



Homework 2

COMP 3220

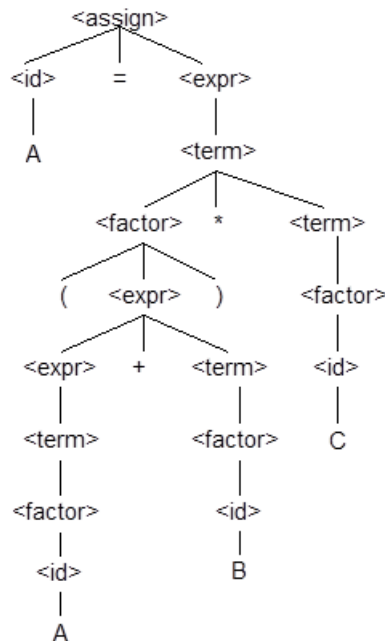
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9/5/14

Due: September 5, Friday by 11:59PM (midnight).
Please submit as a PDF or WORD document using Canvas

(1. 20pts) Question 3.7 (page 163) from the textbook.

a.



$\langle \text{assign} \rangle \Rightarrow \langle \text{id} \rangle = \langle \text{exp} \rangle$

$\Rightarrow A = \langle \text{exp} \rangle$

$\Rightarrow A = \langle \text{term} \rangle$

$\Rightarrow A = \langle \text{factor} \rangle * \langle \text{term} \rangle$

$\Rightarrow A = (\langle \text{exp} \rangle) * \langle \text{term} \rangle$

$\Rightarrow A = (\langle \text{exp} \rangle + \langle \text{term} \rangle) * \langle \text{term} \rangle$

$\Rightarrow A = (\langle \text{term} \rangle + \langle \text{term} \rangle) * \langle \text{term} \rangle$

$\Rightarrow A = (\langle \text{factor} \rangle + \langle \text{term} \rangle) * \langle \text{term} \rangle$

$\Rightarrow A = (\langle \text{id} \rangle + \langle \text{term} \rangle) * \langle \text{term} \rangle$

$\Rightarrow A = (A + \langle \text{term} \rangle) * \langle \text{term} \rangle$

$\Rightarrow A = (A + \langle \text{factor} \rangle) * \langle \text{term} \rangle$

$\Rightarrow A = (A + \langle \text{id} \rangle) * \langle \text{term} \rangle$

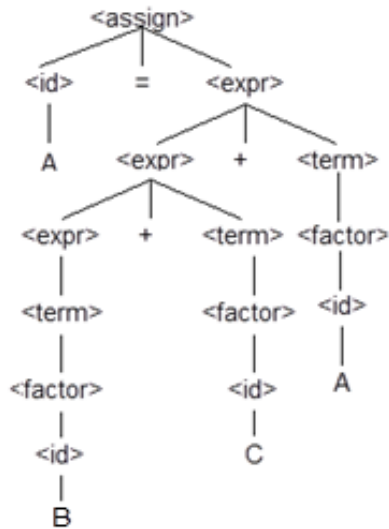
$\Rightarrow A = (A + B) * \langle \text{term} \rangle$

$\Rightarrow A = (A + B) * \langle \text{factor} \rangle$

$\Rightarrow A = (A + B) * \langle \text{id} \rangle$

$\Rightarrow A = (A + B) * C$

b.



$\langle \text{assign} \rangle \Rightarrow \langle \text{id} \rangle = \langle \text{exp} \rangle$

$\Rightarrow A = \langle \text{exp} \rangle$

$\Rightarrow A = \langle \text{exp} \rangle + \langle \text{term} \rangle$

$\Rightarrow A = \langle \text{exp} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$

$\Rightarrow A = \langle \text{term} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$

$\Rightarrow A = \langle \text{factor} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$

$\Rightarrow A = \langle \text{id} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$

$\Rightarrow A = B + \langle \text{term} \rangle + \langle \text{term} \rangle$

$\Rightarrow A = B + \langle \text{factor} \rangle + \langle \text{term} \rangle$

$\Rightarrow A = B + \langle \text{id} \rangle + \langle \text{term} \rangle$

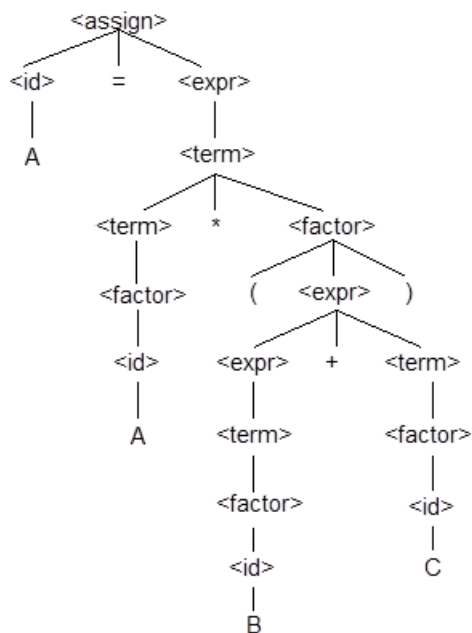
$\Rightarrow A = B + C + \langle \text{term} \rangle$

$\Rightarrow A = B + C + \langle \text{factor} \rangle$

$\Rightarrow A = B + C + \langle \text{id} \rangle$

$\Rightarrow A = B + C + A$

c.



$\langle \text{assign} \rangle \Rightarrow \langle \text{id} \rangle = \langle \text{exp} \rangle$

$\Rightarrow A = \langle \text{exp} \rangle$

$\Rightarrow A = \langle \text{term} \rangle$

$\Rightarrow A = \langle \text{term} \rangle * \langle \text{factor} \rangle$

$\Rightarrow A = \langle \text{factor} \rangle * \langle \text{factor} \rangle$

$\Rightarrow A = \langle \text{id} \rangle * \langle \text{factor} \rangle$

$\Rightarrow A = A * \langle \text{factor} \rangle$

$\Rightarrow A = A * (\langle \text{exp} \rangle)$

$\Rightarrow A = A * (\langle \text{exp} \rangle + \langle \text{term} \rangle)$

$\Rightarrow A = A * (\langle \text{term} \rangle + \langle \text{term} \rangle)$

$\Rightarrow A = A * (\langle \text{factor} \rangle + \langle \text{term} \rangle)$

$\Rightarrow A = A * (\langle \text{id} \rangle + \langle \text{term} \rangle)$

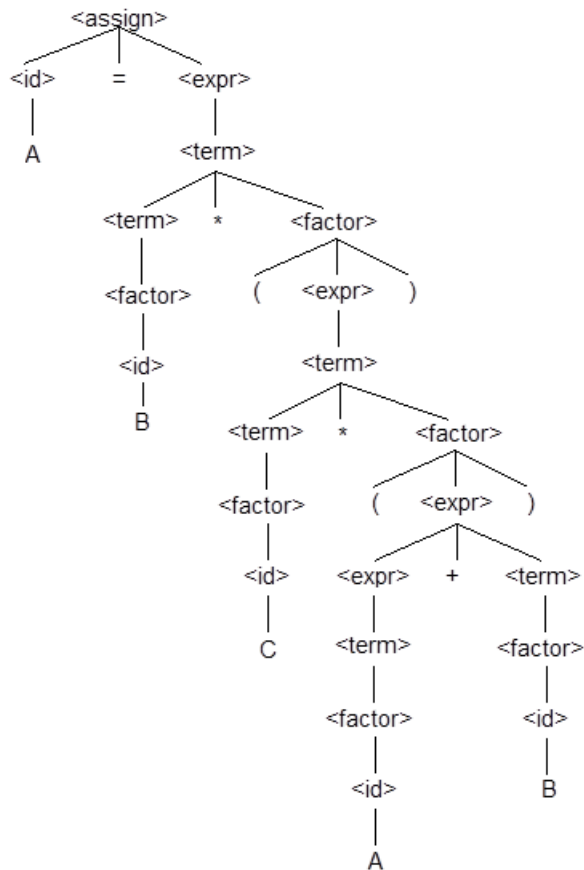
$\Rightarrow A = A * (B + \langle \text{term} \rangle)$

$\Rightarrow A = A * (B + \langle \text{factor} \rangle)$

$\Rightarrow A = A * (B + \langle \text{id} \rangle)$

$\Rightarrow A = A * (B + C)$

d.



$\langle \text{assign} \rangle \Rightarrow \langle \text{id} \rangle = \langle \text{exp} \rangle$

$\Rightarrow A = \langle \text{term} \rangle$

$\Rightarrow A = \langle \text{term} \rangle * \langle \text{factor} \rangle$

$\Rightarrow A = \langle \text{factor} \rangle * \langle \text{factor} \rangle$

$\Rightarrow A = \langle \text{id} \rangle * \langle \text{factor} \rangle$

$\Rightarrow A = B * \langle \text{factor} \rangle$

$\Rightarrow A = B * (\langle \text{exp} \rangle)$

$\Rightarrow A = B * (\langle \text{term} \rangle)$

$\Rightarrow A = B * (\langle \text{term} \rangle * \langle \text{factor} \rangle)$

$\Rightarrow A = B * (\langle \text{factor} \rangle * \langle \text{factor} \rangle)$

$\Rightarrow A = B * (\langle \text{id} \rangle * \langle \text{factor} \rangle)$

$\Rightarrow A = B * (C * \langle \text{factor} \rangle)$

$\Rightarrow A = B * (C * (\langle \text{exp} \rangle))$

$\Rightarrow A = B * (C * (\langle \text{exp} \rangle + \langle \text{term} \rangle))$

$\Rightarrow A = B * (C * (\langle \text{term} \rangle + \langle \text{term} \rangle))$

$\Rightarrow A = B * (C * (\langle \text{factor} \rangle + \langle \text{term} \rangle))$

$\Rightarrow A = B * (C * (\langle \text{id} \rangle + \langle \text{term} \rangle))$

$\Rightarrow A = B * (C * (A + \langle \text{term} \rangle))$

$\Rightarrow A = B * (C * (A + \langle \text{factor} \rangle))$

$\Rightarrow A = B * (C * (A + \langle \text{id} \rangle))$

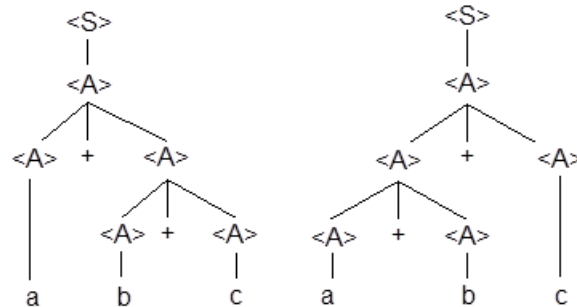
$\Rightarrow A = B * (C * (A + B))$

(2. 20pts) Question 3.8 (page 164) from the textbook.

a. Prove the following is ambiguous:

$$\langle S \rangle \rightarrow \langle A \rangle$$

$$\langle A \rangle \rightarrow \langle A \rangle + \langle A \rangle \mid \langle id \rangle$$

$$\langle id \rangle \rightarrow a \mid b \mid c$$


(3. 20pts) Question 3.11 (page 164) from the textbook.

$$\langle S \rangle \rightarrow \langle A \rangle a \langle B \rangle b$$

$$\langle A \rangle \rightarrow \langle A \rangle b \mid b$$

$$\langle B \rangle \rightarrow a \langle B \rangle \mid a$$

Which of the following sentences are in the language generated by this grammar?

a. **baab**

b. bbbab

c. bbaaaaa

d. **bbaab**

(4. 10pts) Question 3.13 (page 164) from the textbook.

Write a grammar for the language consisting of strings that have n copies of the letter a followed by the same number of copies of the letter b , where $n > 0$. For example, the strings ab , $aaaabbbb$, and $aaaaaaaaabbbbbbb$ are in the language but a , abb , ba , and $aaabb$ are not.

$$S \rightarrow \langle A \rangle$$

$$\langle A \rangle \rightarrow a \langle A \rangle b \mid ab$$

(5. 20pts) Question 3.23 (page 165) from the textbook.

a. $2 * (b - 1) - 1 > 0$

$\{b > 1.5\}$

b. $(c + 10) / 3 > 6$

$\{c > 8\}$

c. $a + 2 * b - 1 > 1$

$\{b > 1 - a/2\}$

d. $2 * y + x - 1 > 11$

$\{y > 6 - x/2\}$

(6. 10pts) Question 3.24(page 165-166) from the textbook.

a. $a = 2 * b + 1$

$$b = a - 3 \{b < 0\}$$

$$a - 3 < 0$$

$$a < 3$$

$$a = 2 * b + 1 \{a < 3\}$$

$$2 * b + 1 < 3$$

$$2 * b < 2$$

$$b < 1$$

b. $a = 3 * (2 * b + a)$

$$b = 2 * a - 1 \{b > 5\}$$

$$2 * a - 1 > 5$$

$$2 * a > 6$$

$$a > 3$$

$$a = 3 * (2 * b + a) \{a > 3\}$$

$$3 * (2 * b + a) > 3$$

$$6 * b + 3 * a > 3$$

$$2 * b + a > 1$$

$$b > (1 - a) / 2$$