

We declare the types of *DECLARATION* to store all declarations. We also need to declare the types *EXPRESSION* and *DEFINITION* which will go into the schemaText.

We say that a schemaText is made up of many *LINES*

$[DECLARATION, EXPRESSION, DEFINITION, LINES]$

We need a type to contain terms and sets. We will call this *VARs*.

$[VARs]$

<i>ZcgaState</i>	
<i>declarations</i> : $VARs \leftrightarrow EXPRESSION$	
<i>expressions</i> : $\mathbb{P} LINES$	
<i>definitions</i> : $\mathbb{P} LINES$	
<i>definedConstants</i> : $\mathbb{P} VARs$	
<i>TermDeclaration</i> : $VARs \leftrightarrow EXPRESSION$	
<i>SetDeclaration</i> : $VARs \leftrightarrow EXPRESSION$	
<i>terms</i> : $\mathbb{P} VARs$	
<i>sets</i> : $\mathbb{P} VARs$	
<i>dvar</i> : $\mathbb{P} VARs$	
<i>TermDeclaration</i> \subseteq <i>declarations</i>	
<i>SetDeclaration</i> \subseteq <i>declarations</i>	
<i>dvar</i> \subset <i>sets</i> \cup <i>terms</i>	
<i>sets</i> \cap <i>terms</i> = $\{\}$	
<i>InitZcgaState</i>	
<i>ZcgaState'</i>	
<i>declarations'</i> = $\{\}$	
<i>expressions'</i> = $\{\}$	
<i>definitions'</i> = $\{\}$	
<i>definedConstants'</i> = $\{\}$	
<i>TermDeclaration'</i> = $\{\}$	
<i>SetDeclaration'</i> = $\{\}$	
<i>terms'</i> = $\{\}$	
<i>sets'</i> = $\{\}$	
<i>dvar'</i> = $\{\}$	

$\text{CorrectTermDeclaration}$
$\Delta ZcgaState$ $dvarExpression : EXPRESSION$ $var : VARS$
$var \notin dvar$ $TermDeclaration' = TermDeclaration \cup \{var \mapsto dvarExpression\}$ $terms' = terms \cup \{var\}$ $dvar' = dvar \cup \{var\}$

$\text{CorrectSetDeclaration}$
$\Delta ZcgaState$ $dvarExpression : EXPRESSION$ $var : VARS$
$var \notin dvar$ $SetDeclaration' = SetDeclaration \cup \{var \mapsto dvarExpression\}$ $sets' = sets \cup \{var\}$ $dvar' = dvar \cup \{var\}$

This schema describe constants giving terms for example $\#S$ takes set S and gives the cardinality of S which is a term.

$\text{CorrectConstantTerm}$
$\Delta ZcgaState$ $constant : \mathbb{P} VARS \rightarrow VARS$ $parameters : \mathbb{P} VARS$ $newTerm : VARS$
$parameters \subseteq sets \cup terms$ $parameters \neq \{\}$ $newTerm = constant parameters$ $terms' = terms \cup \{newTerm\}$

This schema describes constants giving sets, for example $S \cup T$ gives a set with elements from S and elements of T .

$\text{CorrectConstantSet}$
$\Delta ZcgaState$ $setconstant : \mathbb{P} VARS \rightarrow VARS$ $setparameters : \mathbb{P} VARS$ $newset : VARS$
$setparameters \subseteq sets \cup terms$ $setparameters \neq \{\}$ $newset = setconstant parameters$ $sets' = sets \cup \{newset\}$

CorrectExpression

$\Delta ZcgaState$

$expressConstant : \mathbb{P} VARS \rightarrow EXPRESSION$

$expressParameters : \mathbb{P} VARS$

$newExpression : EXPRESSION$

$expressParameters \subseteq sets \cup terms$

$expressParameters \neq \{\}$

$newExpression = expressConstant\ expressParameters$

$expressions' = expressions \cup \{newExpression\}$

CorrectDefinitions

$\Delta ZcgaState$

$definedSet : \mathbb{P} VARS \rightarrow VARS$

$newdefinition : \mathbb{P} VARS \rightarrow DEFINITION$

$parameters : \mathbb{P} VARS$

$newConstant : VARS$

$newConstant \notin sets$

$parameters \subseteq sets \cup terms$

$newConstant = definedSet\ parameters$

$definedConstants' = definedConstants \cup \{newConstant\}$

$sets' = sets \cup \{newConstant\}$

$definitions' = definitions \cup \{newdefinition\ parameters\}$

CorrectSchemaText

$\Xi ZcgaState$

$schemaText : \mathbb{P} LINES$

$schemaText = \{\} \vee$

$schemaText = definitions \cup expressions$