On Certain Lehmer Generators

We are interested in Lehmer generators of pseudorandom numbers.
Let $x_{n+1} = R \cdot x_n \bmod M$ be a Lehmer generator and let M be a prime in some interval $[A, B]$.
It is known that the length of the sequence period of this generator is maximal when R is a primitive root modulo M. To construct the appropriate generator we have to find at least some primitive roots modulo M.

A primitive root R modulo M can be characterized in two ways.

1. Every positive integer less than M is congruent to some power of R modulo M. This is in fact a standard definition.
2. Let PFM be the set of all prime factors of $M-1$. Then R is the primitive root of M if and only if $R^{(M-1)/p}$ is not congruent to 1 mod M, for all $p \in PFM$.

The second characterization is especially useful for a fast computational test whether a given number is a primitive root modulo M.

For various number theoretic reasons, we prefer to work with primitive roots which are relatively highly composite, that is, which have many divisors. An integer is called F-composite if its number of divisors is at least F.

When prime M is huge the number of primitive roots modulo M is also huge and even the number of highly composite primitive roots modulo M might be quite substantial. Consequently, we restrict our search for primitive roots modulo M even more. We are going to look for F-composite primitive roots modulo M only in some given interval $[C, D]$.
Let us denote by S_{ABCDEF} the set of all primes M with the property that $M \in [A, B]$ and that the number of F-composite primitive roots modulo M in interval $[C, D]$ is at least E .

The task

Given the values of A, B, C, D, E, F, find the set S_{ABCDEF}.

Input

The input contains one line with six integers A, B, C, D, E, F separated by space. It holds:
$1 < C < D < A < B < 10^{15}$, $1 < E, F < 200$, $B - A \le 2500$, $D - C \le 2500$.

Output

The output consists of one line with two integers N, P separated by space. N is the cardinality of S_{ABCDEF}, P is equal to the product of all primes in S_{ABCDEF} expressed modulo sum of all primes in S_{ABCDEF}. You may suppose that S_{ABCDEF} is unempty and that $N \le 200$ for all input data in this problem.

Example 1

Input

```
30 50 10 25 3 6
```

Output

```
2 71
```

The resulting two primes in interval [30, 50] (and their respective 6-composite primitive roots in interval [10, 25]) are
37 (18, 20, 24) and 43 (12, 18, 20). The product of the primes is 1591, the sum of primes is 80. 1591 mod 80 = 71.

Example 2

Input

```
50 100 15 45 2 8
```

Output

```
4 81
```

The resulting four primes in interval [50, 100] (and their respective 8-composite primitive roots in interval [15, 45]) are
59 (24, 30, 40, 42), 73 (40, 42), 83 (24, 42), 89 (24, 30).
The product of the primes is 31815809, the sum of primes is 304. 1815809 mod 304 = 81.

Example 3

Input

```
20000000001 20000002222 19900007777 19900009999 50 70
```

Output

```
63 1043378729228
```

Public data

The public data set is intended for easier debugging and approximate program correctness checking. The public data set is stored also in the upload system and each time a student submits a solution it is run on the public dataset and the program output to stdout and stderr is available to him/her.
Link to public data set