Project Euler #203: Squarefree Binomial Coefficients

The binomial coefficients ^nC_k can be arranged in triangular form, Pascal's triangle, like this:

```
                    1
                1       1
            1       2       1
        1       3       3       1
      1     4       6       4       1
    1     5     10      10      5       1
  1     6     15      20      15      6     1
1     7     21      35      35      21      7     1
                  .........
```
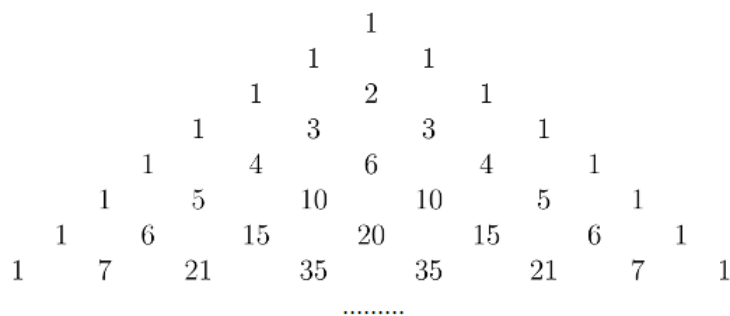
It can be seen that the first eight rows of Pascal's triangle contain twelve distinct numbers:

1, 2, 3, 4, 5, 6, 7, 10, 15, 20, 21 and 35.

A positive integer n is called squarefree if no square of a prime divides n. Of the twelve distinct numbers in the first eight rows of Pascal's triangle, all except 4 and 20 are squarefree. The sum of the distinct squarefree numbers in the first eight rows is 105.

Find the sum of the distinct squarefree numbers in the first K rows of Pascal's triangle.

Since the answer can be huge, output it modulo $10^9 + 7$.

Input Format

First line of each test file contains a single integer Q which is the number of queries per this file. Q lines follow each containing a single integer K_i that is the number of the rows in the Pascal's triangle.

Constraints

- $1 \le Q \le 20$
- $1 \le K_i \le 2 \times 10^5$

Output Format

Output exactly Q lines with the answer modulo $10^9 + 7$ for the i-th query on i-th line.

Sample Input 0

```
1
8
```

Sample Output 0

```
105
```

Explanation 0

$(1 + 2 + 3 + 5 + 6 + 7 + 10 + 15 + 21 + 35) \bmod (10^9 + 7) = 105$