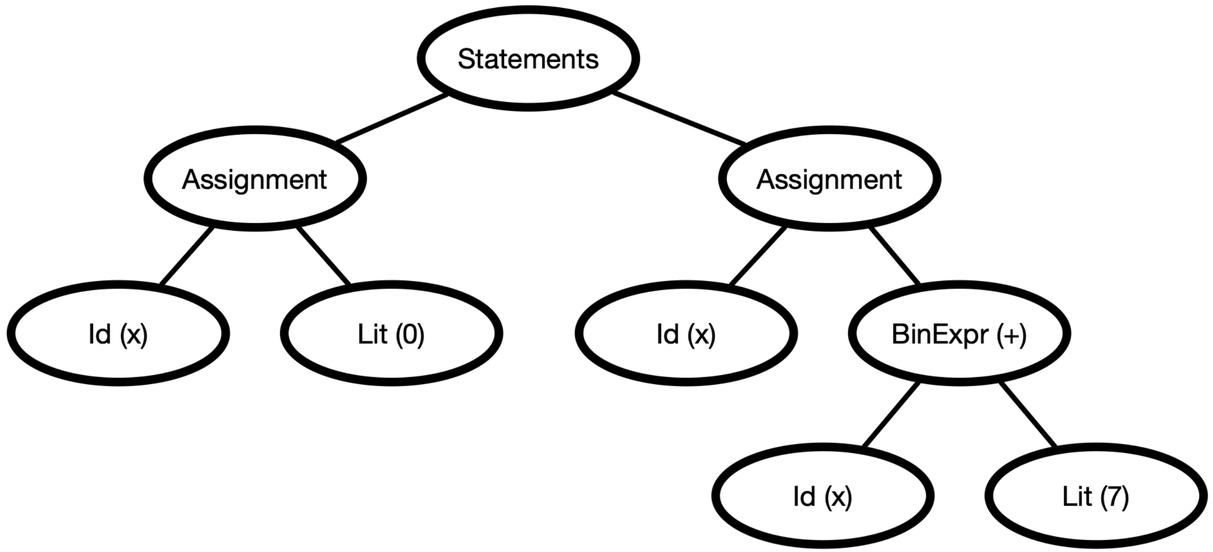
Abstract Syntax Trees

what is an abstract syntax tree

- Tree representing the structure of the program
- Leaf nodes represent elements like variables and literals
- Interior nodes represent higher-level constructs:
  - Arithmetic operations and other complex expressions (e.g., function calls)
  - Assignment statements
  - Control statments
  - Lists of statements

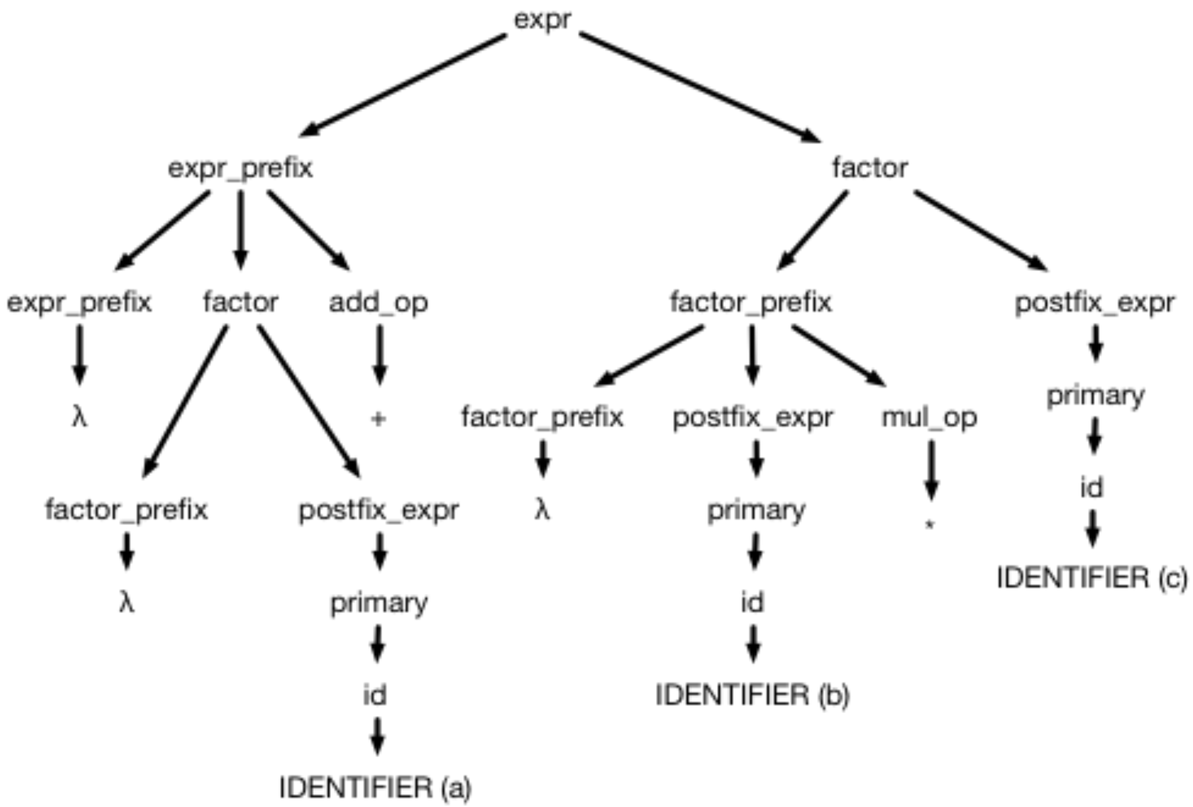


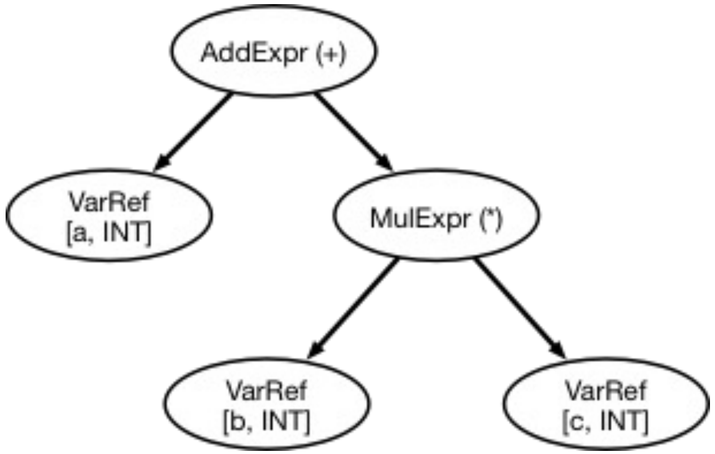
why abstract syntax trees?

- Parse trees are tied to specific grammar used to recognize a language
  - Lots of extraneous information we don't need (semicolons, parentheses, intermediate constructs)
  - May be structured oddly to deal with parser constraints (capturing order of operations, dealing with left-recursion)
- Abstract syntax trees are, well, **abstract**
  - Tree nodes represent operations without necessarily being tied to specific concrete syntax (can change keywords without changing AST structure)
  - Only preserve information needed for correct analysis and code generation (tree structure captures order of operations, rather than grammar structure)

ast vs parse tree

a + b * c





next: ASTs for expressions