Problems Set 1

Exercise 1 : (monoids)

1-Consider the laws * and μ defined on a set E = {a, b, c} by the following tables. Show that (E, *) is a free monoid and that (E, μ) is not a monoid

*	a	b	c
a	a	b	c
b	b	c	a
c	c	a	b

μ	a	b	c
a	a	c	c
b	b	c	a
c	c	a	a

2-Show that the set N of natural numbers equipped with the addition operation (+) is a free monoid

Exercise 2 : (Alphabet and C Language)

1- Determine the alphabet for each of the following languages:

- Hexadecimal numbers;

- The C programming language.

2- What are the keywords of the C language?

3- What are the basic elements for forming an identifier in the C language, what rules are used to form an identifier, and what is the maximum size of an identifier ?

4- What is the difference between:

- int, unsigned int, signed int

- char, signed char, unsigned char

- int, short int, long int

5- What is the order of evaluation of arithmetic expressions in C?

6- Provide a well-formed formula in C.

Exercise 3 : (Ambiguous languages)

Find the languages corresponding to the following definitions:

- All words over {a, b, c} of length 2 containing either an 'a' or a 'b,' but not both.

- All words over {a, b} containing at most two 'a's or exactly one 'b.'

- All words over {a, b} containing more 'a's than 'b's

Exercise 4 : (words)

Two words x and y are said to be conjugates if there exist two words u and v such that: x = uv and y = vu. Provide examples of conjugate words