Question 1 – Power Sum

Find the number of ways that a given integer, X, can be expressed as the sum of the N^{th} power of unique, natural numbers.

Input Format

The first line contains an integer X.
The second line contains an integer N.

Constraints

- $1 \leq X \leq 1000$
- $2 \leq N \leq 10$

Output Format

Output a single integer, the answer to the problem explained above.

Sample Input 0

```
10
2
```

Sample Output 0

```
1
```

Explanation 0

If $X = 10$ and $N = 2$, we need to find the number of ways that 10 can be represented as the sum of squares of unique numbers.

$10 = 1^2 + 3^2$

This is the only way in which 10 can be expressed as the sum of unique squares.

Sample Input 1

```
100
2
```

Sample Output 1

```
3
```

Explanation 1

$100 = 10^2 = 6^2 + 8^2 = 1^2 + 3^2 + 4^2 + 5^2 + 7^2$

Sample Input 2

```
100
3
```

Sample Output 2

```
1
```

Explanation 2

100 can be expressed as the sum of the cubes of $1, 2, 3, 4$.
$(1 + 8 + 27 + 64 = 100)$. There is no other way to express 100 as the sum of cubes.

Question 2 – Time Conversion

Given a time in 12-hour AM/PM format, convert it to military (24-hour) time.

Note: Midnight is $12{:}00{:}00\text{AM}$ on a 12-hour clock, and $00{:}00{:}00$ on a 24-hour clock. Noon is $12{:}00{:}00\text{PM}$ on a 12-hour clock, and $12{:}00{:}00$ on a 24-hour clock.

Input Format

A single string containing a time in 12-hour clock format (i.e.: hh:mm:ssAM or hh:mm:ssPM), where $01 \leq hh \leq 12$ and $00 \leq mm, ss \leq 59$.

Output Format

Convert and print the given time in 24-hour format, where $00 \leq hh \leq 23$.

Sample Input

```
07:05:45PM
```

Sample Output

```
19:05:45
```

Question 3 – CamelCase Count

Alice wrote a sequence of words in CamelCase as a string of letters, s, having the following properties:

- It is a concatenation of one or more *words* consisting of English letters.
- All letters in the first word are *lowercase*.
- For each of the subsequent words, the first letter is *uppercase* and rest of the letters are *lowercase*.

Given s, print the number of words in s on a new line.

Input Format

A single line containing string s.

Constraints

- $1 \leq |s| \leq 10^5$

Output Format

Print the number of words in string s.

Sample Input

```
saveChangesInTheEditor
```

Sample Output

```
5
```

Explanation

String s contains five words:

1. save
2. Changes
3. In
4. The
5. Editor

Thus, we print 5 on a new line.

Question 4 – Architectural Analysis

BRIEF

You meet with a startup company in the early stages of their operations, who has received funding of $250K and been recommended by their investor to discuss their architecture and approach with AWS. Currently the architecture for their social media applications uses a LAMP stack for the main web application and provide a RESTful API for mobile services, written in node.js. All of this is running on a VPS service, location unknown.

Like many small start-ups they are confident that they will be the next big thing and expect significant, rapid, yet un-quantified global growth in the next few months. With this in mind, they are concerned about:

1. How much this demand will be and how to make effective use of their seed funding, whilst ensuring their have the required capacity to meet demand
2. Scaling to meet the demand for the web application and the API services layer
3. Effective distribution of load across the entire application architecture, including the ability to throttle traffic to the API service layer
4. Ability of their database and data access layer to provide high performance read and write throughput, whilst remaining cost effective
5. Providing a high performance end-user experience for the web application, even though a large portion of their user base will be globally distributed
6. Providing secure access for mobile application users to the API services and synchronizing user preferences across devices
7. Ensuring they have a self-healing infrastructure that automatically recovers from failures
8. A strategy for capturing, analyzing and securely storing sentiment analysis data and an archival strategy for inactive data greater than 6 months
9. Security of data at rest and in transit across the entire application architecture
10. Securing and delegating appropriate access to the environment as the team grows
11. Optimize and automating their approach to source code management, build, testing and deployment, which supports their rapid deployment cycle
12. Ability to easily manage and replicate multiple environments based on their blueprint Architecture

OBJECTIVE

Recommend a manageable, secure, scalable, high performance, efficient, elastic, highly available, fault tolerant and recoverable architecture that allows the startup to organically grow. The architecture should specifically address the requirements/concerns described.

Question 5 – Node.js API

Select one of the three technical problems above (Power Sum, Time Conversion, or CamelCase Count) and write a REST API which accepts the input to the problem as JSON in the body of a POST request and returns the output as JSON in the body of the response.

Your service should run locally using the **node** command.

Example input for the CamelCase Count problem:

```
{
	"saveChangesInTheEditor"
}
```

Example output:

```
{
	5
}
```

Please submit your solution code files in a zipped archive.