

# Introduction to Language Theory and Compilation Solutions

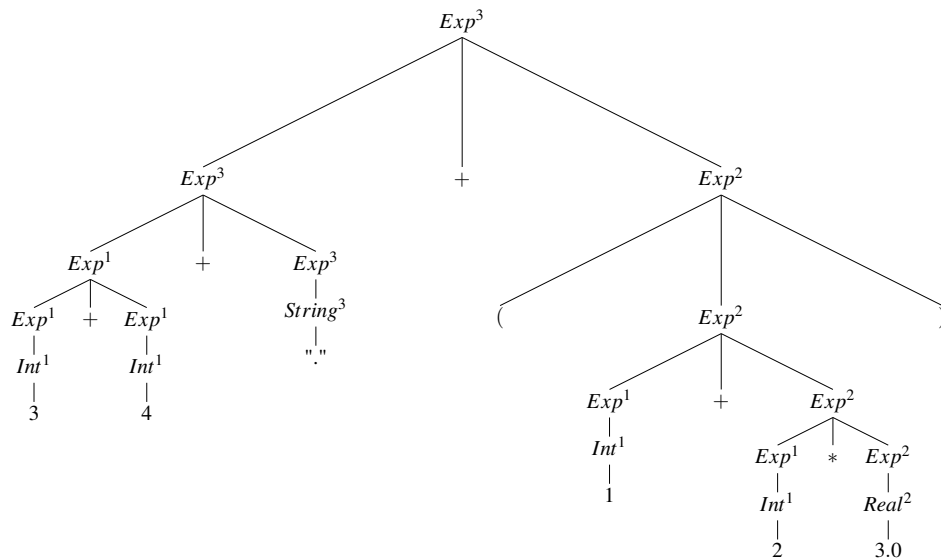
## Session 7: Semantic Analysis

### Solutions

**Ex. 1.** Explain why these methods are (not) semantically correct.

- No because an object is not a boolean value (but the grammar accept it).
- Yes because Java auto-wrap basic types to primitive types.

**Ex. 2.** Write the expression tree decorated with the type of each node.



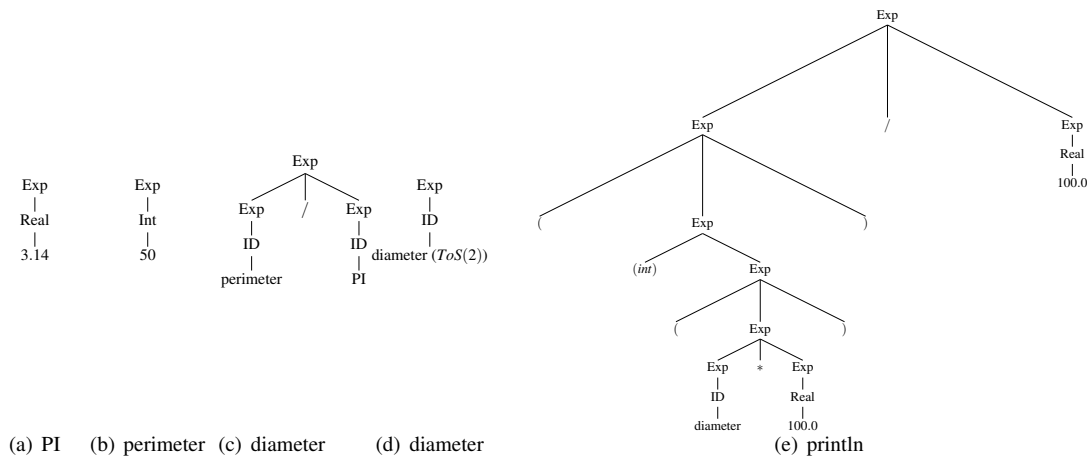
where 1 are **integers**, 2 are **reals** and 3 are **strings**.

**Ex. 3.** Identify the scope of all variables

- Give the table of symbols (ToS)

UID	Name	Context	Initialization	Type
1	PI	Exercise3 class	3.141592653589793	double
2	diameter	Exercise3 class	/	double
3	args	main function class	parameter	String[]
4	perimeter	main function class	50	double
5	diameter	main function	ToS(2)	int

- Give the parse tree of each numerical expression



- Annotated the parse trees with changes of the table of symbols We add these operations in the root of the trees:

PI (a)  $ToS(1) \leftarrow result(Exp)$   
 perimeter (b)  $ToS(4) \leftarrow result(Exp)$   
 diameter (c)  $ToS(2) \leftarrow result(Exp)$   
 diameter (d)  $ToS(5) \leftarrow result(Exp)$   
 println (e) /

Report any semantic error.

**Line 7: the global diameter is a double and the local diameter is an integer. A cast operator is required.** This error occurs at the root of the tree (d).