

S D C A E

N = { Statement, Declarative, Conditional, Assign, Expression,
More Statement, Relop, Type, More IDs, Term, Factor }

T = { if, then, else, endif, while, do, end, begin, end,
;, <, <=, ==, <>, !=, >, int, float, bool, , id, num }

S = Statement

R = { S → A | D | if C then S else S endif |

while C do S whileend |

begin S MS end

MS → ; S MS | ε

C → E R E | E

T R → < | <= | == | <> | != | >

A → id = E;

E → E + T | E - T | T

T → T * F | T / F | F

F → (E) | id | num

D → T ; id MI ; | ε

T → T + int | float | bool

MI → , id MI | ε

23 Rules

check for left recursion → present in E & T
new E & T rules

E → TE'

E' → + TE' | - TE' | ε

T → FT'

T' → *FT' | /FT' | ε

No backtracking present

$MS \rightarrow W \quad B' \rightarrow x$

$MI \rightarrow V \quad T' \rightarrow Y$

New rule set $C' \rightarrow Z$

$R = \{ S \rightarrow A \mid D \mid \text{if } C \text{ then } S \text{ else } S \text{ end if}$

| while C do S while end

| begin S MS end

$\checkmark MS \rightarrow ; \mid S \mid MS \mid \epsilon$

~~$\checkmark C \rightarrow E \mid RE \mid E$~~

$\checkmark A \rightarrow \text{id} = E \mid MS; \quad \checkmark C' \rightarrow RE \mid \epsilon$

$\checkmark E \rightarrow TE'$

$\checkmark E' \rightarrow +TE' \mid -TE' \mid \epsilon$

$\checkmark T \rightarrow FT'$

$\checkmark T' \rightarrow *FT' \mid /FT' \mid \epsilon$

$\checkmark F \rightarrow (E) \mid \text{id} \mid \text{num}$

$\checkmark D \rightarrow \text{type id MI}; \mid \epsilon$

$\checkmark MI \rightarrow , \mid \text{id} \mid MI; \mid \epsilon$

$R \rightarrow \text{rellops}$

$\text{First}(S) = \text{First}(A) \cup \text{First}(D) \cup \{f, \text{while}, \text{begin}\}$
 $\{\text{id}, \text{type}, \text{if}, \text{while}, \text{begin}, \epsilon\}$

$\text{First}(A) = \{\text{id}\}$

$\text{First}(MS) = \{;\, \mid \epsilon\}$

$\text{First}(MI) = \{,\, \mid \epsilon\}$

$\text{First}(D) = \{\text{type}\} \cup \{\epsilon\} = \{\text{type}, \epsilon\}$

$\text{First}(C) = \text{First}(E) = \{,, \mid \text{id}, \mid \text{num}\}$

$\text{First}(E) = \text{First}(T) = \{,, \mid \text{id}, \mid \text{num}\}$

$\text{First}(T) = \text{First}(F) = \{,, \mid \text{id}, \mid \text{num}\}$

$\text{First}(F) = \{,, \mid \text{id}, \mid \text{num}\}$

$\text{First}(E') = \{+, -, \mid \epsilon\}$

$\text{First}(T') = \{* /, \mid \epsilon\}$

$\text{First}(R) = \{\text{rellops}\}$

$\text{First}(C') = \{\text{rellops}, \mid \epsilon\}$

$\text{Follow}(c') = \{\text{do, then}\}$

$\text{Follow}(S) = \{\text{else, end, while end, if, ;, \$}\}$

$\text{Follow}(A) = \{\text{else, end, while end, if, ;, \$}\}$

$\text{Follow}(MS) = \{\text{end}\}$

$\text{Follow}(mB) = \{\text{;}\}$

$\text{Follow}(C) = \{\text{do, then}\}$

$\text{Follow}(D) = \{\text{else, end, while end, ;, \$}\}$

$\text{Follow}(E) = \{\text{;,), relops}\}$

$\text{Follow}(T) = \{\text{+, -, ;,)}\}$

$\text{Follow}(F) = \{\text{+, -, *, /, ;,)}\}$

$\text{Follow}(E') = \{\text{;,)}\}$

$\text{Follow}(T') = \{\text{+, -, ;,)}\}$

begin/

a/z/12/

b/f/13/

c/t/(a+b)/

if/ a/ >/ b/ then/

a/l = (a/*2)/

else/

b = b * 2;

endif/

end

\$

