prog → prog ‘\n’ stmt | stmt | ε

stmt → cond | loop | assign | alloc | func | alloc

alloc → VAR ‘ ‘ ID

shape\_functions → LINE | RECTANGLE | OVAL | COMPOSITE

comp\_exp → LOCATION | SIZE | COLOR | shape\_functions

type → INT | FLOAT | STRING | BOOLEAN | ARRAY\_TYPE | comp\_exp

assign → ID ASSIGN\_OP assign\_tail

| VAR ID ASSIGN\_OP assign\_tail

assign\_tail → ID | prim\_exp | comp\_exp | string\_exp

prim\_exp → int\_exp | float\_exp | boolean\_exp

int\_exp → INT int\_exp\_tail

int\_exp\_tail → PRIMARY\_OPS int\_exp

| PRIMARY\_OPS INT\_FUNCT )

| ε

float\_exp → FLOAT float\_exp\_tail

float\_exp\_tail → PRIMARY\_OPS float\_exp

| PRIMARY\_OPS FLOAT\_FUNCT

| ε

string\_exp → STRING

| STRING\_FUNCT

|string\_exp + STRING\_FUNCT

| STRING\_FUNCT + string\_exp

| string\_exp + string\_exp

boolean\_exp → logic bool\_exp\_tail

bool\_exp\_tail → LOGICAL\_CONCAT logic bool\_exp\_tail

| ε

logic → ‘!’ logic

| ID LOGICAL\_OPS ID

| ID LOGICAL\_OPS BOOL\_FUNCT

| BOOL\_FUNCT LOGICAL\_OPS BOOL\_FUNCT

| BOOL\_FUNCT LOGICAL\_OPS ID | ID | BOOL\_FUNCT

cond → IF ‘(‘ logic ‘)’ ‘{‘ prog ‘}’ if\_tail

if\_tail → ELSE ‘{‘ prog ‘}’ | null

loop → WHILE ‘(‘ logic ‘)’ ‘{‘ prog ‘}’

func → comp\_exp | conv\_exp

conv\_exp → INT\_FUNCT | FLOAT\_FUNCT | STRING\_FUNCT | BOOL\_FUNCT