

Type Rules

AST Node Type	AST rule	Constraints and Actions
Prog	Program ::= IDENT Dec* Stmt*	ProgramName \leftarrow IDENT
Dec	Dec ::= Type IDENT	TypeOf(IDENT) = \perp IDENT \neq ProgramName TypeOf(IDENT) \leftarrow Type
AlternativeStmt	Stmt ::= Expr (Stmt*) _{ifStmtList} (Stmt*) _{elseStmtList}	TypeOf(Expr) = boolean
AssignExprStmt	Stmt ::= IDENT Expr	TypeOf(Expr) = TypeOf(IDENT)
AssignPixelStmt	Stmt ::= IDENT Pixel	TypeOf(IDENT) = pixel
FileAssignStmt	Stmt ::= IDENT FileName	TypeOf(IDENT) = image
ScreenLocationAssignmentStmt	Stmt ::= IDENT Expr _{xScreenExpr} Expr _{yScreenExpr}	TypeOf(IDENT) = image; TypeOf(Expr _{xScreenExpr}) = int; TypeOf(Expr _{yScreenExpr}) = int
SetVisibleAssignmentStmt	Stmt ::= IDENT Expr	TypeOf(IDENT) = image; TypeOf(Expr) = boolean
ShapeAssignment Stmt	Stmt ::= IDENT Expr _{width} Expr _{height}	TypeOf(IDENT) = image; TypeOf(Expr _{width}) = int; TypeOf(Expr _{height}) = int
SinglePixelAssignmentStatement	Stmt ::= IDENT Expr _{xExpr} Expr _{yExpr} Pixel	TypeOf(IDENT) = image; TypeOf(Expr _{xExpr}) = int; TypeOf(Expr _{yExpr}) = int
SingleSampleAssignmentStmt	Stmt ::= IDENT Expr _{xExpr} Expr _{yExpr} COLOR Expr _{rhsExpr}	TypeOf(IDENT) = image TypeOf(Expr _{xExpr}) = int TypeOf(Expr _{yExpr}) = int TypeOf(Expr _{rhsExpr}) = int
IterationStatement	Stmt ::= Expr Stmt*	TypeOf(Expr) = boolean
PauseStatement	Stmt ::= Expr	TypeOf(Expr) = int
BinaryExpr	Expr ::= Expr _{e0} Op Expr _{e1}	See table below
BooleanLitExpr	Expr ::= BooleanLit	TypeOf(Expr) \leftarrow boolean
ConditionalExpr	Expr ::= Expr _{condition} Expr _{trueValue} Expr _{falseValue}	TypeOf(Expr _{condition}) = Boolean TypeOf(Expr _{trueValue}) = TypeOf(Expr _{falseValue}) TypeOf(Expr) \leftarrow TypeOf(Expr _{trueValue})
IdentExpr	Expr ::= IDENT	TypeOf(Expr) \leftarrow TypeOf(Ident)
ImageAttributeExpr	Expr ::= IDENT SELECTOR	TypeOf(Expr) \leftarrow int
IntLitExpr	Expr ::= INT_LIT	TypeOf(Expr) \leftarrow int
PreDefExpr	Expr ::= CONSTANT_LIT	TypeOf(Expr) \leftarrow int

SampleExpr	Expr ::= IDENT Expr _{xLoc} Expr _{yLoc} COLOR	TypeOf(IDENT) = image TypeOf(Expr _{xLoc}) = int TypeOf(Expr _{yLoc}) = int TypeOf(Expr) ← int
Pixel	Pixel ::= Expr _{redExpr} Expr _{greenExpr} Expr _{blueExpr}	TypeOf(Expr _{redExpr}) = int TypeOf(Expr _{greenExpr}) = int TypeOf(Expr _{blueExpr}) = int

Binary Expressions

Op	Constraints	Type of result (TypeOf←)
&,	TypeOf(Expr _{e0}) = boolean TypeOf(Expr _{e1}) = boolean	boolean
+, -, *, /, %	TypeOf(Expr _{e0}) = int TypeOf(Expr _{e1}) = int	int
==, !=	TypeOf(Expr _{e0}) = TypeOf(Expr _{e1})	boolean
<<, >>	TypeOf(Expr _{e0}) = int TypeOf(Expr _{e1}) = int	int
<, >, ≤, ≥	TypeOf(Expr _{e0}) = int TypeOf(Expr _{e1}) = int	boolean