Following is a code in C.

```
#include <stdio.h>
int num[1000006];

int main()
{
     int i,n,cas;

     num[0]=0;
     for(i=1;i<=1000000;i++) num[i]=num[i/2]+(i%2);

     scanf("%d",&cas);

     while(cas--)
     {
          scanf("%d",&n);
            printf("%d\n",num[n]);
     }

     return 0;
}
```

This code will work fine for values of n up to 10^6. But for higher value of n, the code will not work for memory, time constraints. You have to write a code which will give identical result for higher values of n.

Input

The first line contains number of test case T ($1 \leq T \leq 500$). Each of the next T lines contains an integer n ($1 \leq n \leq 10^{18}$).

Output

For each of the test case you must output the answer in a line.

Sample Input

```
3
4
5
6
```

Sample Output

```
1
2
2
```