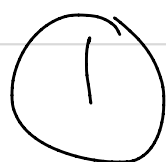


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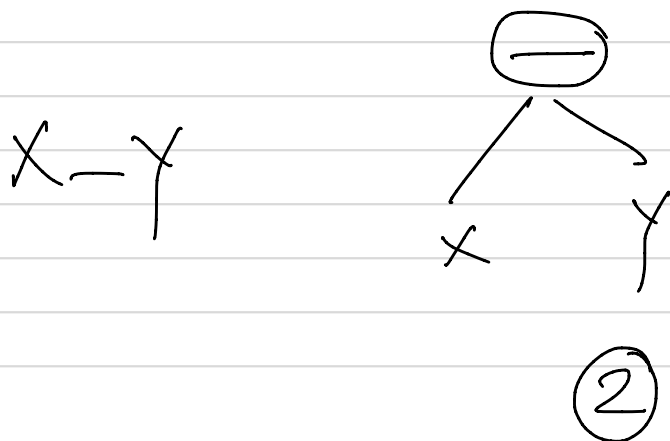
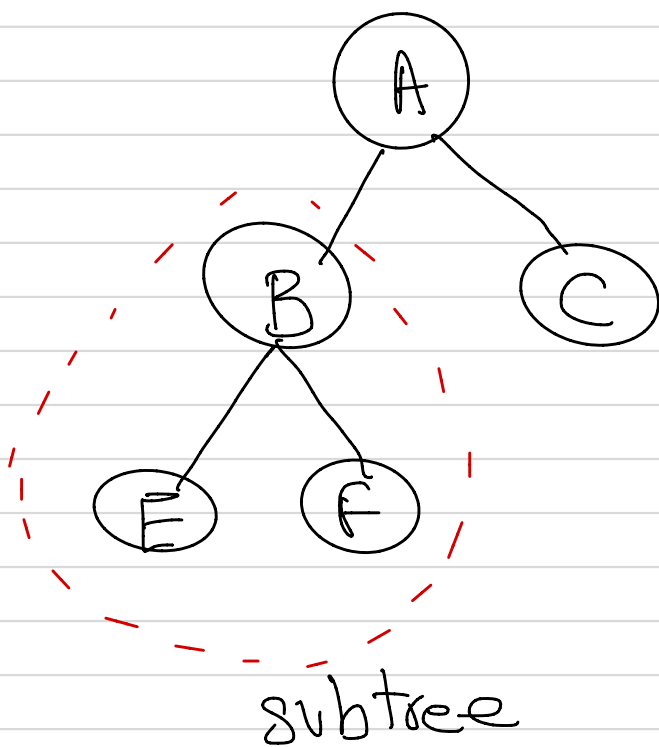


- Graph: is a set of objects in which some of the objects are connected to each other.
- The objects are called vertices or nodes, connections are edges.
- Path: is a sequence from (x_1, x_2, \dots, x_n) of edges that we denote by a sequence of vertices such that, there is an edge from x_{i-1} to x_i $1 \leq i \leq n$.
- Tree is a graph.
- Top node is called root.



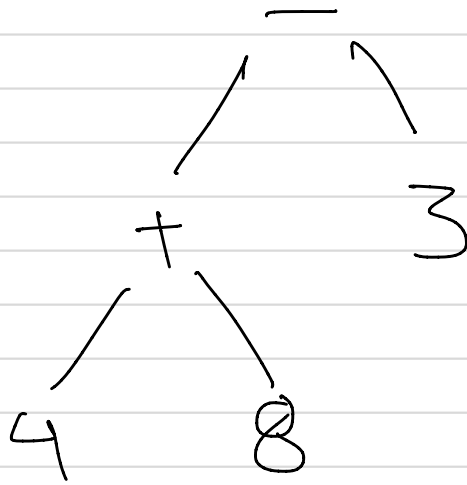
children hang immediately below a given node.

If x is a node in a tree then x together with all its descendants form a tree S with x as its root.

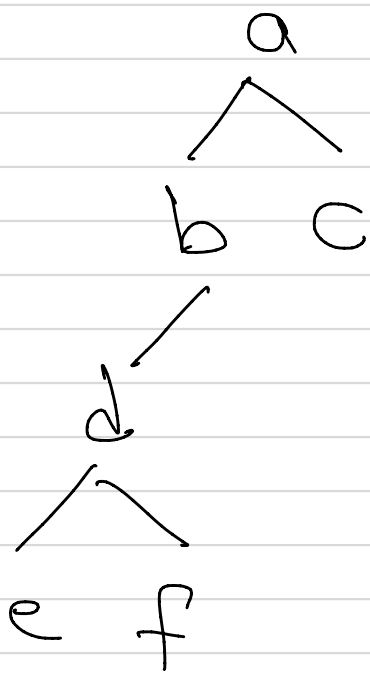


order is important not all commutative:

$$(4 + 8) - 3$$



Graph Traversal:



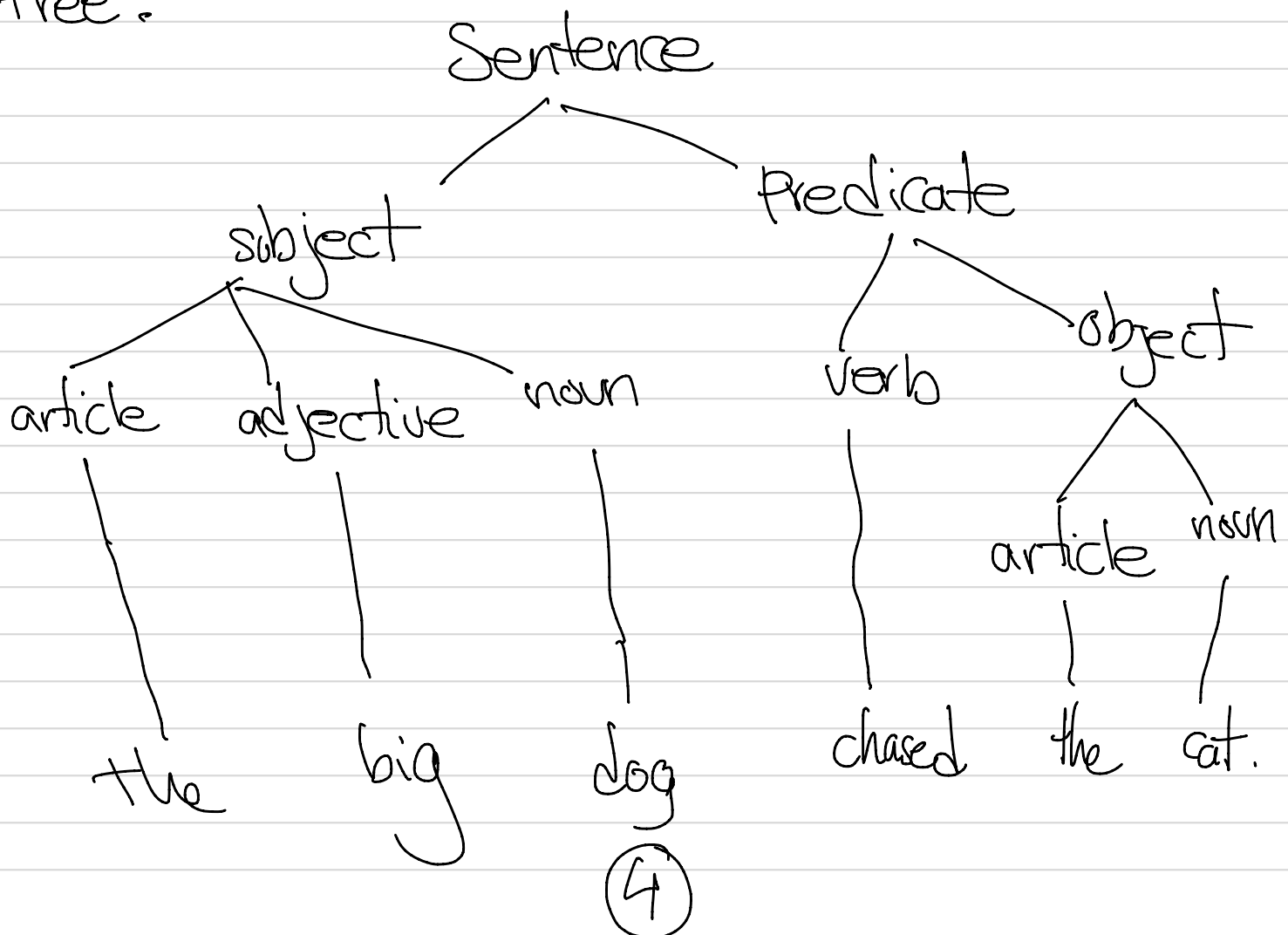
• Breadth-first:
a b c d e f

• Depth-first:
a b d e f c

Grammar: Is a set of rules used to define the structure of the strings in a Language.

To parse a sentence means to break it up into parts that conform to a given grammar.

A parsed sentence is often represented as a tree, called parse tree/derivation tree.



. If L is a language over an alphabet A , then a grammar for L consists of a set of grammar rules of the form $\alpha \rightarrow \beta$ α produces β , where α and β denote strings of symbols from A .

. Every grammar has a special grammar symbol called "the start Symbol".

. There must be at least one production with the left side consisting of only the start symbol $S \rightarrow \beta$.

Let $A = \{a, b, c\}$ then a grammar for a lang. can be

$$S \rightarrow \lambda,$$

$$S \rightarrow aS,$$

$$S \rightarrow bS$$

$$S \rightarrow cS.$$

• $S \rightarrow a$

• $S \rightarrow a$

and

$$S \rightarrow b$$

• $S \rightarrow a \mid b$

• $S \rightarrow \lambda$

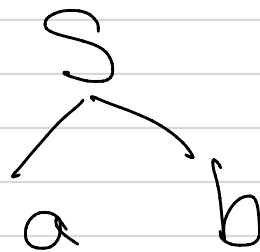
. Each step of derivation corresponds to attaching a new subtree to parse tree.

. Root is the start Symbol.

$S \rightarrow a$



$S \rightarrow a \mid b$



$S \rightarrow aS$

