Project Euler #231: The prime factorisation of binomial coefficients

This problem is a programming version of Problem 231 from projecteuler.net

For a positive integer $n = \prod_{i=1}^{r} p_i^{\alpha_i}$ where p_i are distinct primes, the prime omega function is defined as $\Omega(n) = \sum_{i=1}^{r} \alpha_i$.

For example, $\Omega(1) = 0$, $\Omega(9) = 2$ and $\Omega(12) = 3$.

Let

$$f(N, M, k) = \sum_{\substack{d \mid \binom{N}{M} \\ \Omega(d)=k}} d$$

That is, $f(N, M, k)$ is the sum of all positive divisors d of the binomial coefficient $\binom{N}{M}$ satisfying $\Omega(d) = k$.

Given N, M and K, find $f(N, M, k)$ modulo 1004535809, for all $1 \le k \le K$.

Input Format

The only line of each test file contains three space-separated integers: N, M and K.

Constraints

- $1 \le M \le N \le 10^9$.
- $1 \le K \le 15$.

Output Format

Print exactly K lines, the i-th line must contain the answer when $k = i$.

Sample Input 0

```
15 9 3
```

Sample Output 0

```
36
466
```

```
2556
```

Explanation 0

$\binom{15}{9} = 5 \cdot 7 \cdot 11 \cdot 13 = 5005.$

- $k = 1$: $5 + 7 + 11 + 13 = 36.$
- $k = 2$: $35 + 55 + 65 + 77 + 91 + 143 = 466.$
- $k = 3$: $385 + 455 + 715 + 1001 = 2556.$

Sample Input 1

```
16 3 1
```

Sample Output 1

```
14
```

Explanation 1

$\binom{16}{3} = 2^4 \cdot 5 \cdot 7 = 560.$

- $k = 1$: the answer is $2 + 5 + 7 = 14.$

Sample Input 2

```
22 6 4
```

Sample Output 2

```
57
1210
11730
50629
```

Explanation 2

$\binom{22}{6} = 3 \cdot 7 \cdot 11 \cdot 17 \cdot 19 = 74613.$

- $k = 1$: $3 + 7 + 11 + 17 + 19 = 57.$
- $k = 2$: $21 + 33 + 51 + 57 + 77 + 119 + 133 + 187 + 209 + 323 = 1210.$
- $k = 3$: $231 + 357 + 399 + 561 + 627 + 969 + 1309 + 1463 + 2261 + 3553 = 11730.$
- $k = 4$: $3927 + 4389 + 6783 + 10659 + 24871 = 50629.$