

Contest Duration: 2025-05-17(Sat) 22:00 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250517T2100&p1=248>) - 2025-05-17(Sat) 23:40 (<http://www.timeanddate.com/worldclock/fixedtime.html?iso=20250517T2240&p1=248>) (local time) (100 minutes)

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E - Popcount Sum 3

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 450 points

Problem Statement

You are given positive integers N and K .

Find the sum, modulo 998244353, of all positive integers x that do not exceed N and satisfy the following condition:

- the popcount of x is exactly K .

You are given T test cases; solve each of them.

► What is popcount?

Constraints

- $1 \leq T \leq 100$
- $1 \leq N < 2^{60}$
- $1 \leq K \leq 60$
- T, N , and K are integers.

Input

The input is given from Standard Input in the following format:

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05:24:06 +11:00

```
T  
case1  
case2  
:  
caseT
```

case_i denotes the i -th test case. Each test case is given in the following format:

```
N K
```

Output

Output T lines. The i -th line ($1 \leq i \leq T$) should contain the answer for the i -th test case.

Sample Input 1

[Copy](#)

```
2  
20 2  
1234567890 17
```

[Copy](#)

Sample Output 1

[Copy](#)

```
100  
382730918
```

[Copy](#)

For the first test case, there are nine positive integers not exceeding 20 whose popcount is 2: 3, 5, 6, 9, 10, 12, 17, 18, 20. Their sum is 100.

The remainder when 100 is divided by 998244353 is 100, so output 100 on the first line.

Remember to output the sum modulo 998244353.

```
'#telegram)
```

```
'url=https%3A%2F%2Fatcoder.jp%2Fcontests%2Fabc406%2Ftasks%2Fabc406_e%3Flang%3Den&title=E%20-
```

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