

# SOEN331: Introduction to Formal Methods for Software Engineering

## Assignment 4 on algebraic specifications

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**Location**

**Spec:** Location;

**Sort:** Loc;

**Imports:** String, Point;

**Operations:**

$\text{newLocation} : \text{String} \times \text{Point} \rightarrow \text{Loc};$

$\text{setDescription} : \text{Loc} \times \text{String} \rightarrow \text{Loc} ;$

$\text{getDescription} : \text{Loc} \rightarrow \text{String};$

$\text{setPoint} : \text{Loc} \times \text{Point} \rightarrow \text{Loc} ;$

$\text{getPoint} : \text{Loc} \rightarrow \text{Point};$

**Variables:**

$d: \text{String}; p1, p2: \text{Point}; st: \text{String}$

**Axioms:**

[A1]  $\text{getDescription}(\text{newLocation}(d, p1)) = d;$

[A2]  $\text{getPoint}(\text{newLocation}(d, p1)) = p1;$

[A3]  $\text{setDescription}(\text{newLocation}(d, p1), st) = \text{newLocation}(st, p1) ;$

[A4]  $\text{setPoint}(\text{newLocation}(d, p1), p2) = \text{newLocation}(d, p2);$

Map

**Spec:** Map(Element);

**Sort:** Map;

**Imports:** String,Point,Boolean,Natural,Location;

**Operations:**

newMap  $\rightarrow$  Map;

addLocation : Loc  $\times$  Map  $\rightarrow$  Map ;

deleteLocation : String  $\times$  Map  $\rightarrow$  Map;

containDescription : String  $\times$  Map  $\rightarrow$  Boolean ;

containPoint :Point  $\times$  Map  $\rightarrow$  Boolean;

findLocation :String  $\times$  Map  $\rightarrow$  Map;

isEmpty :Map  $\rightarrow$  Boolean;

clear :Map  $\rightarrow$  Map;

**Variables:**

m: Map; loc: Loc; d:String; p:Point el:Element

**Axioms:**

[A1] isEmpty(newMap)=true;

[A2] clear(m)=newMap;

[A6] isEmpty (deleteLocation (getDescription(loc), (addLocation (loc,newMap)))) = true;

[A8] findLocation(newMap)=undefined;

[A9] deleteLocation(newMap)=undefined;