Biscuits

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

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

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

Time limit: 0.1 sec.

Memory limit: 256 MB

Sample test

Input (biscuits.in)	Output (biscuits.out)
3 10 30082005 359889847301337	9 9044609 2199602110601

Sample test explanation

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

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After first round:

🍪		🍪		🍪		🍪		🍪	

After second round:

🍪			🍪			🍪	

After third round:

🍪						🍪	

After fourth round:

						🍪	

The index of the last remaining biscuit is 9.