

### 0.0.1 Map?

The operation  $map?$  will return a boolean which indicates if the passed in argument is a  $KV$

$Map? [V]$ $m? : V$ $bol! : Boolean$ $map? : V \rightarrow Boolean$	
$bol! = map?(m?) \bullet bol! = true \iff m? : KV \Rightarrow V \setminus (Scalar, Collection)$	

where  $V \setminus (Scalar, Collection)$  is used to indicate that  $m?$  is of type  $V$

$$V ::= Scalar \mid Collection \mid KV$$

but in order for  $bol! = true$ ,  $m?$  must not be of type  $Scalar \vee Collection$  such that

$$\begin{aligned}
X &= \langle\langle x_0, x_1, x_2, x_3, x_4 \rangle\rangle \\
x_0 &= 0 \\
x_1 &= foo \\
x_2 &= \langle baz, qux \rangle \\
x_3 &= \langle\langle abc \mapsto 123, def \mapsto 456 \rangle\rangle \\
x_4 &= \langle\langle\langle ghi \mapsto 789, jkl \mapsto 101112 \rangle\rangle, \langle\langle ghi \mapsto 131415, jkl \mapsto 161718 \rangle\rangle\rangle \\
map?(X) &= true && [KV \text{ by definition}] \\
map?(x_3) &= true && [KV] \\
map?(x_2) &= false && [Collection] \\
map?(x_4) &= false && [Collection of maps] \\
map?(x_0) &= false && [Scalar] \\
map?(x_1) &= false && [String]
\end{aligned}$$