CSc 600 Homework 1 - Syntax

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It is formatted in LaTeX, using TeXShop editor (under GNU GPL license).
Syntax diagrams are created in LucidChart online editor (lucidchart.com).

1. Using BNF write the syntax definitions of the following objects:

a) Natural number (1, 2, 3, ...). The answer:

⟨*natural number*⟩ ::= ⟨*non-zero digit*⟩ | ⟨*natural number*⟩ ⟨*digit*⟩

⟨*digit*⟩ ::= 0 | ⟨*non-zero digit*⟩

⟨*non-zero digit*⟩ ::= 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

b) Unsigned integer (0, 1, 2, 3, ...). The answer:

⟨*unsigned integer*⟩ ::= 0 | ⟨*natural number*⟩

⟨*natural number*⟩ ::= ⟨*non-zero digit*⟩ | ⟨*natural number*⟩ ⟨*digit*⟩

⟨*digit*⟩ ::= 0 | ⟨*non-zero digit*⟩

⟨*non-zero digit*⟩ ::= 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

c) Integer (..., -2, -1, 0, 1, 2, ...). The answer:

⟨*integer*⟩ ::= ⟨*sign*⟩ ⟨*unsigned integer*⟩

⟨*sign*⟩ ::= + | - | ⟨*empty*⟩

⟨*empty*⟩ ::=

⟨*unsigned integer*⟩ ::= 0 | ⟨*natural number*⟩

⟨*natural number*⟩ ::= ⟨*non-zero digit*⟩ | ⟨*natural number*⟩ ⟨*digit*⟩

⟨*digit*⟩ ::= 0 | ⟨*non-zero digit*⟩

⟨*non-zero digit*⟩ ::= 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

d) Odd number (..., -3, -1, 1, 3, ..., 101, ..., 2047, ...). The answer:

⟨*odd number*⟩ ::= ⟨*sign*⟩ ⟨*unsigned odd number*⟩

⟨*sign*⟩ ::= + | - | ⟨*empty*⟩

⟨*empty*⟩ ::=

⟨*unsigned odd number*⟩ ::= ⟨*odd digit*⟩ | ⟨*natural number*⟩ ⟨*odd digit*⟩

⟨*natural number*⟩ ::= ⟨*non-zero digit*⟩ | ⟨*natural number*⟩ ⟨*digit*⟩

⟨*digit*⟩ ::= 0 | ⟨*non-zero digit*⟩

⟨*non-zero digit*⟩ ::= 2 | 4 | 6 | 8 | ⟨*odd digit*⟩

⟨*odd digit*⟩ ::= 1 | 3 | 5 | 7 | 9

e) Even number (..., -4, -2, 0, 2, 4, ..., 332, ..., 1022, ...). The answer:

⟨*even number*⟩ ::= ⟨*sign*⟩ ⟨*unsigned even number*⟩

⟨*sign*⟩ ::= + | - | ⟨*empty*⟩

⟨*empty*⟩ ::=

⟨*unsigned even number*⟩ ::= ⟨*even digit*⟩ | ⟨*natural number*⟩ ⟨*even digit*⟩

⟨*natural number*⟩ ::= ⟨*non-zero digit*⟩ | ⟨*natural number*⟩ ⟨*digit*⟩

⟨*digit*⟩ ::= 0 | ⟨*non-zero digit*⟩

⟨*non-zero digit*⟩ ::= 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

⟨*even digit*⟩ ::= 0 | 2 | 4 | 6 | 8

f) Integer divisible by five (..., -10, 5, 0, 5, 10, ...). The answer:

⟨*integer div-by-5*⟩ ::= ⟨*sign*⟩ ⟨*unsigned int div-by-5*⟩

⟨*sign*⟩ ::= + | - | ⟨*empty*⟩

⟨*empty*⟩ ::=

⟨*unsigned int div-by-5*⟩ ::= ⟨*div-by-5 suffix*⟩ | ⟨*natural number*⟩ ⟨*div-by-5 suffix*⟩

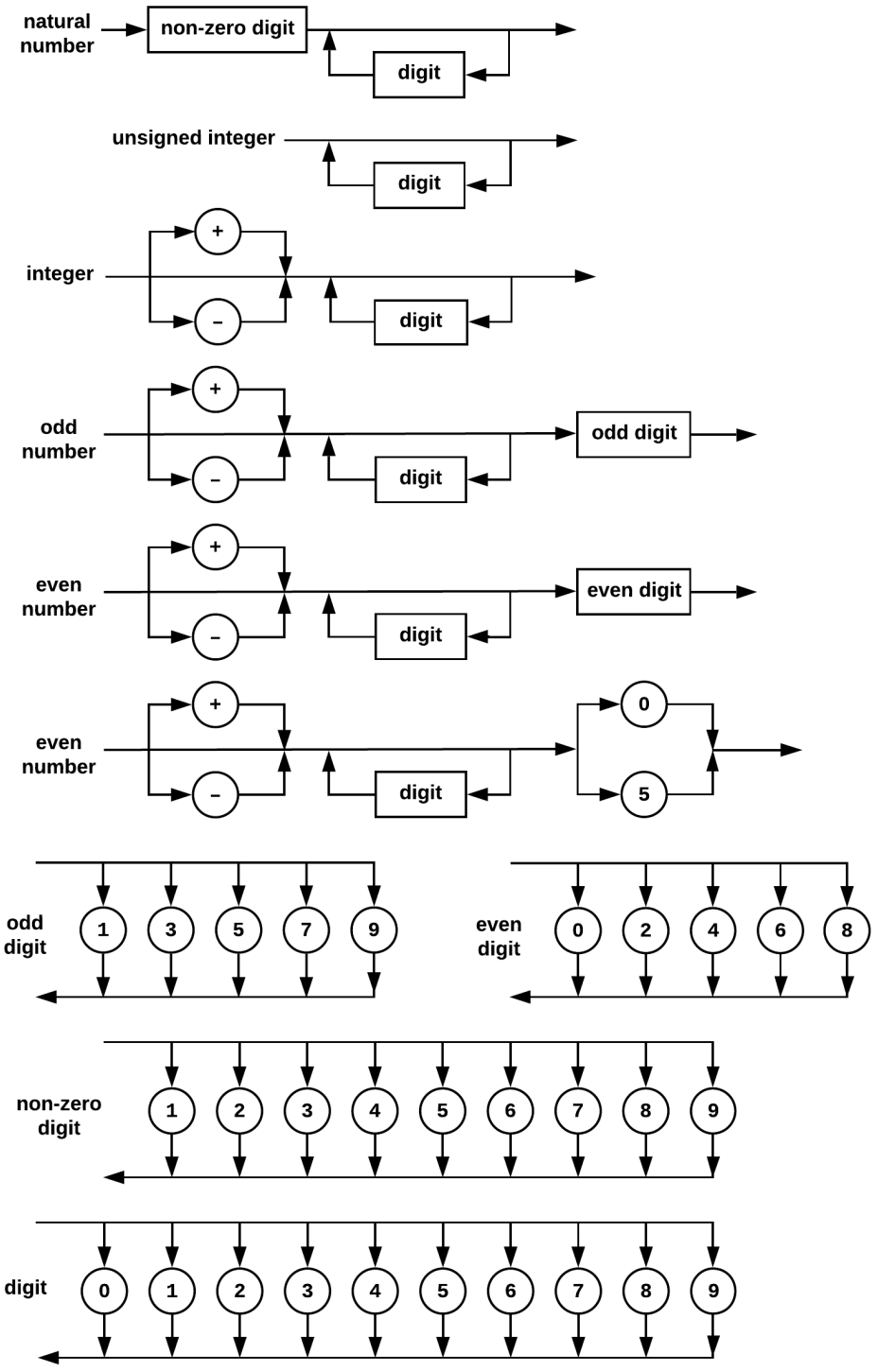
⟨*natural number*⟩ ::= ⟨*non-zero digit*⟩ | ⟨*natural number*⟩ ⟨*digit*⟩

⟨*div-by-5 suffix*⟩ ::= 0 | 5

⟨*digit*⟩ ::= 0 | ⟨*non-zero digit*⟩

⟨*non-zero digit*⟩ ::= 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

2. Show syntax diagrams for questions (a), ..., (f) of problem 1.



Example of syntax diagrams for integers with no support of leading zeroes.