After the long school day, Bel and Vita need to play an entertaining game to relax. They put N biscuits in front of them. Bel is located at the left end of the sequence, while Vita is at the right end. Bel goes from left to right, while Vita – from right to left. They both remove every second biscuit they see on their path. Their turns alternate and on a single turn only one player moves. The winner is the one after whose turn only 1 biscuit remains.

Even though it is clear that the winner is uniquely determined, calculating the position of the last standing biscuit would require a lot of time. You should help them by finding the position of the last remaining biscuit for T different games.

**Input**

The first line of the file **biscuits.in** reads an integer T – the count of games. The next T lines contain an integer N – the count of biscuits for the corresponding game.

**Output**

Print T lines in the file **biscuits.out** with 1 number each – the index of the last remaining biscuit.

**Constraints**

$$1\leq N\leq 10^{16}$$

$Т=10^{4}$*, except 2 tests for which T = 200*

**Time limit: 0.1 sec.**

**Memory limit: 256 MB**

**Sample test**

|  |  |
| --- | --- |
| **Input (biscuits.in)** | **Output (biscuits.out)** |
| 31030082005359889847301337 | 990446092199602110601 |

**Sample test explanation**

In the case of 10 biscuits, the game goes as follows:

After first round:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  | 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  | 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  | 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  | 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  |

After second round:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  |  |  | 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  |  |  | 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  |

After third round:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  |  |  |  |  |  |  | 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  |

After fourth round:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  | 1,473,600+ Biscuits Stock Photos, Pictures & Royalty-Free Images - iStock |  Chocolate chip cookies, Cookie background, Cookie dough |  |

The index of the last remaining biscuit is 9.