

Express the following functions in terms of  $\Theta$ -notation.

(a)  $f(n) = 2n + 31 \log^{100} n.$

(b)  $f(n) = 7n^3 + 1000n \log n + 3n.$

(c)  $f(n) = 3n^{1.5} + \sqrt[3]{n} \log n$

(d)  $f(n) = 2^n + 100^n + n!.$

(e)  $f(n) = 18n^3 + \log n^8.$

(f)  $f(n) = (n^3 + n)/(n + 5).$

Express the following functions in terms of the  $O$ -notation.

(a)  $f(n) = 18n^3 + \log n^8.$

(b)  $f(n) = (n^3 + n)/(n + 5).$

(c)  $f(n) = \log^2 n + \sqrt{n} + \log \log n.$

(d)  $f(n) = n!/2^n + n^{n/2}.$

(e)  $f(n) = 7n^3 + 1000n \log n + 3n.$

(f)  $f(n) = 3n^{1.5} + \sqrt[3]{n} \log n$

(g)  $f(n) = 2^n + 100^n + n!.$

Express the following functions in terms of the  $\Omega$ -notation.

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Find Big-Oh

i.  $f(n) = 16 \rightarrow O(1)$

Review

ii.  $f(n) = 8 \times 2^n + 5n + 1$

iii.  $f(n) = 5n^3 + 2n^2 + 3n + O(1)$

(i)  $f(n) = 16$

$\Rightarrow f(n) \leq 16 \times 1$

As per Big-Oh defin

$f(n) \leq c \times g(n)$

$c = 16$

$g(n) = 1$

$f(n) = O(g(n))$

$\Rightarrow f(n) = O(1)$

constant

$\times$

Algorithm find

Algorithm for find

Big-Oh

Add()

$S = 0$

for  $I = 1$  to  $n$

for  $J = 1$  to  $n$

$S = I + J$

$$T(n) = 1 + (n+1) + n(n+1) + n^2$$
  

$$= 1 + n + 1 + n^2 + n + n^2$$
  

$$= 2n^2 + 2n + 2$$
  

$$\uparrow f(n) = O(n^2)$$

ii.  $f(n) = 8 \times 2^n + 5n + 1$

$n = 0 \quad 2^0 \quad \checkmark \quad 0$

$n = 1 \quad 2^1 \quad 1$

$f(n) = O(2^n)$

Exponential

iii.  $f(n) = 5n^3 + 2n^2 + 3n + O(1)$

$\Rightarrow f(n) = 5n^3 + 2n^2 + 3n + O(1)$

$= 5n^3 + 2n^2 + O(n)$

$= 5n^3 + O(n^2)$

$= O(n^3)$

# Traversing a Binary Tree

1. PreOrder (R Lt Rt)
2. InOrder (Lt R Rt)
3. Post-Order (Lt Rt R)

R - Root

Lt - Left

Rt - Right

Expression Tree:

$$\text{Expression} = \frac{2+5}{a+b} \quad (a=3 \quad b=7)$$

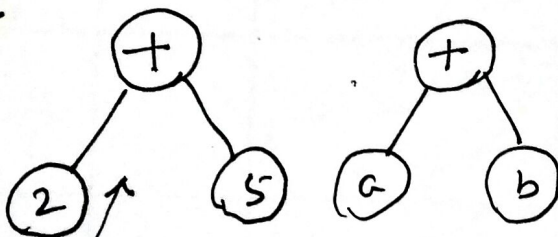
$$= \frac{3+7}{3+7}$$

Binary tree:

1. The Root & Internal contains operator.
2. Leaf node contains operands or variables.

Exp:  $2+5$

$a+b$



Now applying traversal

Pre Order (Lt R Rt)

(R Lt Rt)

+ 2 5 - Prefix

In Order: (Lt R Rt)

2, +, 5 - Infix

Post-Order (Lt Rt R)

2 5, + - Postfix



To draw Expression tree

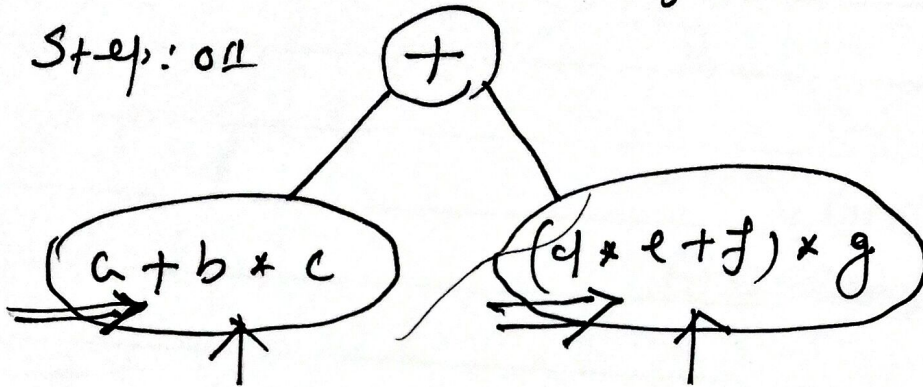
Rajiv

$$(a + b * c) + ((d * e + f) * g)$$

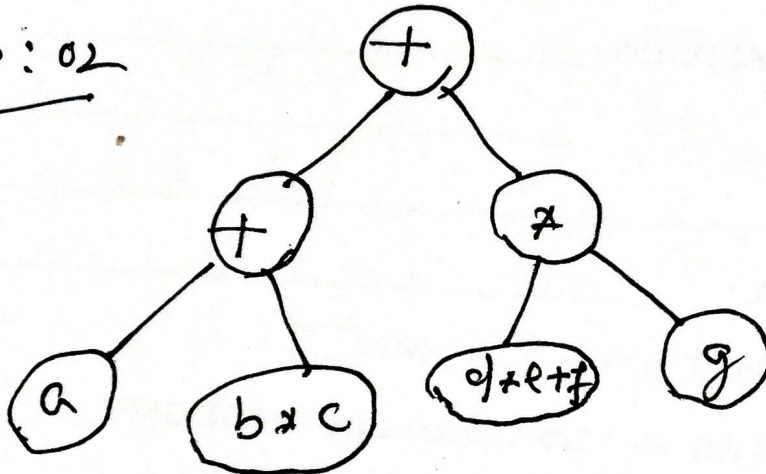
LT-Subtree

Right-Subtree

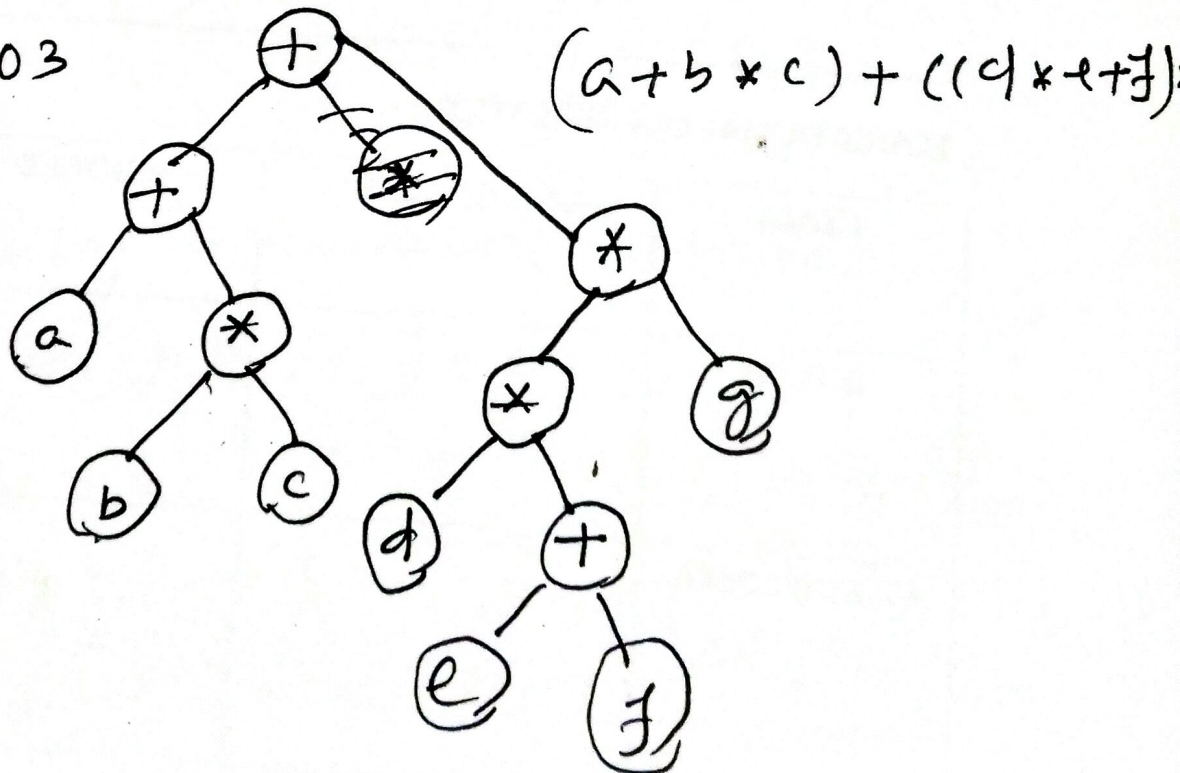
Step: 01

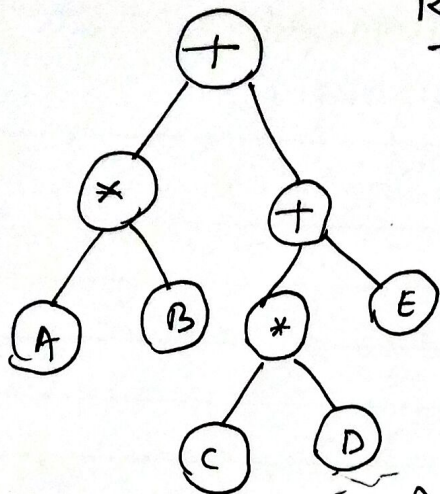


Step: 02

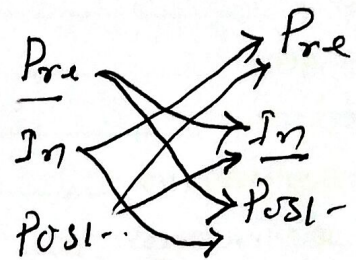


Step: 03





Rajiv  
Construction of Binary tree!



InOrder/ Infer/  
Postorder/ Postfix/  
 $A * B + C * D + E$  ✓  
 $AB * CD * E + +$  ✓

Pre } given  
In } construct a  
BT.

Pre Pre X  
In In  
Post Post

Solve

Construct a Binary tree to represent the following arithmetic expression.

1.  $a + b * (c - d) + e / (f + g - h)$
2.  $3 + ((5 + 9) * 2)$
3.  $A - (c / 5 * 2) + (D * 5 \% 4)$
4.  $(z + 3) / (2 + y) * (w - (z + 7))$
5.  $A * B - (c + d) * (p / q)$
6.  $((-a) + (x + y)) / ((+b) * (C * a))$
7.  $a - b / c + d * e \wedge f \wedge g$
8.  $3 + -4 + 5 / 2$
9.  $B = (SR - ST)^2 - (R + Q)^2$
10.  $(A + B) * (C * D - E) * F / G$

From 1 TO 10 find PreOrder, InOrder & Post-order.