has nothing special.

The third type of ascension materials is mob drops. Mob drops also have different rareness levels: common, rare, and epic.

The last type of ascension materials is local specialties, which is (probably) the character's favorite item in the world.

The amount of materials needed is in the following table.

Ascension level	Normal level	Gemstones	Boss Drops	Mob Drops	Specialties	Coins
0→1	20	1 Sliver	0	3 Common	3	20000
1→2	40	3 Fragments	2	15 Common	10	40000
2→3	50	6 Fragments	4	12 Rare	20	60000
3→4	60	3 Chunks	8	18 Rare	30	80000
4→5	70	6 Chunks	12	12 Epic	45	100000
5→6	80	6 Gemstones	20	24 Epic	60	120000

The 3 talent levels are upgraded mutually independently. In order to upgrade a talent level, 4 types of different materials and coins are needed.

The first type of talent level-up materials is normal mob drops, which is ths same as the third type of ascension materials.

The second type of talent level-up materials is talent books, which has 3 different rarities: Teachings, Guides, and Phylosophies.

The third type of talent level-up materials is weekly boss drops, which has nothing special.

The last type of talent level-up materials is "Crown of Insight", which is only used in the last talent level upgrade.

The amount of materials needed is in the following table.

Talent Level	Coins	Mob Drops	Talent Level-Up Materials		
			Talent Books	Weekly Boss Drops	Crown of Insight
1→2	12500	6 Common	3 Teachings	0	0
2→3	17500	3 Rare	2 Guides	0	0
3→4	25000	4 Rare	4 Guides	0	0
4→5	30000	6 Rare	6 Guides	0	0
5→6	37500	9 Rare	9 Guides	0	0
6→7	120000	4 Epic	4 Philosophies	1	0
7→8	260000	6 Epic	6 Philosophies	1	0
8→9	450000	9 Epic	12 Philosophies	2	0
9→10	700000	12 Epic	16 Philosophies	2	1

Grammy has a character with ascension level a_0, normal level l_0, and talent levels t_{10}, t_{20}, t_{30}, and she wants to upgrade the character to ascension level a, normal level l, and talent levels t_1, t_2, t_3. If the character gains experience after leveling up to normal level l, the extra experience gained is also considered as wasted experience and will not spend coins.

Grammy wants to ask you about the amount of materials needed. If there are multiple ways to use experience materials, choose a way that minimizes total experience wasted. If there are still multiple ways, choose a way that minimizes the amount of experience materials used.

Input

Each test contains multiple test cases. The first line contains a single integer T ($1 \le T \le 200\,000$) — the

number of test cases. Description of the test cases follows.

The only line of each test case contains 10 integers $a_0, l_0, t_{10}, t_{20}, t_{30}, a, l, t_1, t_2, t_3$ ($0 \le a_0 \le a \le 6, 1 \le l_0 \le l \le 90, 1 \le t_{i0} \le t_i \le 10$). It is guaranteed that the normal level can be reached while in the corresponding ascension level.

Output

For each test case print the answer in the following format.

Print 5 integers in the first line, indicating the number of coins needed, the number of local specialties needed, the number of boss drops needed, the number of weekly boss drops needed, and the number of "Crown of Insight" needed, respectively. It can be proved that under given constraints, the number of coins needed is an integer.

Print 3 integers in the second line, indicating the number of "Wanderer's Advice" needed, the number of "Adventurer's Experience" needed, the number of "Hero's Wit" needed, respectively.

Print 4 integers in the third line, indicating the number of Slivers, Fragments, Chunks, Gemstones needed, respectively.

Print 3 integers in the fourth line, indicating the number of common mob drops, rare mob drops, epic mob drops needed, respectively.

Print 3 integers in the fifth line, indicating the number of teachings, guides, and phylosophies needed, respectively.

Example

standard input	standard output
2 0 1 1 1 1 0 20 4 5 6 0 20 3 3 3 1 30 6 6 6	286535 0 0 0 0 1 0 6 0 0 0 0 18 42 0 9 39 0 340085 3 0 0 0 3 2 10 1 0 0 0 3 57 0 0 57 0

Problem H. Minimum Edit Distance

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Assume A and B are two strings. Define $d(A, B)$ as the minimum number of following operations to change A into B.

- Insert a character in A
- Delete a character in A
- Modify a character in A

Grammy has two strings S and T. She wants to find a string R such that $d(S, R) + d(T, R)$ is minimized.

Input

The first line contains a single string $S(1 \leq |S| \leq 1000)$. S only consists of lowercase alphabets.

The second line contains a single string $T(1 \leq |T| \leq 1000)$. T only consists of lowercase alphabets.

Output

Output a string R such that $d(S, R) + d(T, R)$ is minimized and $1 \leq |R| \leq 100\,000$.

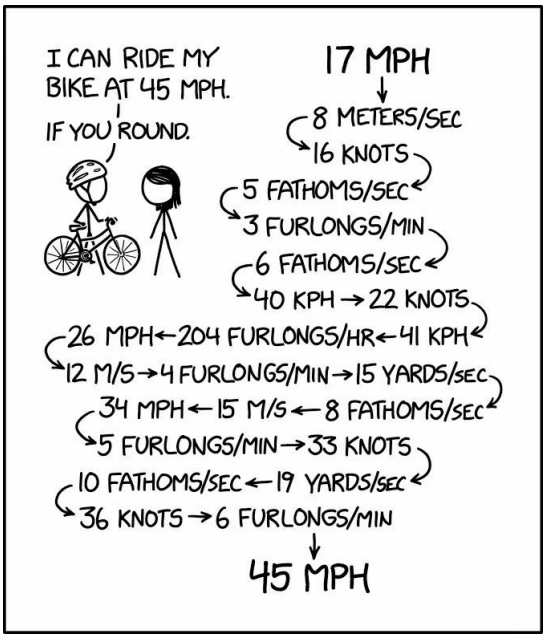
Example

standard input	standard output
abc bcd	bc

Problem I. Rounding Master

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Grammy has obtained master degree in rounding(she awarded herself). She can use her rounding techniques to obtain a super large number by changing a unit and round.



In particular, she has a number x, which initially equals to 1. She will perform the following operation k times, and finally make her number $x \geq n$. In each operation, she will multiply x by q, and round it. Rounding a number w means to find integer a such that $a \leq w < a + 1$, and if $w \geq a + 0.5$, then change w into $a + 1$, otherwise change w into a.

Can you help her to choose the minimum q such that after k operations, x will be greater than or equal to n.

Input

The first line contains two integers $n, k (1 \leq n, k \leq 10^{18})$, representing the final target and the number of operations.

Output

Output a real number q, representing the answer. You answer will be considered correct if its absolute or relative error does not exceed 10^{-6}.

Example

standard input	standard output
18 4	2.125000000000

Problem J. Mountain

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Grammy is climbing a mountain. She can either walk a meters by spending 1 stamina, or jump c meters by spending b stamina. If her remaining stamina is less than b, she can still jump once and use up all her stamina. She wants to know how many meters she can climb if she has S stamina at the beginning.

Input

Each test contains multiple test cases. The first line contains a single integer T ($1 \le T \le 30\,000$) — the number of test cases. Description of the test cases follows.

The only line for each testcase contains 4 integers in one line, $a, b, c, S (1 \le a, b, c, S \le 10^9)$.

Output

For each testcase, output a single integer, representing the maximum distance(in meters) Grammy can climb.

Example

standard input	standard output
4 1 1 4 5 1 4 1 9 1 9 8 10 114 514 1919 810	20 9 17 94145

Problem K. Pairing Game

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Recently, Grammy invented a new game about pairing cards.

Grammy's deck consists of $2n$ cards with numbers written on them. For each integer between 1 and n (inclusive), there are exactly 2 cards with that number.

At the beginning of the game, all the cards are placed in a row as a good arrangement, which satisfies the description below.

1. An empty row of cards is considered as a good arrangement.

2. If S is a good arrangement of cards, then placing S between two cards with same numbers will also result in a good arrangement of cards.

3. If S, T are both good arrangement of cards, then placing S to the left of T will also result in a good arrangement of cards.

We define d_i as the number of cards between two cards with number i on them.

The game consists of several turns. In the i-th turn, Grammy will remove all remaining cards with number $n - i + 1$ and calculate the score of this turn $-\sum_{j=1}^{n-i} d_i$. Can you help her to calculate it faster?

Input

The first line contains a single integer $n(1 \leq n \leq 300\,000)$, indicating the maximum number written on cards.

The second line contains $2n$ integers $a_1, a_2, ..., a_{2n}(1 \leq a_i \leq n)$, indicating the initial arrangement of the cards. It is guaranteed that each number between 1 and n (inclusive) occurs exactly twice, and the arrangement is good.

Output

Output n lines, the i-th line contains the score of i-th turn.

Example

standard input	standard output
4 3 4 4 2 1 1 2 3	6 2 0 0

Problem L. Race

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Pigetown is a city with n crossings and m bidirectional roads. A huge race event is going to be held in Pigetown. There are k types of race tracks, and each road in the city can be viewed as a particular type of race track.

In the race, each participant should choose an integer i such that $1 \leq i \leq q$, start at crossing S_i, visit each type of race tracks the same number of times, and finally arrive at crossing T_i in order to finish the race.

Grammy wants to know if it is possible to finish the race when choosing each integer i. Write a program to help her solve the problem.

Input

The first line contains 4 integers $n, m, k, q (1 \leq n, m, q \leq 200\,000,\ 1 \leq k \leq 30)$, indicating the number of crossings, the number of roads, the number of race track types, the upper limit of chosen integer i, respectively.

In the next m lines, each line contains 3 integers $u, v, t (1 \leq u, v \leq n, 1 \leq t \leq k)$, indicating that there is a bidirectional road between crossing u and crossing v with type t.

In the next q lines, each line contains 2 integers $S_i, T_i (1 \leq S_i, T_i \leq n)$, indicating one possible combination of starting point and ending point.

Output

Output q lines.

In the i-th line, if it is possible to finish the race while choosing integer i, output "Yes", otherwise output "No"(Without quotes).

Example

standard input	standard output
7 9 3 4 1 2 1 2 3 1 3 1 2 1 4 3 5 6 2 6 7 1 6 7 3 7 7 2 5 5 1 6 7 1 4 2 4 2 5	Yes No Yes No

Problem M. A Chinese Idiom

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	256 megabytes

There is an ancient Chinese saying: the larger the watermelon, the larger the watermelon rind.

Grammy is a critically minded girl. She thinks this idiom is incorrect in some special situations. In order to support her, you want to find such an example.

You found two round watermelons. The smaller one has radius r_1, you cut it apart and figured out that its rind has thickness d. The larger one has radius r_2. Before cutting it open, you want to know the maximum thickness of the second rind to let the volume of the second watermelon rind to be smaller than the volume of the first watermelon rind.

Note that the watermelons are perfectly ball-shaped. A watermelon has two parts — watermelon pulp and watermelon rind. The watermelon pulp is also ball-shaped and it is concentric with the watermelon itself.

Input

Each test contains multiple test cases. The first line contains a single integer T ($1 \le T \le 30\,000$) — the number of test cases. Description of the test cases follows.

The only line for each testcase contains three integers in one line, $r_1, r_2, d (1 \le d < r_1 < r_2 \le 1\,000)$.

Output

For each testcase, output one real number in a line, representing the maximum thickness of the second watermelon rind.

Your answer will be considered correct if its absolute or relative error does not exceed 10^{-4}.

Example

standard input	standard output
2 2 3 1 5 7 1	0.2855823834 0.4423278138