Syntax Tree
Definition

A syntax tree (also known as abstract syntax tree) is a condensed form of parse tree.

Example:

```
       +
      /  
   E    *
   /  
 T    digit
 /  
digit digit
```

Parse Tree  Syntax Tree
<table>
<thead>
<tr>
<th>Parse Tree</th>
<th>Syntax Tree</th>
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</thead>
<tbody>
<tr>
<td><strong>Parse Tree</strong></td>
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<td>A parse tree is a graphical representation of the replacement process in a derivation.</td>
<td>A syntax tree is a condensed form of parse tree.</td>
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<td>In parse trees,</td>
<td>In syntax trees,</td>
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<tr>
<td>→ each interior node represents a grammar rule</td>
<td>→ each interior node represents an operator</td>
</tr>
<tr>
<td>→ each leaf node represents a terminal</td>
<td>→ each leaf node represents an operand</td>
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</tbody>
</table>
Parse trees represent every detail from the real syntax.

Syntax trees do not represent every detail from the real syntax (that's why they are called abstract). For example: no rule nodes, no parentheses etc.

Parse trees are less dense compared to syntax trees for the same language construct.

Syntax trees are more dense compared to parse trees for the same language construct.
Problem-01: Consider the following grammar:

\[ E \rightarrow E + T / T \]
\[ T \rightarrow T \times F / F \]
\[ F \rightarrow (E) / \text{id} \]

For the string, \[ W = \text{id} + \text{id} \times \text{id} \]

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**Solution:** The given grammar is:

\[ E \rightarrow E + T / T \]

\[ T \rightarrow T \times F / F \]

\[ F \rightarrow (E) / \text{id} \]

\[ w = \text{id} + \text{id} \times \text{id} \]
**Problem-02:** Construct the syntax tree for the following expression:

\[(a+b) \times (c-d) + ((e/f) \times (a+b))\]

**Solution:**

**Step-1:** Convert the given expression into a postfix expression.

\[
\begin{align*}
(a+b) \times (c-d) + ((e/f) \times (a+b)) & \\
\Rightarrow &
ab \times c \times d + ef/a b +
\end{align*}
\]
Step-2:  
In the syntax tree, 

\[(a+b) - c \times d / (a+c) \times (a+b)\]
Syntax tree