

OGD

Input file: **standard input**
Output file: **standard output**
Time limit: 1 second
Memory limit: 256 megabytes

Cat Miston has grown tired of powers of two and the number 2 in general. However, he still likes GCD (greatest common divisor). So he came up with OGD — the odd greatest divisor.

The cat knows a thing or two about math. So he can find the OGD of a number. Therefore, help him answer a more complex question: what is the sum of OGD of numbers from l to r ? To simplify your task, calculate this sum modulo $10^9 + 9$.

Input

The first line contains an integer t — the number of questions ($1 \leq t \leq 10^5$).

In the i -th of the following t lines, two integers l_i and r_i are given ($1 \leq l_i \leq r_i \leq 10^{18}$).

Output

Output t numbers (one per line) — the answers to the questions.

Scoring

Subtask	Points	Additional constraints		Required subgroups
		t	l_i and r_i	
1	10	$t = 1$	$l_i = r_i \leq 10^6$	
2	10	$t = 1$	$l_i = r_i \leq 10^{12}$	1
3	20	$t = 1$	$r_i - l_i \leq 5 \cdot 10^6$	1, 2
4	20	$t = 1$	$r_i - l_i \leq 10^8$	1, 2, 3
5	10	—	$r_i \leq 10^5$	
6	5	—	$r_i \leq 10^9$	1, 5
7	25	—	—	1–6

Example

standard input	standard output
2 1 13 1000001 1001499	63 639972

Explanation

The answer to the first question is $\text{OGD}(1) + \text{OGD}(2) + \text{OGD}(3) + \dots + \text{OGD}(13) = 1 + 1 + 3 + 1 + 5 + 3 + 7 + 1 + 9 + 5 + 11 + 3 + 13 = 63$