

1. Reverse Polish Notation:

a) Convert the following infix expression to RPN:

- $a + b / (c + d) * e$
- $a b c d + / e * +$

b) Convert the following expression from RPN to infix:

- $a b + c d + *$
- $(a + b) * (c + d)$

c) Evaluate the following RPN expression :

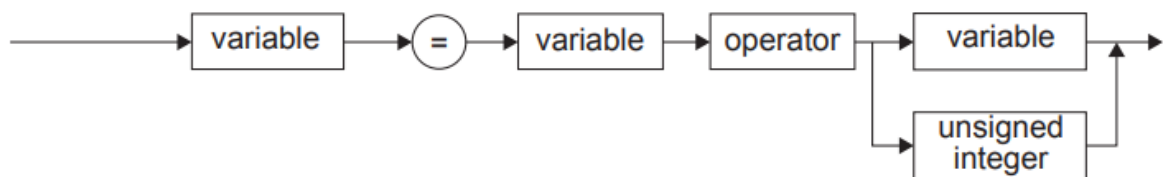
- $a b c + * d e / -$ (Where, $a = 2, b = 3, c = 4, d = 12, e = 6$)
- $2 3 4 + * 12 6 / -$

d) What are two advantages of using RPN over infix?

2. Syntax diagrams and BNF:

Using syntax diagram is given below:

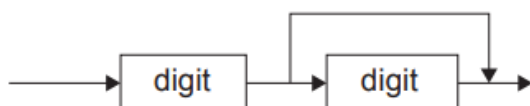
assignment statement



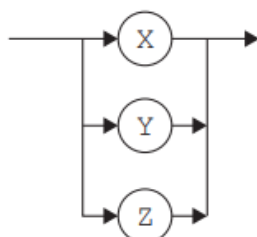
variable



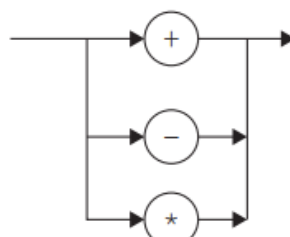
unsigned integer



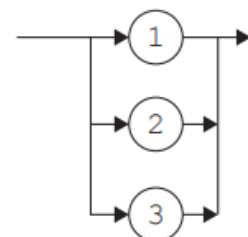
letter



operator



digit



a) Explain why each of these statements are invalid:

- $X = XY + 21$
- $YZ := YZ * 3$
- $XY = XY - 5$

b) Write the Backus-Naur Form (BNF) for the syntax diagrams shown.

c) The syntax diagram of variable has changed to allow one or two letters followed by zero, one or two digits.

- Draw an updated syntax diagram for the variable.
 - Give the BNF for the revised variable.
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