

Problem E. Bewitching Stargazer

Time Limit 2000 ms

Mem Limit 262144 kB

I'm praying for owning a transparent heart; as well as eyes with tears more than enough...

— Escape Plan, [Brightest Star in the Dark](#)

Iris looked at the stars and a beautiful problem emerged in her mind. She is inviting you to solve it so that a meteor shower is believed to form.

There are n stars in the sky, arranged in a row. Iris has a telescope, which she uses to look at the stars.

Initially, Iris observes stars in the segment $[1, n]$, and she has a *lucky value* of 0. Iris wants to look for the star in the middle position for each segment $[l, r]$ that she observes. So the following recursive procedure is used:

- First, she will calculate $m = \lfloor \frac{l+r}{2} \rfloor$.
- If the length of the segment (i.e. $r - l + 1$) is even, Iris will divide it into two equally long segments $[l, m]$ and $[m + 1, r]$ for further observation.
- Otherwise, Iris will aim the telescope at star m , and her *lucky value* will increase by m ; subsequently, if $l \neq r$, Iris will continue to observe two segments $[l, m - 1]$ and $[m + 1, r]$.

Iris is a bit lazy. She defines her laziness by an integer k : as the observation progresses, she will not continue to observe any segment $[l, r]$ with a length **strictly less than** k . In this case, please predict her final *lucky value*.

Input

Each test contains multiple test cases. The first line of input contains a single integer t ($1 \leq t \leq 10^5$) — the number of test cases. The description of test cases follows.

The only line of each test case contains two integers n and k ($1 \leq k \leq n \leq 2 \cdot 10^9$).

Output

For each test case, output a single integer — the final *lucky value*.

Examples

Input	Output
6	12
7 2	18
11 3	196
55 13	1975581
5801 6	958900
8919 64	38416403456028
8765432 1	

Note

In the first test case, at the beginning, Iris observes $[1, 7]$. Since $[1, 7]$ has an odd length, she aims at star 4 and therefore increases her *lucky value* by 4. Then it is split into 2 new segments: $[1, 3]$ and $[5, 7]$. The segment $[1, 3]$ again has an odd length, so Iris aims at star 2 and increases her *lucky value* by 2. Then it is split into 2 new segments: $[1, 1]$ and $[3, 3]$, both having a length less than 2, so no further observation is conducted. For range $[5, 7]$, the progress is similar and the *lucky value* eventually increases by 6. Therefore, the final *lucky value* is $4 + 2 + 6 = 12$.

In the last test case, Iris finally observes all the stars and the final *lucky value* is $1 + 2 + \dots + 8\,765\,432 = 38\,416\,403\,456\,028$.