A. Maximum GCD

time limit per test: 1 second
memory limit per test: 256 megabytes

Let's consider all integers in the range from 1 to n (inclusive).

Among all pairs of **distinct** integers in this range, find the maximum possible greatest common divisor of integers in pair. Formally, find the maximum value of $\gcd(a, b)$, where $1 \le a < b \le n$.

The greatest common divisor, $\gcd(a, b)$, of two positive integers a and b is the biggest integer that is a divisor of both a and b.

Input
The first line contains a single integer t ($1 \le t \le 100$) — the number of test cases. The description of the test cases follows.

The only line of each test case contains a single integer n ($2 \le n \le 10^6$).

Output
For each test case, output the maximum value of $\gcd(a, b)$ among all $1 \le a < b \le n$.

Example

input
```
2
3
5
```

output
```
1
2
```

Note
In the first test case, $\gcd(1,2) = \gcd(2,3) = \gcd(1,3) = 1$.

In the second test case, 2 is the maximum possible value, corresponding to $\gcd(2,4)$.

Maxi

$1 \rightarrow n$

1, 2, 3, 4, 5, 6 . . . n

(1, 5)

max (a, b)

a mid, $\frac{6}{a+1}$

1, 2, 3

max = 1

idea

n/2

1, 2, 3, 4, 5, 6

~~(a, b)~~

$\frac{6}{4}$ x

$\frac{6}{5}$ x

$\frac{\cancel{6}}{\cancel{3}}$ 2

$\rightarrow \frac{5}{2} \Rightarrow 2 \rightarrow$ (2, 4) $\rightarrow$ 1

1, 2, 3, 4, 5 | 6, ...

(2, 4)

(1, 4) = 1 $\rightarrow$

(2, 4) = 2 $\rightarrow$

B)

B. EhAb AnD gCd

time limit per test: 1 second
memory limit per test: 256 megabytes

You are given a positive integer x. Find **any** such 2 positive integers a and b such that $GCD(a, b) + LCM(a, b) = x$.

As a reminder, $GCD(a, b)$ is the greatest integer that divides both a and b. Similarly, $LCM(a, b)$ is the smallest integer such that both a and b divide it.

It's guaranteed that the solution always exists. If there are several such pairs (a, b), you can output any of them.

Input
The first line contains a single integer t $(1 \le t \le 100)$ — the number of testcases.

Each testcase consists of one line containing a single integer, x $(2 \le x \le 10^9)$.

Output
For each testcase, output a pair of positive integers a and b $(1 \le a, b \le 10^9)$ such that $GCD(a, b) + LCM(a, b) = x$. It's guaranteed that the solution always exists. If there are several such pairs (a, b), you can output any of them.

Example

input
```
2
2
14
```

output
```
1 1
6 4
```

Note
In the first testcase of the sample, $GCD(1,1) + LCM(1,1) = 1 + 1 = 2$.

In the second testcase of the sample, $GCD(6,4) + LCM(6,4) = 2 + 12 = 14$.

(a, b)

GCD(a, b) + LCM(a, b) = x

a ↗↘ b ↗↘

$1 \le a, b \le 10^9$

a == b

GCD(a, b) + LCM(a, b)

= x

a, b = 100

$a, b = 100$

$a = 5, b = 5$

$a == b$

input $= x$

$2 = GCD(a,b) + LCM(a,b)$

$(a, 2b) \to (a,b) = a,\ (x-a)$ - LCM

$(1, x-1),\quad (1, x-1)$

$1 \qquad (x-1)$

$2 \to 1 + 1$

$2 \to GCD(a,b) + LCM(a,b)$

* Euclidean Algo $\to$ GCD is max(a, a)

a

$\to GCD(a/2, a/2) \Rightarrow a/2$

$\to LCM = x - GCD$

$(a,a) - a$

$\to x - GCD$

$2 \to GCD(2,2) = 2 + LCM(2,2)$

$2 + 2 \Rightarrow 4$

$2 \to GCD(1,2) + LCM(1,2) \to < 2$

$\geq 2 \quad 2$

Ex: $1 + 1 \quad 2 = 3$ ✗

0

$2 \to GCD(1,1) + LCM(1,1)$

$1 + 1$ ✓

b

$3 \to GCD(1,2) + LCM(1,2)$

$1 + 2 \Rightarrow 3$

$4 \to GCD(2,2) + LCM(2,2)$

$5 \to GCD(1,4) + LCM(1,4)$

a b

$1 + 4 \Rightarrow 5$

C)

C. Madoka and Strange Thoughts

time limit per test: 1 second
memory limit per test: 256 megabytes

Madoka is a very strange girl, and therefore she suddenly wondered how many pairs of integers (a, b) exist, where $1 \le a, b \le n$, for which $\boxed{\frac{\operatorname{lcm}(a,b)}{\gcd(a,b)} \le 3}$.

In this problem, $\gcd(a, b)$ denotes the greatest common divisor of the numbers a and b, and $\operatorname{lcm}(a, b)$ denotes the smallest common multiple of the numbers a and b.

Input

The input consists of multiple test cases. The first line contains a single integer t $(1 \le t \le 10^4)$ — the number of test cases. Description of the test cases follows.

The first and the only line of each test case contains the integer n $(1 \le n \le 10^8)$.

Output

For each test case output a single integer — the number of pairs of integers satisfying the condition.

Example

Output

For each test case output a single integer — the number of pairs of integers satisfying the condition.

Example

input

```
6
1
2
3
4
5
100000000
```

output

```
1
4
7
10
11
266666666
```

Note

For $n = 1$ there is exactly one pair of numbers — $(1, 1)$ and it fits.

For $n = 2$, there are only 4 pairs — $(1,1)$, $(1,2)$, $(2,1)$, $(2,2)$ and they all fit.

For $n = 3$, all 9 pair are suitable, except $(2,3)$ and $(3,2)$, since their lcm is 6, and $\gcd$ is 1, which doesn't fit the condition.

$n \to 1$ to 10^8

$n = 2$

$(1,1)\ (2,2)\ (2,1)\ (1,2)$

$2^n \to$

$3 \to 2^3 \Rightarrow 8$

$n^2 \to$ all combinations

Output

For each test case output a single integer — the number of pairs of integers satisfying the condition.

Example

input

```
6
1
2
3
4
5
100000000
```

output

```
1
4
7
10
11
266666666
```

Note

For $n = 1$ there is exactly one pair of numbers — $(1, 1)$ and it fits.

For $n = 2$, there are only 4 pairs — $(1,1)$, $(1,2)$, $(2,1)$, $(2,2)$ and they all fit.

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$2^n \to$

$3 \to 2^3 \Rightarrow 8$

$\boxed{n^2 \to \text{all combinations}}$

$$\boxed{\frac{LCM(a,b)}{GCD(a,b)} \le 3} \quad \Big\} \quad LCM(a,b) \le 3 * GCD(a,b)$$

$a, b \to (1, \text{ to } n)$

GCD == LCM ($a == b$)

$1 \to \{1,1\}$

$+$

$2 \to \{2,2\}, \{1,2\}, \{2,1\},$

$GCD(2,2) \Rightarrow \cancel{2}$ ①

$LCM(2,2) \Rightarrow \cancel{2}$

$GCD(2,1) = 1$

$LCM(2,1) = 2$

$\frac{2}{1} \le 3$ ✓

$(1,2) == (2,1)$

$(2,2)$

$(n,n) \to 1$

$(2,3)$, (a,b) $\to$ $\frac{6 = LCM}{1 = GCD}$

$+$

$3 \Rightarrow \{1,3\}, \{3,1\}, \{3,3\}$

$4 \to \{2,4\}\{4,2\}\cancel{\{4,4\}}$

$5 \to \{5,5\}$

$6 \to \{2,6\}\{6,2\}\cancel{\{3,6\}}\cancel{\{6,3\}}\cancel{\{6,6\}}$

$4, b$

$LCM = \cancel{12}$ ①

$GCD = \cancel{2}$

$(n,n) + (n, \frac{n}{2})\ (\frac{n}{2}, n) + (n, n/3)\ (n/3, n)$

$1 + \left((n, \frac{n}{2})\ (n, \frac{n}{3}) \right)$

$(6, \frac{6}{3})$

$(n, \frac{n}{2})$

$(10, 5) \to$ ✓

$(6,2)$ ✓

$LCM = 10$, $GCD = 5$, $2 \le 3$

$8 \to (8,2) \to$ LCM $\Rightarrow \frac{8}{}$ (4)

GCD $\Rightarrow \cancel{2}$

$>3^x n$

$\frac{\text{LCM}}{\text{GCD}} \Rightarrow 3$

$\left(n, \frac{n}{4}\right)$ NO

$7 \xrightarrow{n} (7,7)$ ✓

$n = 6$

$8 \to (8,8)$ ✓ $\cancel{(8,8)}$

$(6,6)$ $(6,6)$ } 2

$9 \to 9 + \left(2 \times \left(\frac{n}{2} + \frac{n}{3}\right) - \cancel{\frac{n}{6}}\right)$

$\frac{9}{\cancel{2}}$ $4 \to \left(\frac{n}{2}\right)$

$\left(\frac{n}{2}\right) \times 2$

$\frac{9}{\cancel{3}}$ $3 \to (n, n/3)$

$(n, n/3) \times 2$

$(n/3, n)$

$(1,2) \to (2,1)$

order

$$\boxed{n + 2^k\left(\frac{n}{2} + \frac{n}{3}\right)}$$

} is it clear

D. Cat Cycle

time limit per test: 1 second

memory limit per test: 256 megabytes

Suppose you are living with two cats: A and B. There are n napping spots where both cats usually sleep.

Your cats like to sleep and also like all these spots, so they change napping spot each hour cyclically:

- Cat A changes its napping place in order: $n, n-1, n-2, \dots, 3, 2, 1, n, n-1, \dots$ In other words, at the first hour it's on the spot n and then goes in decreasing order cyclically;
- Cat B changes its napping place in order: $1, 2, 3, \dots, n-1, n, 1, 2, \dots$ In other words, at the first hour it's on the spot 1 and then goes in increasing order cyclically.

The cat B is much younger, so they have a strict hierarchy: A and B don't lie together. In other words, if both cats'd like to go in spot x then the A takes this place and B moves to the next place in its order (if $x < n$ then to $x + 1$, but if $x = n$ then to 1). Cat B follows his order, so **it won't return to the skipped spot x after A frees it, but will move to the spot $x + 2$ and so on.**

Calculate, where cat B will be at hour k?

Input

The first line contains a single integer t ($1 \le t \le 10^4$) — the number of test cases.

The first and only line of each test case contains two integers n and k ($2 \le n \le 10^9$; $1 \le k \le 10^9$) — the number of spots and hour k.

Output

A, B

n

The first line contains a single integer t ($1 \le t \le 10^4$) — the number of test cases.

The first and only line of each test case contains two integers n and k ($2 \le n \le 10^9$; $1 \le k \le 10^9$) — the number of spots and hour k.

Output

For each test case, print one integer — the index of the spot where cat B will sleep at hour k.

Example

input

```
7
2 1
2 2
3 1
3 2
3 3
5 5
69 1337
```

output

```
1
2
1
3
2
2
65
```

Note

In the first and second test cases $n = 2$, so:

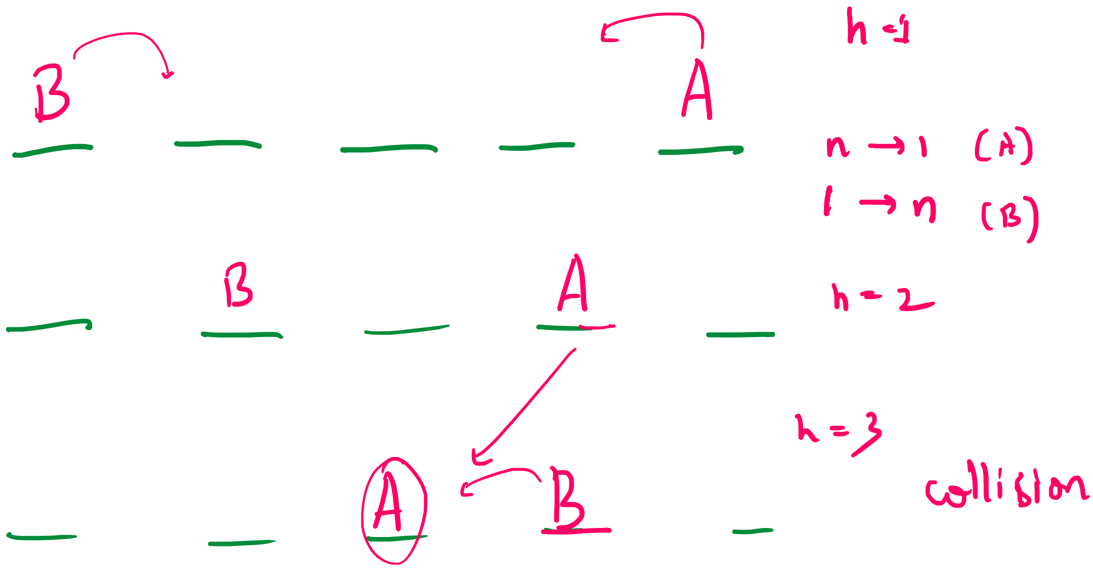
- at the 1-st hour, A is on spot 2 and B is on 1;
- at the 2-nd hour, A moves to spot 1 and B — to 2.

If $n = 3$ then:

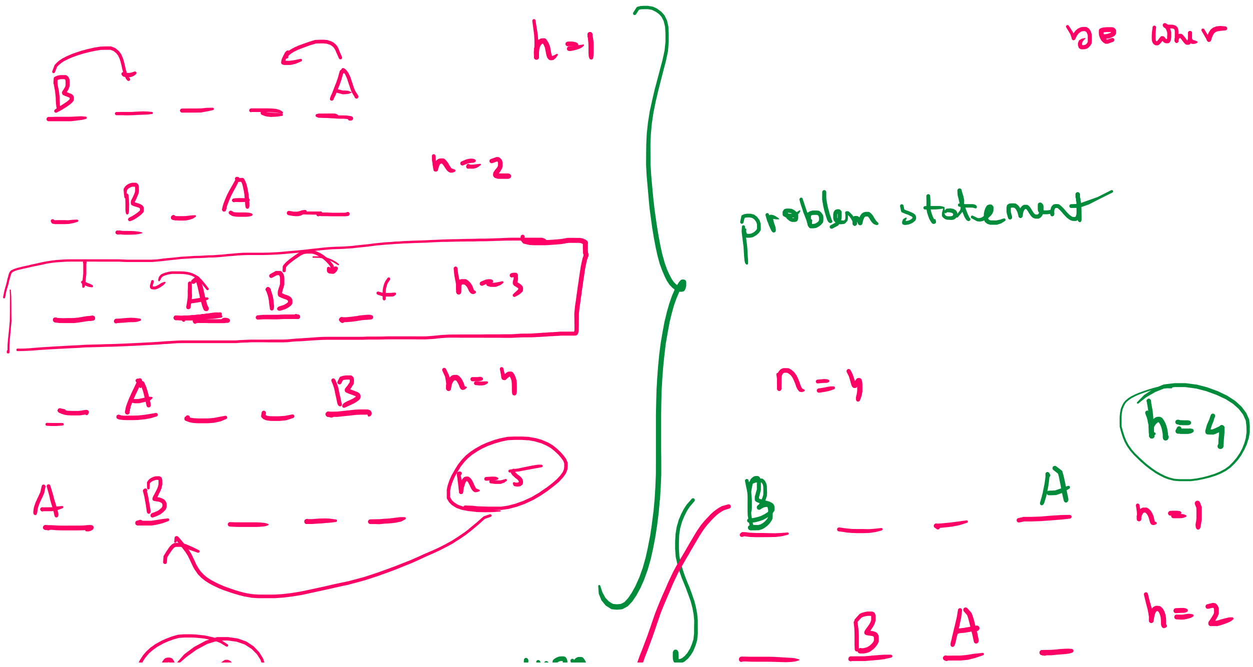
- at the 1-st hour, A is on spot 3 and B is on 1;
- at the 2-nd hour, A moves to spot 2; B'd like to move from 1 to 2, but this spot is occupied, so it moves to 3;
- at the 3-rd hour, A moves to spot 1; B also would like to move from 3 to 1, but this spot is occupied, so it moves to 2.

In the sixth test case:

- A's spots at each hour are $[5, 4, 3, 2, 1]$;
- B's spots at each hour are $[1, 2, 4, 5, 2]$.



k → cat B will be where



$n = 2$

$B = 10 \Rightarrow$ ✓

even

_	B	A	_	$h=2$
_	A	B	_	$h=3$
A	_	_	B	$h=4$
B	_	_	A	$h=5$

$n \to 10$

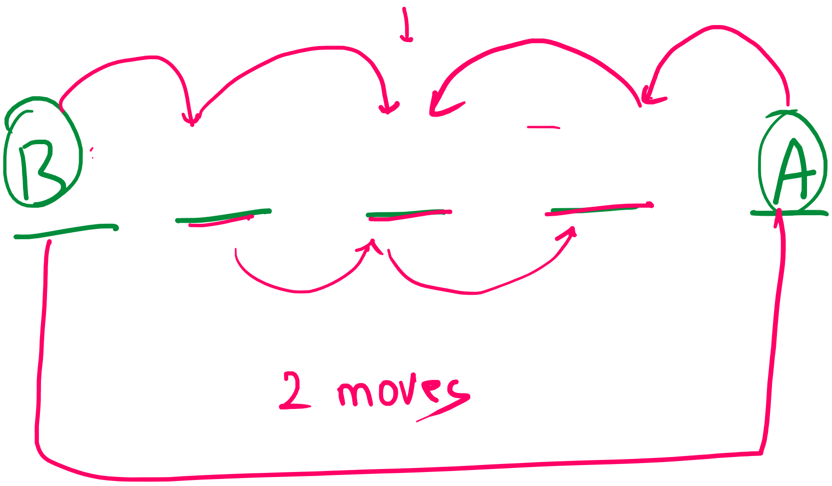
$k=1,\ k=5$

1 2 3 4 5 6 7

B _ _ A B B B _ _ _ _ _

$n = \infty$

$B = \underbrace{k \text{ steps}} + \underbrace{\text{No of collisions}}$



2 moves

$n \to$ odd

↓

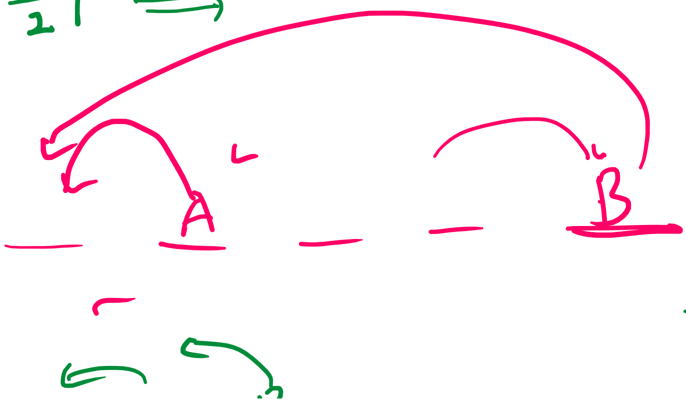
collide

3 hop

$\to \left\lceil \frac{3}{2} \right\rceil \Longleftarrow \Longrightarrow 2$

5 gaps

$\left\lceil \frac{5}{2} \right\rceil = 3$



why 0?

$\to 3$

$\left\lceil 2 \right\rceil$ 2 moves

_ A B _ _ _

A B _ _ _

B _ _ _ A

$\left\lceil \frac{3}{2} \right\rceil$ 2 moves

B _ A

_ A B } position

1

B _ _ _ A

||

_ _ A B _

moves + no collitions

k hours

1) collition happens → $\left\lceil \frac{n}{2} \right\rceil$ $k / \left\lceil \frac{n}{2} \right\rceil$ ⇒ collitions

1	2	3	4	5	6
k	k	k	k	k	k
1	2	3	4	5	6

k hours

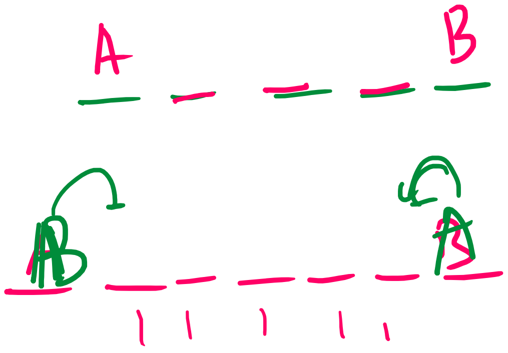
moves → ↓ (k-1) moves

↓

collistions →

$n-2 \Rightarrow \lceil 3 \rceil$

collisions →



$n-2 \Rightarrow \left\lceil \frac{3}{2} \right\rceil$

$\left\lceil \frac{n-2}{2} \right\rceil$ → k hours

$(k-1)$ moves

$(k-1)$ - mo

$\frac{k-1}{\left\lceil \frac{n-2}{2} \right\rceil}$ → no of collitions

total B moves → moves + # collisions

$\Rightarrow (k-1) + \frac{k-1}{\left\lceil \frac{n-2}{2} \right\rceil}$ → infinite

$k=5$

$(k-1) + \frac{(k-1)}{\left\lceil \frac{n-2}{2} \right\rceil}$

B _ _ _ B

1 2 3 4 5

6 moves

5th

length → same position

$k = 5 \% 5 = 0$

$4 + \frac{(4)}{\left\lceil \frac{5-2}{2} \right\rceil} \Rightarrow 4 + \frac{\cancel{4}\,2}{\cancel{2}}$

→ 6 moves

$K \% n$ = my position

$\boxed{5 \% 5 = 0} + 1$

→ 4 moves → 5 moves

m move its coming back

$6 \% 5 = 1 + 1$

→ 2 nd

→ Rotations $\Rightarrow \frac{\text{total moves}}{\text{length}}$

the position $\Rightarrow$ (~~total~~ moves % length) + 1

moves B → %

5) T-primes

→ n → T-prime → 7 → 1 x 7

1 x 7 x 7 ⇒ 49 → (1, 7, 49)

4 → 1, 2, 4 → {1, p, p²}

n ⇒ 10 → T prime or not

10 → 1, 10, 2, 5

4, 3 div

No

4 → 1, 2, 4

Yes

1 → 3 divisor

14

7 × 7 → 3 divisor

1 7

49

1 7 7 49 ⇒ 1, 7, 49

14

1 2 7 14

= = = =

reduce this

8

1 2 4 8 } already covered

6

1 2 3 4

11 × 11

1 11 121

121

1 11 11

121

1 11 121

* Why does work → 6 × 6

6 × 6

1 2 3 6 36

18

→ 17 → T prime

$\rightarrow$ $n \rightarrow T$ prime