
1 - Syntax

1. Write the syntax definitions of the following objects:

- (a) Natural number (1, 2, 3, ...)
- (b) Unsigned integer (0, 1, 2, 3, ...)
- (c) Integer (... , -2, -1, 0, 1, 2, ...)
- (d) Odd number (... , -3, -1, 1, 3, ...)
- (e) Even number (... , -4, -2, 0, 2, 4, ...)
- (f) Integer divisible by 5 (... , -10, -5, 0, 5, 10, ...)

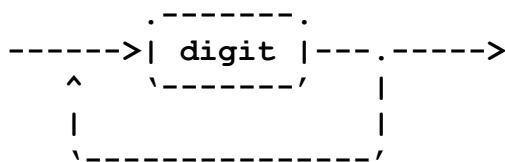
Solve each problem from (a) to (f) using **BNF, EBNF, syntax diagrams, and the parenthetic notation**. At the end compare all solutions and write what is in your opinion the most suitable metalanguage for solving this type of problems.

2. Following is an example of assignment statement with int or double variables in C++ :

```
alpha5[i][j] = 12.34*a[5]/rate + 3.14*(x[2*i-j/2][3 + j] -1);
```

Based on this example, write a **BNF** definition of the syntax of arbitrary assignment statements with integer or double variables in C++. Do not expand your definition beyond components shown in the above example. So, variables can be scalar or can have any number of indexes. Indexes must be integer expressions (in C++ variable a[5.] creates error “invalid type double for array subscript”). Use only basic arithmetic operations (+, -, *, /). Do not use functions or multiple assignments. No strings. No logic expressions. The goal is to create a basic definition of arbitrary expressions based on the combinations of variables, constants, and basic arithmetic operations where variables can be integer or double, and indexes must be integer expressions.

Note #1: Your solution should be submitted as a single pdf file. This file must be prepared using a text editor (like Notepad) or a word processor (like MS Word) and then converted to pdf. Graphical components (circles, rectangles, arrows) can be inserted in any readable way including by hand. You can also use approximations and simplifications such as this example:



Note #2: I did not bring this example in the last presentation.