Question 1:

a) Write down the code of Program $P$ in the language $L$ for which $\#(P) = 1831$.

b) What is the number of the following program?

```
IF X \neq 0 GOTO A
Y \leftarrow Y + 1
[A] Y \leftarrow Y + 1
```

You do not have to compute the numerical values of expressions such as $3^{27}$ that would result in huge numbers.

Question 2:

Do you remember how we used the pairing function and the Gödel numbering to associate each program in the language $L$ with a unique natural number? To be precise, we demanded that every program in $L$ is associated with unique number, and we also required that every natural number is associated with a valid program in $L$. Now it is your task to develop such one-to-one mappings for other things. If you think that a mapping cannot be defined, please give a reason.

a) Define such a mapping for $2 \times 2$ matrices $[a_{ij}]$ of natural numbers.

b) Define such a mapping for odd natural numbers.

c) Define such a mapping for the set of natural numbers $\{0, 1, \ldots, 1000\}$. 