Problem 11. School informatics

Input file:	`input.txt`
Output file:	`output.txt`
Time limit:	3 seconds
Memory limit:	256 megabytes

Vasya was getting ready for his SAT tests in Informatics and found the following problem in one of his textbooks: "All books stored in the library have the same format. A book contains 400 pages, each page contains 40 lines, and there are precisely 80 printed symbols in a line. There are 25 different symbols: 22 letters, period, comma and space. Calculate the number of bits necessary to encode the contents of a single book."

Vasya decided that the authors of the problem assumed that all symbols must be coded with the same number of bits. Thus, to code 25 different symbols one must use 5 bits per symbols. But such coding means storing unnecessary information.

Had it been known that different symbols and their combinations occur in text with different frequency, using variable-length code would make sense, e.g. Huffman code. But the authors hadn't provided the necessary information, so Vasya assumed all symbols and their combinations occur in the text with equal frequency, and used a fixed number of bits for coding.

Vasya gave it another thought and realized that coding groups of symbols instead of single symbols could allow to partially get rid of the useless information.

For example, when coding groups of three subsequent symbols, the number of possible combinations would be $25^3 = 15625$. Then 14 bits is enough to encode this number of combinations. This way we get $4\frac{2}{3}$ bits per symbol instead of 5 as the authors assumed.

Vasya wondered if this was a way to indefinitely approach the value $\log_2 25 \approx 4.64385619$. But then he remembered that the code was intended for use with finite-length messages. If the length of a message is not divisible by the length of the letter groups being coded, the message is automatically padded with spaces until number of letter groups becomes integer. Moreover, the use of excessively long letter groups is impossible due to technical reasons.

Vasya decided to write a program which would define the optimal size of letter group for coding messages with predefined parameters. Help Vasya write the program.

Input

The first line of the input file contains the integer number T — the number of tests ($1 \le T \le 10^4$). This is followed by the test descriptions, one test per line.

For each test, three integer numbers are provided: N — the number of different symbols in the message alphabet, L — the message length in symbols, and K — the maximum allowed letter group size ($2 \le N \le 10^9$, $1 \le L \le 2 \cdot 10^6$, $1 \le K \le L$).

For each test it is guaranteed that the number $\log_2 N$ either is an integer, or differs from any rational number with a denominator no greater than K by at least 10^{-13}.

Output

For each test, print a separate line containing two integers: A — the resulting length of the coded message in bits and B — the size of the letter group used ($1 \le B \le K$).

The length of the coded message A must be as short as possible, provided that the length of the letter group B is no greater than the number K (defined in the input data). If there are several optimal solutions, any of them can be printed.

Example

input.txt	output.txt
3 25 1280000 10 2 1000 1000 3 7 3	5973338 3 1000 1000 14 1

Example explanation

The first test corresponds to the example from Vasya's textbook: the message is 1 280 000 symbols long, and the alphabet contains 25 symbols. In the given case, the use of three-letter groups provides the minimal size of the encoded message, if letter group size is kept within 10. One space is automatically added at the end of the message due to padding. If each symbol was coded separately, as originally intended by the textbook authors, 6 400 000 bits of information would be required.