

Phrase Structure

$\langle \text{Program} \rangle ::= \langle \text{ImportList} \rangle \text{ class IDENT } \langle \text{Block} \rangle$

$\langle \text{ImportList} \rangle ::= (\text{ import IDENT } (. \text{ IDENT })^* ;)^*$

$\langle \text{Block} \rangle ::= \{ (\langle \text{Declaration} \rangle ; \mid \langle \text{Statement} \rangle ;)^* \}$

$\langle \text{Declaration} \rangle ::= \text{ def } \langle \text{VarDec} \rangle \mid \text{ def } \langle \text{ClosureDec} \rangle$

$\langle \text{VarDec} \rangle ::= \text{ IDENT } (: \langle \text{Type} \rangle \mid \epsilon)$

$\langle \text{Type} \rangle ::= \langle \text{SimpleType} \rangle \mid \langle \text{KeyValue Type} \rangle \mid \langle \text{ListType} \rangle$

$\langle \text{SimpleType} \rangle ::= \text{ int } \mid \text{ boolean } \mid \text{ string }$

$\langle \text{KeyValue Type} \rangle ::= @ @ [\langle \text{SimpleType} \rangle : \langle \text{Type} \rangle]$

$\langle \text{ListType} \rangle ::= @ [\langle \text{Type} \rangle]$

$\langle \text{ClosureDec} \rangle ::= \text{ IDENT } = \langle \text{Closure} \rangle$

$\langle \text{Closure} \rangle ::= \{ \langle \text{FormalArgList} \rangle - \rangle \langle \text{Statement} \rangle^* \}$

$\langle \text{FormalArgList} \rangle ::= \epsilon \mid \langle \text{VarDec} \rangle (, \langle \text{VarDec} \rangle)^*$

$\langle \text{Statement} \rangle ::= \langle \text{LValue} \rangle = \langle \text{Expression} \rangle$
| $\text{ print } \langle \text{Expression} \rangle$
| $\text{ while } (\langle \text{Expression} \rangle) \langle \text{Block} \rangle$
| $\text{ while}^* (\langle \text{Expression} \rangle) \langle \text{Block} \rangle$
| $\text{ while}^* (\langle \text{RangeExpression} \rangle) \langle \text{Block} \rangle$
| $\text{ if } (\langle \text{Expression} \rangle) \langle \text{Block} \rangle$
| $\text{ if } (\langle \text{Expression} \rangle) \langle \text{Block} \rangle \text{ else } \langle \text{Block} \rangle$
| $\% \langle \text{Expression} \rangle$
| $\text{ return } \langle \text{Expression} \rangle$
| ϵ

$\langle \text{ClosureEvalExpression} \rangle ::= \text{ IDENT } (\langle \text{ExpressionList} \rangle)$

$\langle \text{LValue} \rangle ::= \text{ IDENT } \mid \text{ IDENT } [\langle \text{Expression} \rangle]$

$\langle \text{List} \rangle ::= @ [\langle \text{ExpressionList} \rangle]$

<ExpressionList> ::= ϵ | <Expression> (, <Expression>) *

<KeyValueExpression> ::= <Expression> : <Expression>

<KeyValueList> ::= ϵ | <KeyValueExpression> (, <KeyValueExpression>) *

<MapList> ::= @ @[<KeyValueList>]

<RangeExpr> :: <Expression> .. <Expression>

<Expression> ::= <Term> (<RelOp> <Term>)*

<Term> ::= <Elem> (<WeakOp> <Elem>)*

<Elem> ::= <Thing> (<StrongOp> <Thing>)*

<Thing> ::= <Factor> (<VeryStrongOp> <Factor>) *

<Factor> ::= IDENT | IDENT [<Expression>] | INT_LIT | true | false | STRING_LIT
| (<Expression>) | ! <Factor> | -<Factor> | size(<Expression>) |
key(<Expression>) | value(<Expression>) | <ClosureEvalExpression> | <Closure> |
<List> | <MapList>

<RelOp> ::= | | & | == | != | < | > | ≤ | ≥

<WeakOp> ::= + | -

<StrongOp> ::= * | /

<VeryStrongOp> ::= << | >>