

Compiler Construction (2)

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1. (a) Draw a complete NFA for floating point numbers. It should accept `44`, `44.0`, `-1.45`, `4.4E01`, `440E-1`.
Also give a regular expression.
 - (b) Assume that we have a cheap table calculator with usual operators, with usual numbers (signs, decimal fractions, but no 'e'/'E'), without operator priorities and without parentheses.
Draw an NFA for this calculator.
 - (c) Give a regular expression for C-style comments, starting with `/*` and ending with `*/`.
 - (d) Same for C-style comments that start with `//` and last until the end of the line.
 - (e) Give regular expressions that accept all words over the the usual alphabet $\{a, \dots, z\}$ that contain (exactly, less than, more than) four occurrences of the letter a .
 - (f) Give a regular expressions that accepts all words over $\Sigma = \{a, b, c\}$ that contain each of the letters in Σ at least once. Could you describe a similar regular expression for the complete alphabet $\Sigma' = \{a, b, c, \dots, z\}$?
2. Let us define two regular expressions *equivalent* if they accept the same set of words. Which of the following pairs of regular expressions are equivalent? (Give proofs or counter examples)
 - (a) RS and SR ,
 - (b) $R|S$ and $S|R$,
 - (c) $R(ST)$ and $(RS)T$,
 - (d) $(R|S)^*$ and R^*S^* ,
 - (e) $(R|S)^*$ and $(R^*S^*)^*$,
 - (f) $R(S|T)$ and $RS|RT$.