Homework 7 (10 points)

Semantic analysis

Consider the following semantic rules in our language:

- Expressions of type integer and real can be combined. The type of the resulting expression is real, if at least one operand is real; otherwise, it is integer.
- If the variable in an assignment statement is real (integer) and the right hand side expression is integer (real), the latter is implicitly converted to real (integer).

Extend your Yacc-based parser with semantic analysis that performs the following semantic checks and outputs corresponding error messages (containing line numbers).

a) Variable not declared; **(1.5 points)**

b) Variable already declared in this scope; **(1.5 point)**

c) Wrong array index type; **(1.5 points)**

- e.g. **`a[true]`**, **`a[3.14]`**
- Consider also expressions and variables as index;

d) Negative array size declaration; **(1 point)**

e) Type mismatch in assignment: **(1.5 points)**

- e.g. **`b: real; b := false;`**
- e.g. assuming **a** is an array and **b** is a scalar variable:

  (1) **`b:= a`** is not allowed

  (2) **`a:= b`** is allowed (assigns **b** to every element of array **a**);

f) Illegal operand type (does not match operator); **(1.5 points)**

- e.g. **`(3.14 and 2.0)`**;

g) Condition not boolean (in if and while-statements); **(1.5 points)**

- e.g. **`if (4-3) then …`**