

# Problem I

## The Priest Mathematician

**Input:** standard input

**Output:** standard output

**Time Limit:** 10 seconds

The ancient folklore behind the "**Towers of Hanoi**" puzzle invented by E. Lucas in **1883** is quite well known to us. One more recent legend tells us that the Brahmin monks from Benares never believed that the world could vanish at the moment they finished to transfer the **64** discs from the needle on which they were to one of the other needles, and they decided to finish the task as soon as possible.



**Fig: The Four Needle (Peg) Tower of Hanoi**

One of the priests at the Benares temple (who loved the mathematics) assured their colleagues to achieve the transfer in the afternoon (the rhythm they had thought was a disc-per-second) by using an additional needle. They couldn't believe him, but he proposed them the following strategy:

- First move the topmost discs (say the top **k** discs) to one of the spare needles.
- Then use the standard three needles strategy to move the remaining **n-k** discs (for a general case with **n** discs) to their destination.
- Finally, move the top **k** discs into their final destination using the four needles.

He calculated the value to **k** in order to minimize the number of movements and get a total of **18433** transfers, so they spent just **5** hours, **7** minutes and **13** seconds against the more than **500000** millions years without the additional needle (as they would have to do  **$2^{64}-1$**  disc transfers. Can you believe it?)

Try to follow the clever priest's strategy and calculate the number of transfer using four needles but according with the fixed and immutable laws of Brahma, which require that the priest on duty must not move more than one disc at a time and that he must place this disc on a needle so that there is no smaller disc below it. Of course, the main goal is to calculate the  $k$  that minimize the number of transfers (even though it is not known for sure that this is always the optimal number of movements).

## Input

The input file contains several lines of input. Each line contains a single integer  $N$ , which is the number of disks to be transferred. Here  $0 \leq N \leq 10000$ . Input is terminated by end of file.

## Output

For each line of input produce one line of output which indicates the number of movements required to transfer the  $N$  disks to the final needle.

## Sample Input:

```
1
2
28
64
```

## Sample Output:

```
1
3
769
18433
```

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(World Finals Warm-up Contest, Problem Setter: Miguel Revilla)