

# Aula 3 – Exercício sobre descrição de sintaxe

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## 1) Resposta

### Gramática para números inteiros

$\langle \text{Num} \rangle \rightarrow \langle \text{Num} \rangle \langle \text{digit} \rangle \mid \langle \text{digit} \rangle$

$\langle \text{digit} \rangle \rightarrow 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$

Derivação mais à direita para o inteiro 4520:

$\langle \text{Num} \rangle$

$\Rightarrow \langle \text{Num} \rangle \langle \text{digit} \rangle$

$\Rightarrow \langle \text{Num} \rangle 0$

$\Rightarrow \langle \text{Num} \rangle 2 0$

$\Rightarrow \langle \text{Num} \rangle 5 2 0$

$\Rightarrow 4 5 2 0$

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## 2) Resposta

### Gramática para dar precedência ao + sobre \* à direita

$\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$

$\langle \text{id} \rangle \rightarrow A \mid B \mid C$

$\langle \text{expr} \rangle \rightarrow \langle \text{term} \rangle + \langle \text{expr} \rangle \mid \langle \text{term} \rangle$

$\langle \text{term} \rangle \rightarrow \langle \text{factor} \rangle * \langle \text{term} \rangle \mid \langle \text{factor} \rangle$

$\langle \text{factor} \rangle \rightarrow (\langle \text{expr} \rangle) \mid \langle \text{id} \rangle$

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## 3) Resposta

### Adicionando os operadores unários ++ e --

$\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$

$\langle \text{id} \rangle \rightarrow A \mid B \mid C$

$\langle \text{expr} \rangle \rightarrow \langle \text{term} \rangle + \langle \text{expr} \rangle \mid \langle \text{term} \rangle$

$\langle \text{term} \rangle \rightarrow \langle \text{factor} \rangle * \langle \text{term} \rangle \mid \langle \text{factor} \rangle$

$\langle \text{factor} \rangle \rightarrow (\langle \text{expr} \rangle) \mid \langle \text{id} \rangle \mid ++ \langle \text{id} \rangle \mid -- \langle \text{id} \rangle$

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## 4) Resposta

### Derivação de expressões

$\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$

$\langle \text{id} \rangle \rightarrow A \mid B \mid C$

$\langle \text{expr} \rangle \rightarrow \langle \text{id} \rangle + \langle \text{expr} \rangle \mid \langle \text{id} \rangle * \langle \text{expr} \rangle \mid (\langle \text{expr} \rangle) \mid \langle \text{id} \rangle$

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

$A = \langle \text{expr} \rangle$

$A = (\langle \text{id} \rangle + \langle \text{expr} \rangle)$

$A = (\langle \text{id} \rangle + (\langle \text{expr} \rangle))$

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

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

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

#### (B) $A = B + C + A$

$A = \langle \text{expr} \rangle$

$A = \langle \text{id} \rangle + \langle \text{expr} \rangle$

$A = \langle \text{id} \rangle + \langle \text{id} \rangle + \langle \text{expr} \rangle$

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

$A = B + C + A$

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

$A = \langle \text{expr} \rangle$

$A = \langle \text{id} \rangle * \langle \text{expr} \rangle$

$A = \langle \text{id} \rangle * (\langle \text{expr} \rangle)$

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

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

$A = A * (B + C)$

#### (D) $A = B * (C * (A + B))$

$A = \langle \text{expr} \rangle$

$A = \langle \text{id} \rangle * \langle \text{expr} \rangle$

$A = \langle \text{id} \rangle * (\langle \text{expr} \rangle)$

$A = \langle \text{id} \rangle * (\langle \text{id} \rangle * \langle \text{expr} \rangle)$

$A = \langle \text{id} \rangle * (\langle \text{id} \rangle * (\langle \text{expr} \rangle))$

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

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

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

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## 5) Resposta

$\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$   
 $\langle \text{id} \rangle \rightarrow A \mid B \mid C$   
 $\langle \text{expr} \rangle \rightarrow \langle \text{expr} \rangle + \langle \text{term} \rangle \mid \langle \text{term} \rangle$   
 $\langle \text{term} \rangle \rightarrow \langle \text{term} \rangle * \langle \text{factor} \rangle \mid \langle \text{factor} \rangle$   
 $\langle \text{factor} \rangle \rightarrow (\langle \text{expr} \rangle) \mid \langle \text{id} \rangle$

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

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

### (B) $A = B + C + A$

$A = \langle \text{expr} \rangle$   
 $A = \langle \text{expr} \rangle + \langle \text{term} \rangle$   
 $A = \langle \text{expr} \rangle + \langle \text{factor} \rangle$   
 $A = \langle \text{expr} \rangle + \langle \text{expr} \rangle + \langle \text{term} \rangle$   
 $A = \langle \text{term} \rangle + \langle \text{term} \rangle + \langle \text{factor} \rangle$   
 $A = \langle \text{factor} \rangle + \langle \text{factor} \rangle + \langle \text{id} \rangle$   
 $A = \langle \text{id} \rangle + \langle \text{id} \rangle + \langle \text{id} \rangle$   
 $A = B + C + A$

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

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

### (D) $A = B * (C * (A + B))$

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

## 8) Resposta

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

### Palavra Gerada?

baab      ✓ Sim

bbbab     ✗ Não

bbaaaaa ✗ Não

bbaab     ✓ Sim

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## 9) Resposta

$\langle \text{program} \rangle \rightarrow \text{begin } \langle \text{stmt\_list} \rangle \text{ end}$   
 $\langle \text{stmt\_list} \rangle \rightarrow \langle \text{stmt} \rangle ( ; \langle \text{stmt} \rangle )^*$   
 $\langle \text{stmt} \rangle \rightarrow \langle \text{var} \rangle = \langle \text{expression} \rangle$   
 $\langle \text{var} \rangle \rightarrow A \mid B \mid C$   
 $\langle \text{expression} \rangle \rightarrow \langle \text{var} \rangle ( + \langle \text{var} \rangle \mid - \langle \text{var} \rangle )^*$

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## 10) Resposta

$\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$   
 $\langle \text{id} \rangle \rightarrow A \mid B \mid C$   
 $\langle \text{expr} \rangle \rightarrow \langle \text{term} \rangle ( + \langle \text{term} \rangle \mid * \langle \text{term} \rangle )^*$   
 $\langle \text{term} \rangle \rightarrow ( \langle \text{expr} \rangle ) \mid \langle \text{id} \rangle$

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