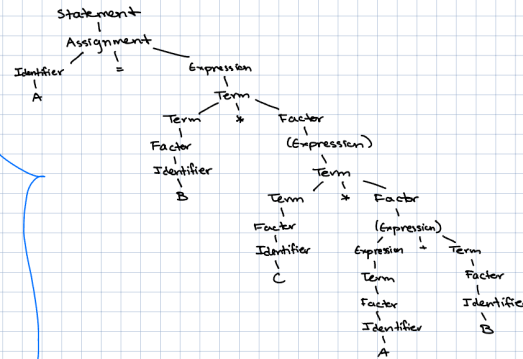


1) $A = B * (C * (A + B))$

Leftmost Derivation:
 Statement \rightarrow Assignment
 Assignment \rightarrow Identifier = Expression
 Identifier \rightarrow A
 Expression \rightarrow Term
 Term \rightarrow Term * Factor
 Term \rightarrow Factor
 Factor \rightarrow Identifier
 Identifier \rightarrow B
 Factor \rightarrow (Expression)
 Expression \rightarrow Term
 Term \rightarrow Term + Factor
 Term \rightarrow Factor
 Factor \rightarrow Identifier
 Identifier \rightarrow A
 Factor \rightarrow (Expression)
 Expression \rightarrow (Expression + Term)
 Expression \rightarrow Term
 Term \rightarrow Factor
 Factor \rightarrow Identifier
 Identifier \rightarrow C
 Term \rightarrow Factor
 Factor \rightarrow Identifier
 Identifier \rightarrow B

Statement
 Assignment
 Identifier = Expression
 $A = \text{Expression}$
 $A = \text{Term}$
 $A = \text{Term} * \text{Factor}$
 $A = \text{Factor} * \text{Factor}$
 $A = \text{Identifier} * \text{Factor}$
 $A = B * \text{Factor}$
 $A = B * (\text{Expression})$
 $A = B * (\text{Term})$
 $A = B * (\text{Term} * \text{Factor})$
 $A = B * (\text{Factor} * \text{Factor})$
 $A = B * (\text{Identifier} * \text{Factor})$
 $A = B * (C * \text{Factor})$
 $A = B * (C * (\text{Expression}))$
 $A = B * (C * (\text{Expression} + \text{Term}))$
 $A = B * (C * (\text{Term} + \text{Term}))$
 $A = B * (C * (\text{Factor} + \text{Term}))$
 $A = B * (C * (\text{Identifier} + \text{Term}))$
 $A = B * (C * (A + \text{Term}))$
 $A = B * (C * (A + \text{Factor}))$
 $A = B * (C * (A + \text{Identifier}))$
 $A = B * (C * (A + B))$



2) a. Static Scope

add(v) 69	$u = 69 + 42 + 69$ ↑ global = 180
bar(add)	L u = 17
foo(u, 13) 42	L v = 42
main	u = 42 v = 69 w = 17

fn's get assigned w/ original definition

b. Dynamic Deep

add(v) 42	$u = 42 + 42 + 42$ = 126
bar(add)	L u = 13 L v = 42
foo(u, 13) 42	L v = 42
main	u = 42 v = 69 w = 17

valid since bar calls in

uses local u & v

c. Dynamic Shallow

add(v) 42	$u = 42 + 13 + 42$ = 97
bar(add)	L u = 13 L v = 42
foo(u, 13) 42	L v = 42
main	u = 42 v = 69 w = 17

Things to note:

- static scope pays attention to global
- dynamic deep pays attention to when fn 1st defined (checks further down stack if needed)
- dynamic shallow pays attention to fn immediately before one that was called (goes to stack just below if needed)

- each call has own assignments
↳ as a result they may be from previous calls
- calls valid only in method when called

In static scope u prints 180.

In dynamic deep scope u prints 126.

In dynamic shallow scope u prints 97