問題 4 – 病毒 (Virus)

(15 分)

問題敘述

有一種特別的病毒，每一天都能夠快速地進行分裂。同時這種病毒還有分等級，等級一共有 k 等，一開始的病毒是 1 等，等級會隨著每天逐漸增加直到成為 k 等的病毒。而根據病毒的等級還可以區分出病毒分裂的速度。

具體來說，對於一個等級 x 等的病毒，到了下一天時這個病毒便會產生出 x 隻等級 1 等的病毒，並且原先這個等級 x 等的病毒將會變成等級 $min(x+1, k)$ 等的病毒。

那麼如果第一天只有 1 隻等級 1 的病毒，經過 n 天後總共會有多少的病毒呢？

由於當病毒的數量很多時，具體有多少病毒也變得沒有意義，因此如果經過 n 天後總共的病毒數量超過 9876543212345678 9 隻的話，直接以 9876543212345678 9 做為答案即可。

輸入格式

第一行有一個正整數 T 代表接下來一共會有 T 個問題。
接下來的 T 行，每行會有兩個非負整數 n_i, k_i 代表在這個問題中詢問的天數以及病毒的最大等級。

輸出格式

請一共輸出 T 行，依序代表每一個問題的答案。

資料範圍

$1 \le T \le 300$
$0 \le n_i \le 10^9$
$1 \le k_i \le 10^9$

輸入範例 1

```
2
3 1
2 2
```

輸出範例 1

```
8
5
```

輸入範例 2

```
2
1 1
1 1
```

輸出範例 2

```
2
2
```

輸入範例 3

```
1
1000000000 1000000000
```

輸出範例 3

```
98765432123456789
```

範例說明

以下分別用數字表示病毒的等級藉此說明，譬如 (112) 代表一共有 3 個病毒，分別是等級 1、等級 1、等級 2。

第一個範例一共有兩個問題，第一個問題中病毒在每一天依序為 (1) -> (11) -> (1111) -> (11111111)，因此三天後一共有 8 隻病毒；第二個問題中病毒在每一天依序為 (1) -> (12) -> (11122)，因此兩天後一共有 5 隻病毒。

第二個範例一共有兩個問題，第一個問題中病毒在每一天依序為 (1) -> (11)，因此一天後一共有 2 隻病毒；而第二個問題則與第一個問題相同。

第三個範例一共有一個問題，在經過 1000000000 天後，病毒已經變得非常非常的多，遠超過 98765432123456789 隻，因此答案是 98765432123456789。

Q4: Virus

(15 points)

Description

There is a special virus that divides rapidly every day. There are also k levels of the virus, starting with level 1 and increasing each day until it becomes a level k virus. The speed of virus division can also be distinguished according to the level of the virus.

Specifically, for a level x virus, on the next day the virus will produce x level 1 viruses, and the original virus with level x will become a virus with level $min(x+1, k)$.

So if there are only 1 viruses with level 1 on the first day, how many viruses will be there in total after n days?

Since the exact number of viruses becomes meaningless when the number of viruses is large, if the total number of viruses exceeds $9876543212345678 9$ after n days, the answer is just $9876543212345678 9$.

Input Format

The first line has a positive integer T representing the total number of questions.

In the next T rows, each row has two non-negative integers n_i, k_i representing the number of days asked in this question and the maximum level of the virus.

Output Format

Please output T lines, representing the answers to each question in order.

Data Range

$1 \leq T \leq 300$
$0 \leq n_i \leq 10^9$
$1 \leq k_i \leq 10^9$

Input Example 1

```
2
3 1
2 2
```

Output Example 1

```
8
5
```

Input Example 2

```
2
1 1
1 1
```

Output Example 2

```
2
2
```

Input Example 3

```
1
1000000000 1000000000
```

Output Example 3

```
98765432123456789
```

Example Explanation:

The following numbers are used to indicate the level of the virus. For example, (112) means there are 3 viruses in total, which are level 1, level 1, and level 2 respectively.

The first example has two problems, the first problem has viruses (1) -> (11) -> (1111) -> (11111111) on each day, so there are 8 viruses after 3 days. The second problem has viruses (1) -> (12) -> (11122) on each day, so there are 5 viruses after 2 days.

The second example has two problems, the first problem has viruses (1) -> (11) on each day, so there are 2 viruses after 1 day; and the second problem is the same as the previous one.

The third example has one question. After 1000000000 days, the number of viruses will become very large and much more than 98765432123456789, so the answer is 98765432123456789.