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denotational semantics:
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<STMT>:
[[<STMT>]]: Stmt \rightarrow Env \rightarrow Env
[[<STMT>]] = [[<IF STMT>]] | [[<BLOCK>]] | [[<ASSIGN>]] | [[<DECLARE>]] |
[[<WHILE LOOP>]]
<STMT LIST>:
[[<STMT LIST>]]: List<Stmt> \rightarrow Env \rightarrow Env
<WHILE LOOP>:
[[<WHILE LOOP>]]: BExpr \times Stmt \rightarrow Env \rightarrow Env
[while (b) S] = if ([b] = true) then [[S]]([while (b) S]) else env
<IF STMT>:
[[\langle \text{IF STMT} \rangle]]: BExpr \times Stmt \times Stmt \rightarrow Env \rightarrow Env
[if (b) S1 else S2] = if ([b] = true) then [S1] else [S2]
<BLOCK>:
[[<BLOCK>]]: List<Stmt> \rightarrow Env \rightarrow Env
[\{SL\}] = [\langle STMT \ LIST \rangle]
<DECLARE>:
[[\langle DECLARE \rangle]]: DataType \times List\langle ID \rangle \rightarrow Env \rightarrow Env
[DataType ID1, ID2, ...] = env[ID1 ← DefaultValue(DataType), ID2 ← DefaultValue(DataType),
...]
<ASSIGN>:
[[<ASSIGN>]]: ID \times Expr \rightarrow Env \rightarrow Env
[ID = E] = env[ID \leftarrow [E]]
<EXPR>:
[[\langle EXPR \rangle]]: Expr \rightarrow Env \rightarrow Value
[E1 + E2] = [E1] + [E2]
[E1 - E2] = [E1] - [E2]
<TERM>:
[[<TERM>]]: Expr \rightarrow Env \rightarrow Value
[E1 * E2] = [E1] * [E2]
[E1 / E2] = [E1] / [E2]
[E1 \% E2] = [E1] \% [E2]
<FACT>:
[[<FACT>]]: Expr\rightarrow Env\rightarrow Value
[ID] = env(ID)
[INT LIT] = INT LIT
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$$[FLOAT_LIT] = FLOAT_LIT$$

$$[(E)] = [E]$$

<BOOL EXPR>:

[[
$$<$$
BOOL EXPR $>$]]: BExpr \rightarrow Env \rightarrow Bool

$$[E1 > E2] = ([E1] > [E2])$$

$$[E1 < E2] = ([E1] < [E2])$$

$$[E1 >= E2] = ([E1] >= [E2])$$

$$[E1 \le E2] = ([E1] \le [E2])$$

<BTERM>:

[[
$$\langle BTERM \rangle$$
]]: BExpr \rightarrow Env \rightarrow Bool

$$[E1 == E2] = ([E1] == [E2])$$

$$[E1 != E2] = ([E1] != [E2])$$

<BAND>:

[[
$$\langle BAND \rangle$$
]]: BExpr \rightarrow Env \rightarrow Bool

$$[E1 \&\& E2] = ([E1] \&\& [E2])$$

<BOR>:

[[
$$\langle BOR \rangle$$
]]: BExpr \rightarrow Env \rightarrow Bool

$$[E1 \parallel E2] = ([E1] \parallel [E2])$$