

Tutorial on ANTLR4:

A Parser Generation Tool

Assumptions

- Eclipse IDE

- Installation of the ANTLR4 tool

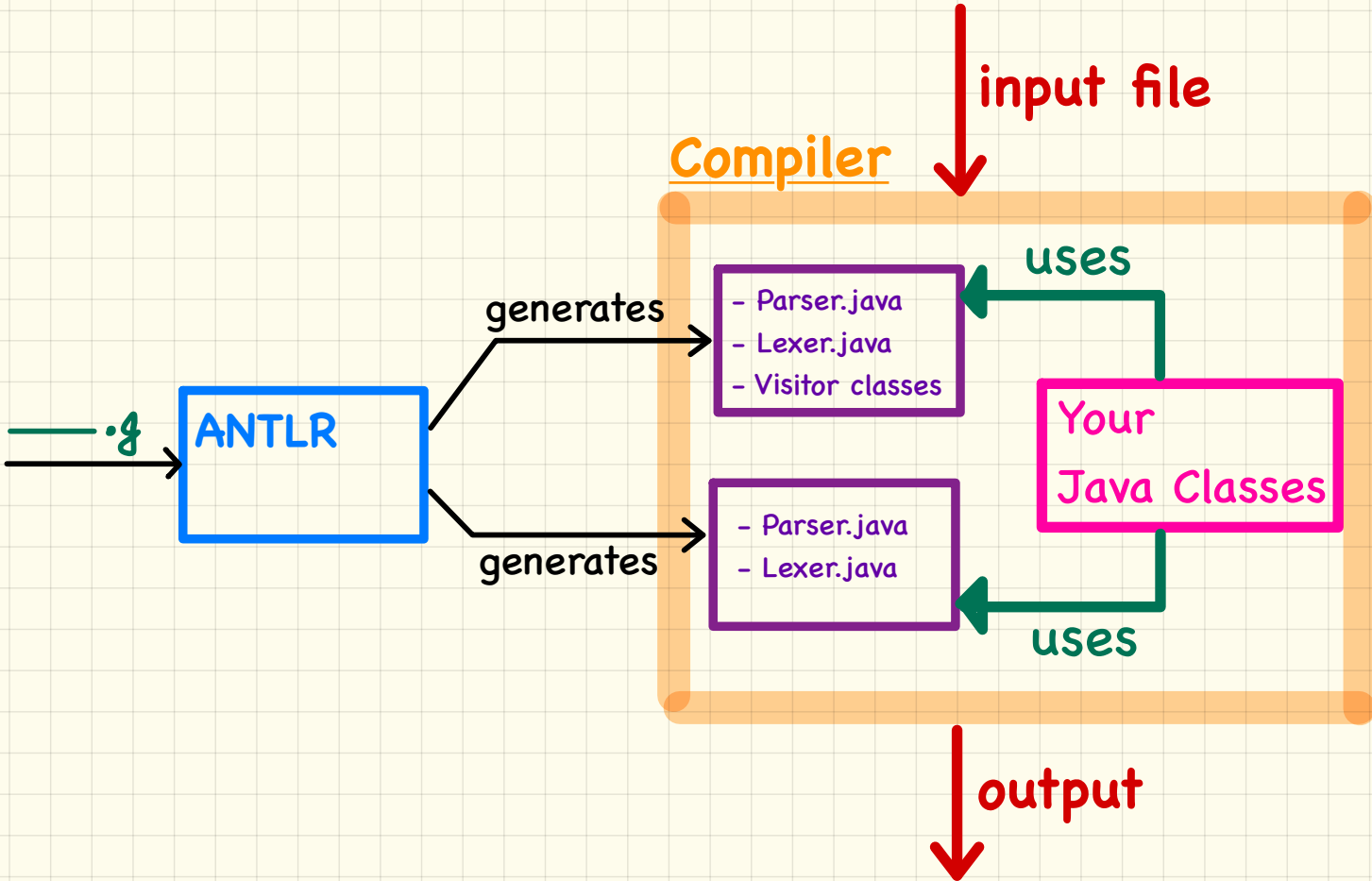
- Download the jar file of ANTLR4

- Further References:

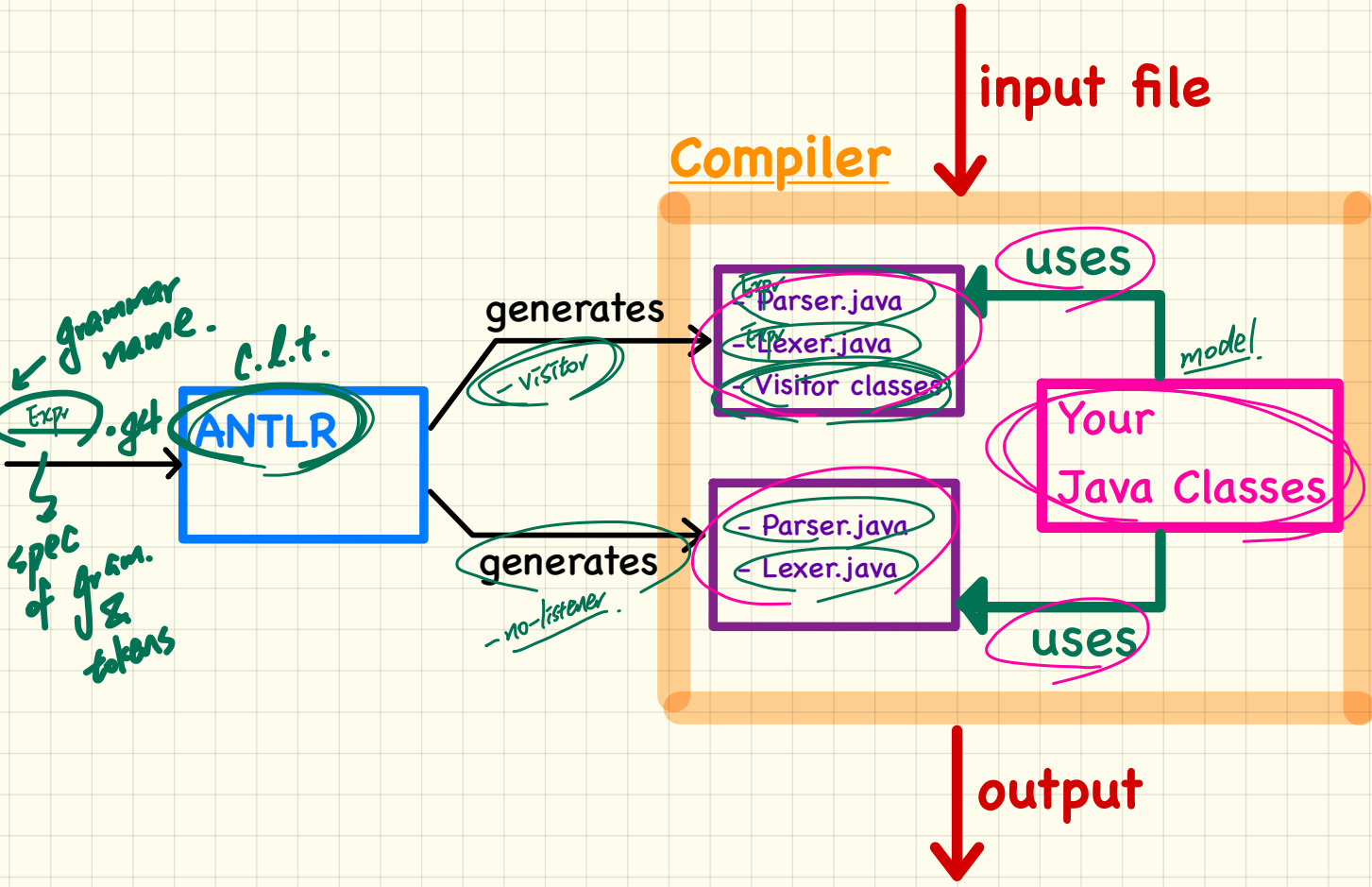
 - * ANTLR website

 - * Book on ANTLR4

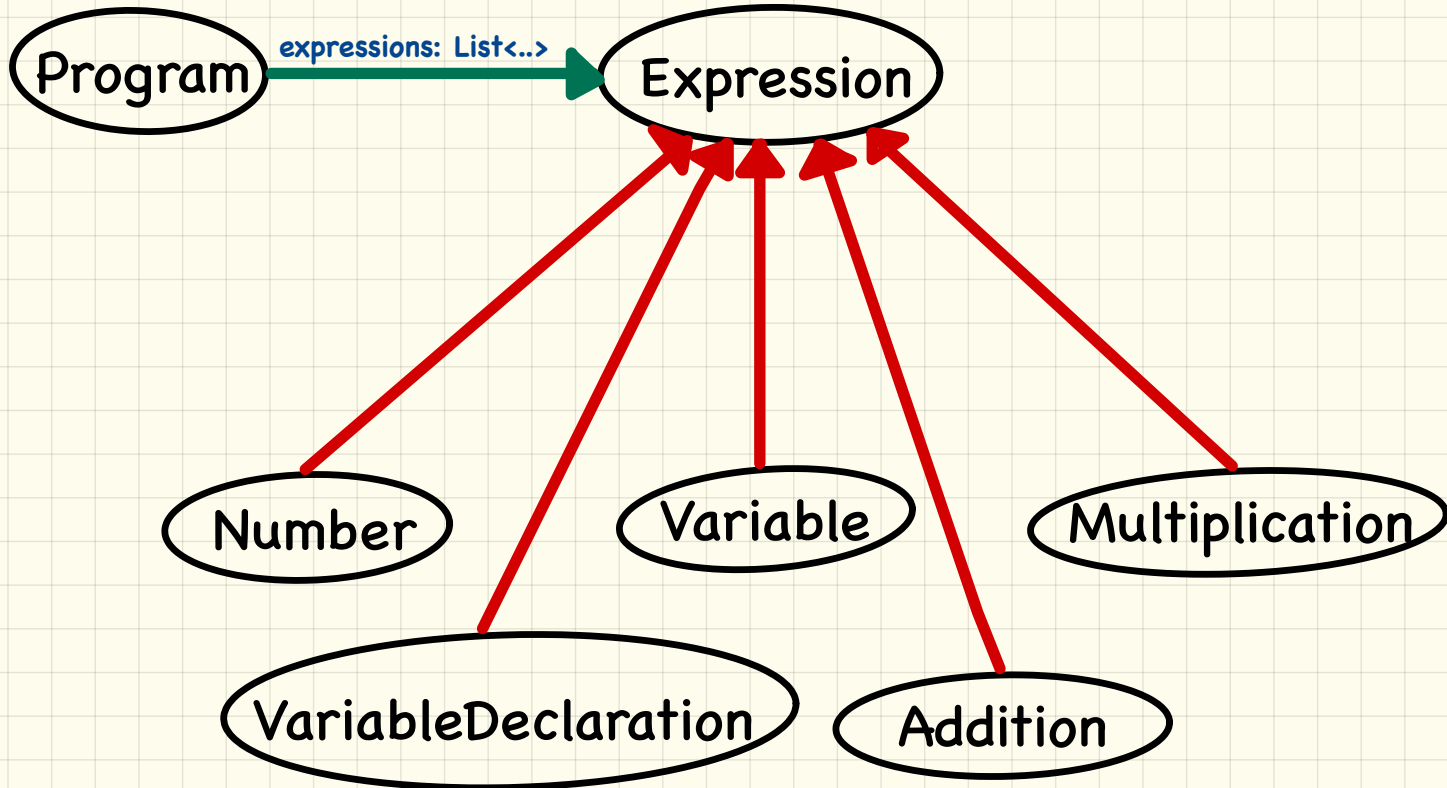
ANTLR (Another Tool for Language Recognition)



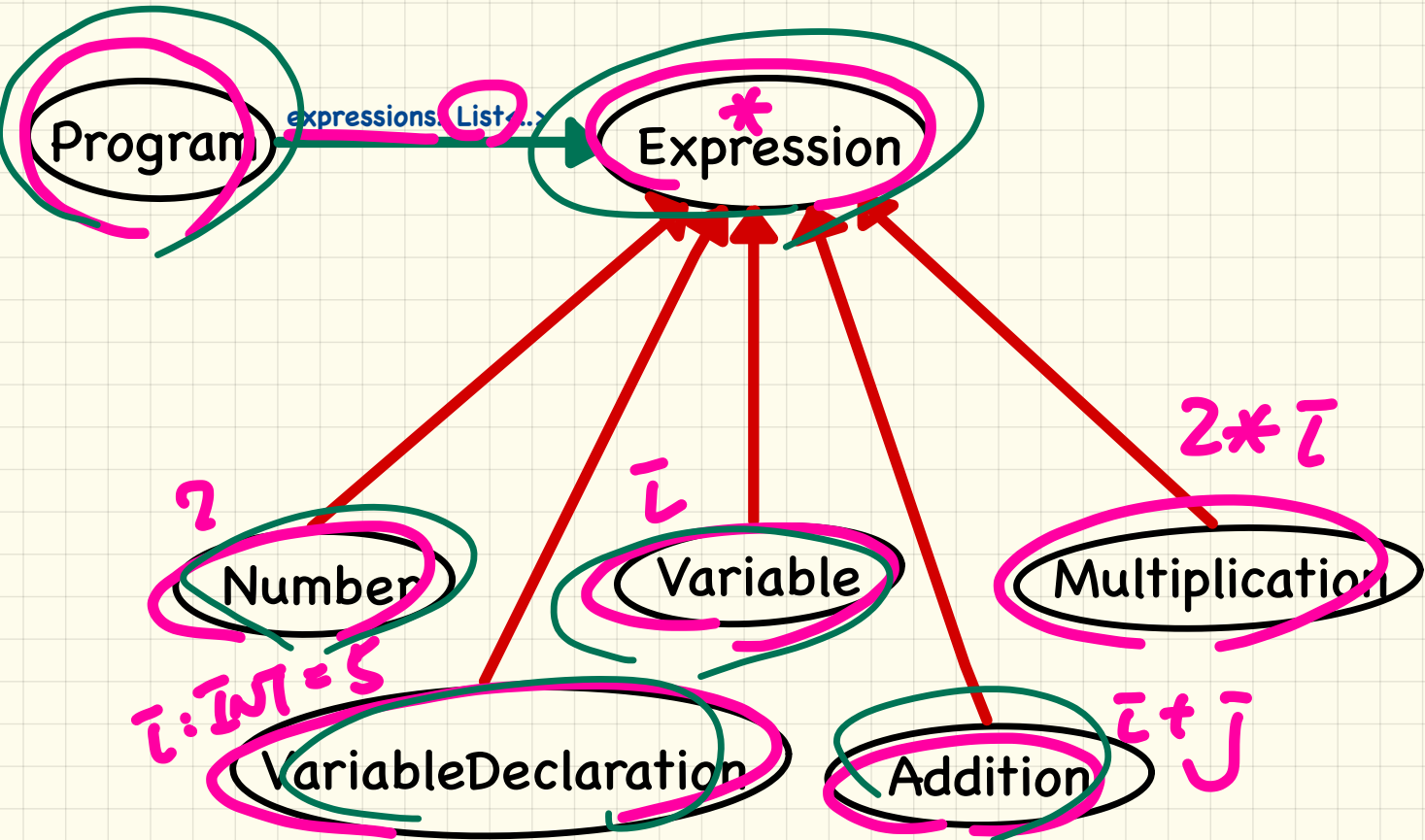
ANTLR (ANother Tool for Language Recognition)



Composite Pattern of Model Classes



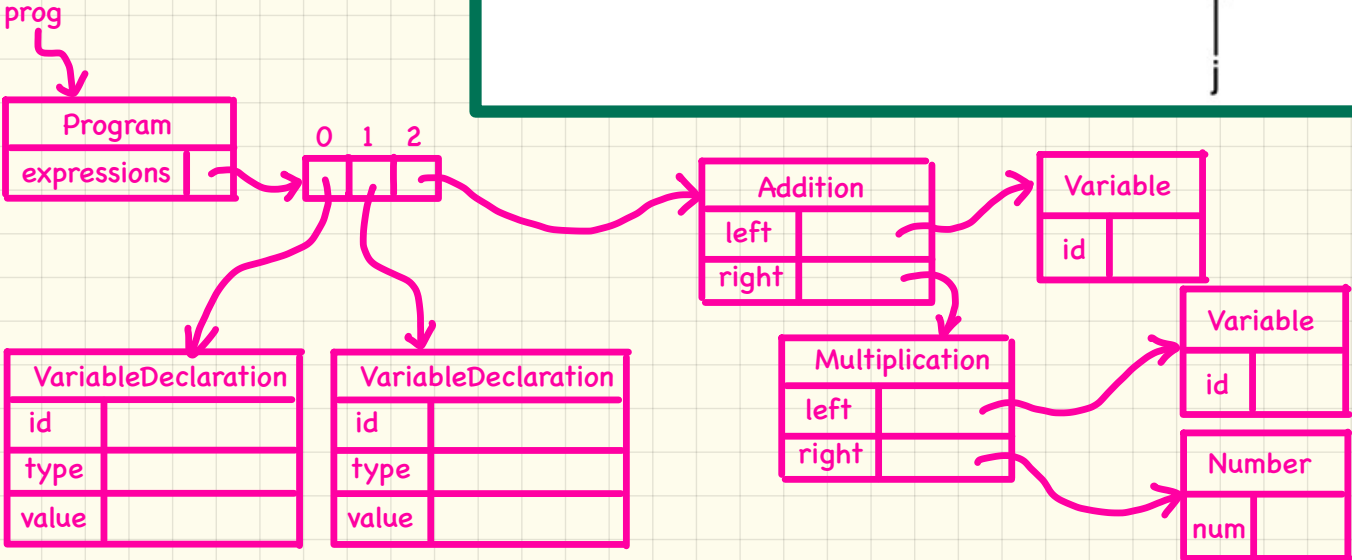
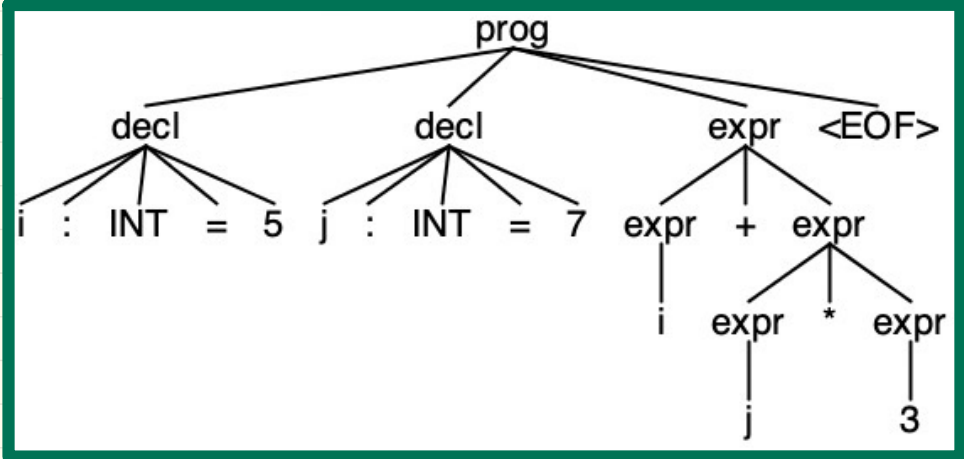
Composite Pattern of Model Classes



Building Model Objects from Parse Trees

```

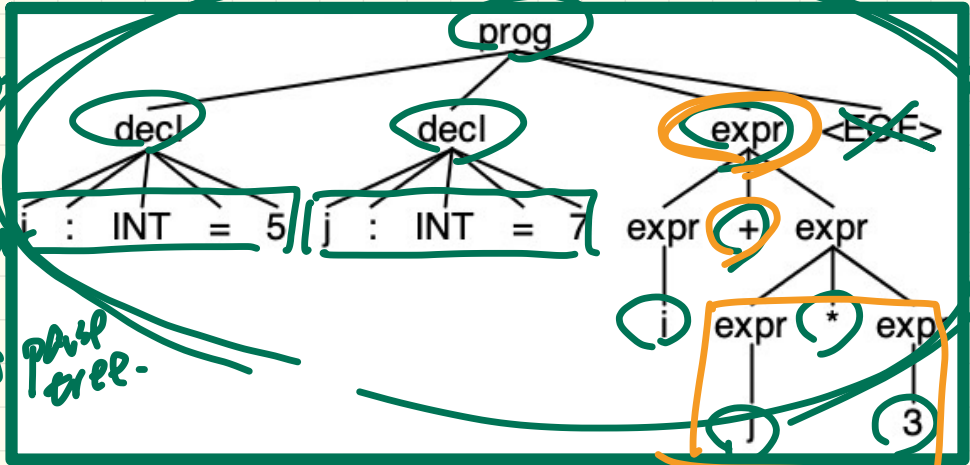
i : INT = 5
j : INT = 7
i + j * 3
    
```



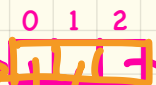
Building Model Objects from Parse Trees

```

i : INT = 5
j : INT = 7
(i - j) * 3
    
```



We do not want to manipulate directly upon the parse tree.



VariableDeclaration	
id	i
type	INT
value	5

VariableDeclaration	
id	j
type	INT
value	7

Addition	
left	
right	

Variable	
id	i

Multiplication	
left	
right	

Variable	
id	j

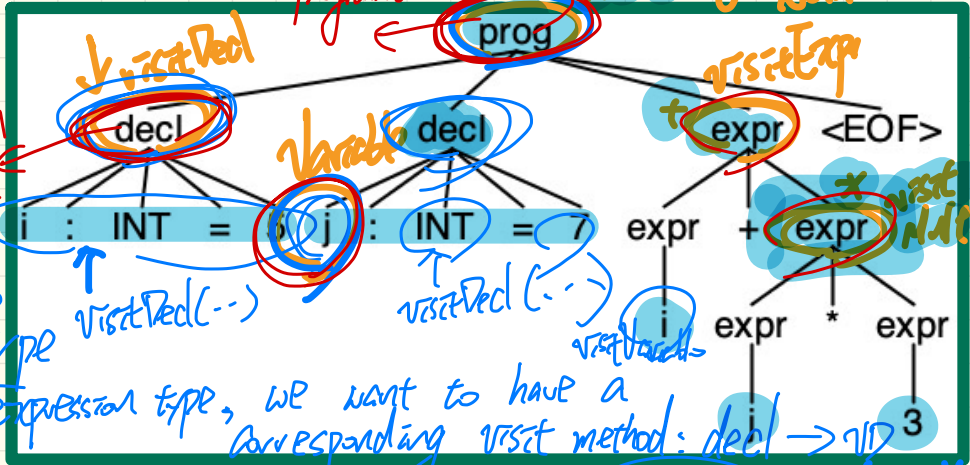
Number	
num	3

Building Model Objects from Parse Trees

```

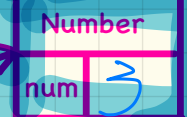
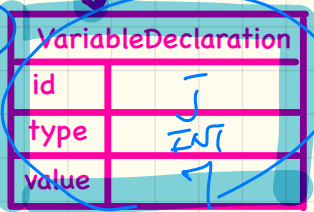
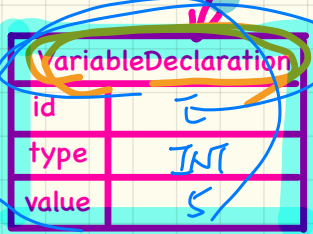
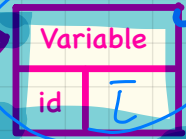
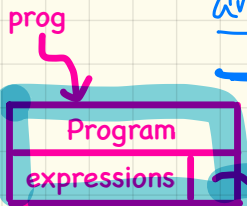
i : INT = 5
j : INT = 7
i + j * 3
    
```

Declaration Context



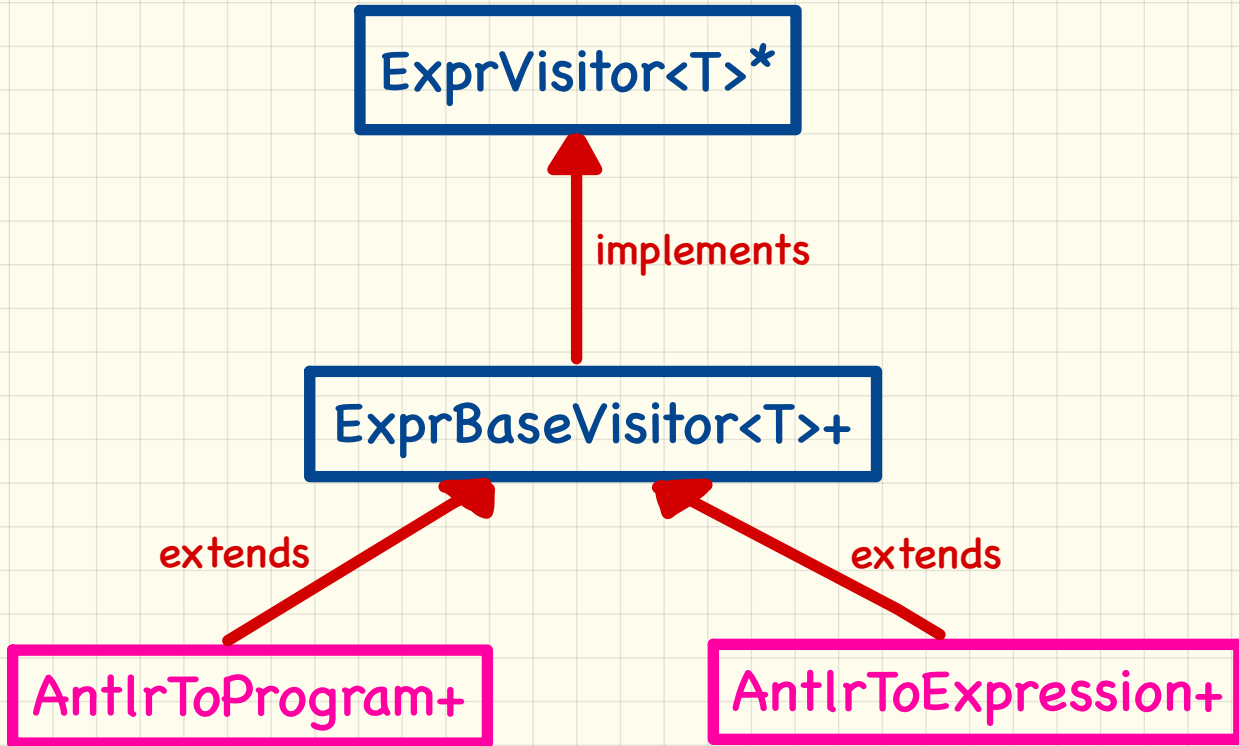
Each internal node → an expression type

For every expression type, we want to have a corresponding visit method: decl → visitDecl

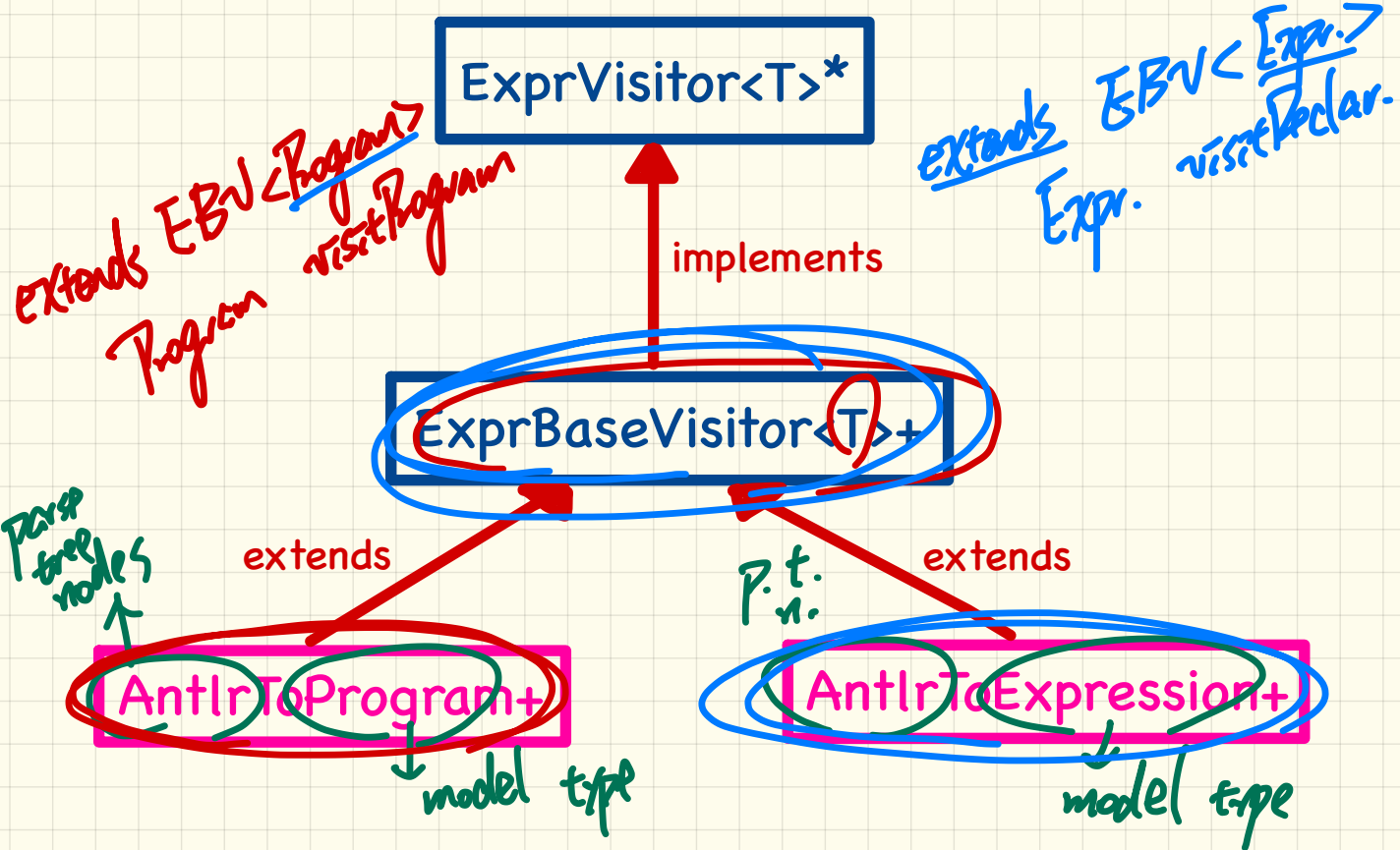


j → Variable

Hierarchy of **Visitor** Classes



Hierarchy of Visitor Classes

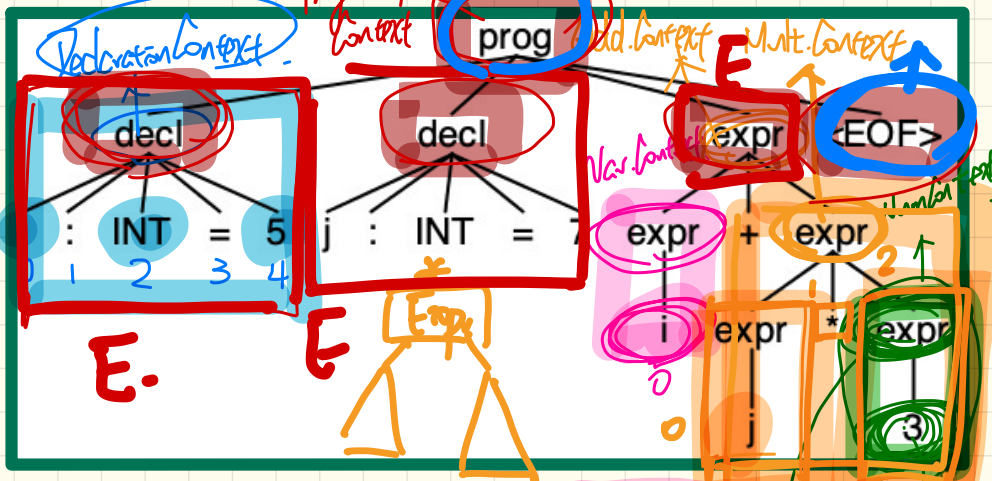


Building Model Objects from Parse Trees

[IX]

```

i : INT = 5
j : INT = 7
i + j * 3
    
```



The way nodes are visited corresponds to the order of tokens in input prog.



Visited
Composite

VariableDeclaration	
id	•
type	•
value	•

VariableDeclaration	
id	
type	
value	

Addition	
left	
right	

Variable	
id	i

Multiplication	
left	
right	

Variable	
id	

Number	
num	3



grammatical.

Syntax Errors vs. Semantic Errors

```
i: INT = 5  
i: INT = 7  
j = i + 23 : INT  
24 * k  
i: INT = 9
```

typ error

Syntax errors must be all fixed before semantic errors can be reported

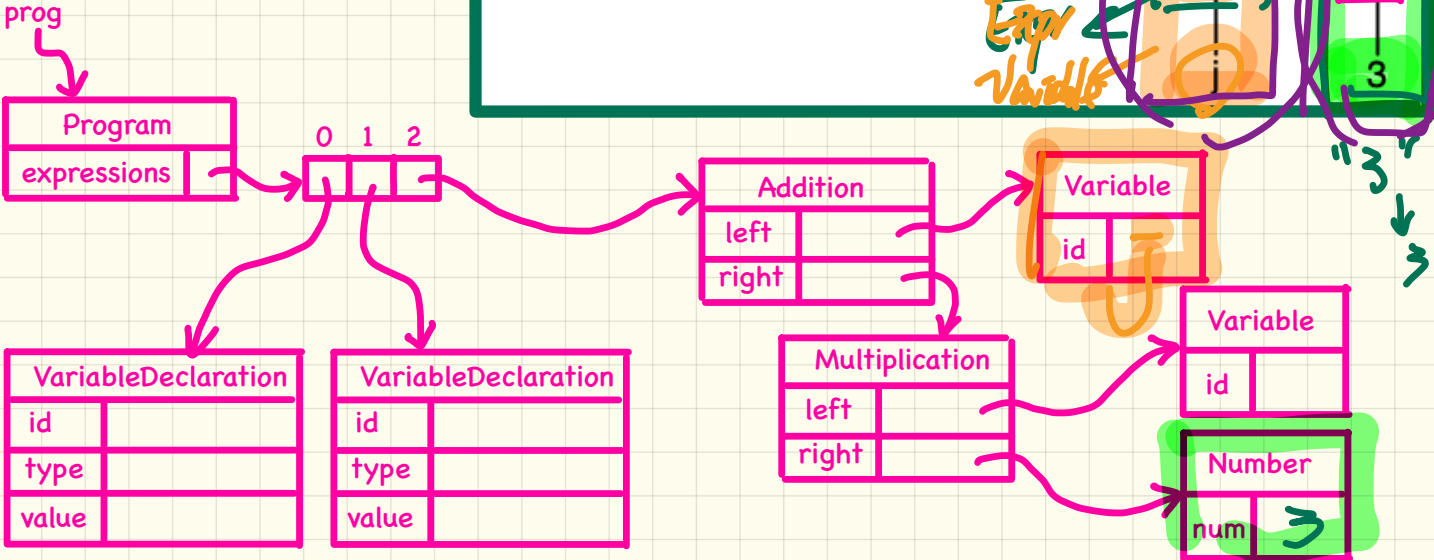
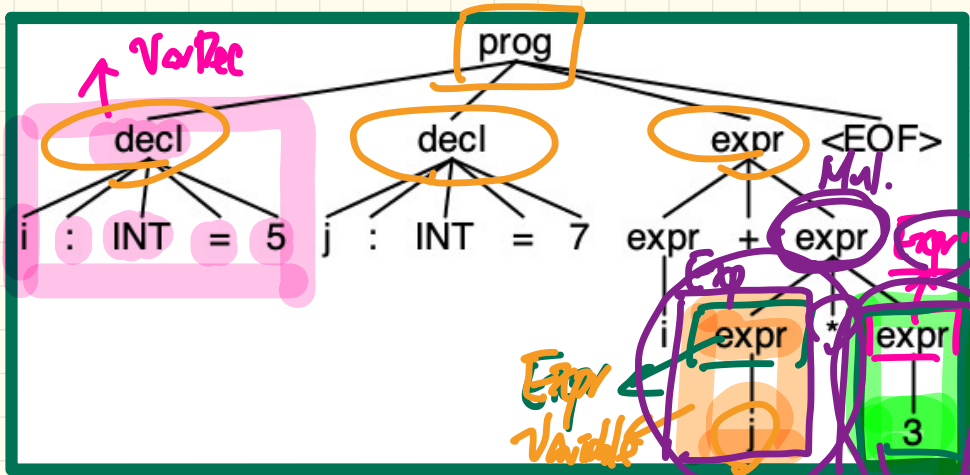
Parsing Error

line 3:2 no viable alternative at input 'j='
Error: variable i already declared (2, 2)

Building Model Objects from Parse Trees

```

i : INT = 5
j : INT = 7
i + j * 3
    
```



Visitor vs. Action

	Visitor	Action
grammar vs. semantic actions	distributed	centralized
retrieval of model object	indirect (visit parse tree)	direct (built as parsing goes)

Visitor vs. Action

	Visitor	Action
grammar vs. semantic actions	distributed - clean grammar - actions are visit methods in multiple classes	centralized @members { } → <code>— i — { . - }</code> <code>— i — { - }</code>
retrieval of model object	indirect (visit parse tree) ↓ program ↗ parsing & building model object ↓ seq.	direct (built as parsing goes) parsing & building model object ↓ class construction