Statistician
Algebraic Specifications

NEW creates a new statistician
INSERT inserts a real number into the statistician
RESET puts the statistician back to its original state
LENGTH reports on how many values have been inserted
SUM total of the inserted values
MEAN average of the inserted values
UNION creates a statistician combining all values of unioned statisticians

Syntax:

<table>
<thead>
<tr>
<th>operation</th>
<th>domain</th>
<th>range</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEW</td>
<td>( ) --&gt; STAT</td>
<td>STAT</td>
</tr>
<tr>
<td>INSERT</td>
<td>(STAT, REAL) --&gt; STAT</td>
<td>STAT</td>
</tr>
<tr>
<td>RESET</td>
<td>(STAT) --&gt; STAT</td>
<td>STAT</td>
</tr>
<tr>
<td>LENGTH</td>
<td>(STAT) --&gt; INT</td>
<td>INT</td>
</tr>
<tr>
<td>SUM</td>
<td>(STAT) --&gt; REAL</td>
<td>REAL</td>
</tr>
<tr>
<td>MEAN</td>
<td>(STAT) --&gt; REAL</td>
<td>REAL</td>
</tr>
<tr>
<td>UNION</td>
<td>(STAT, STAT) --&gt; STAT</td>
<td>STAT</td>
</tr>
</tbody>
</table>

The Axioms:
(s and t are of type STAT and x is of type REAL)

1) RESET(NEW) = NEW
2) RESET(INSERT(s, x)) = NEW
3) LENGTH(NEW) = 0
4) LENGTH(INSERT(s, x)) = LENGTH(s) + 1
5) SUM(NEW) = 0
6) SUM(INSERT(s, x)) = SUM(s) + x
7) MEAN(NEW) = error
8) MEAN(INSERT(s, x)) = (SUM(s) + x) / (LENGTH(s) + 1)
9) UNION(NEW, t) = t
10) UNION(INSERT(s, x), t) = UNION(s, INSERT(t, x))

Compose each of the other functions with each essential builder (NEW, INSERT). Then describe the actions in terms of the other functions.