1 Introduction

For the grammar that follows, here are the types of the various elements by type font:

- **Keywords are in this type font.**
- **TOKEN CLASSES ARE IN THIS TYPE FONT.**
- **Nonterminals are in this type font.**

1.1 Some Token Definitions

<table>
<thead>
<tr>
<th>Letter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>letter</td>
<td>a . . . z A . . . Z</td>
</tr>
<tr>
<td>digit</td>
<td>0 . . . 9</td>
</tr>
<tr>
<td>ID</td>
<td>letter+</td>
</tr>
<tr>
<td>NUM</td>
<td>digit+</td>
</tr>
</tbody>
</table>

Also note that white space is ignored except that it must separate ID’s, NUM’s, and keywords.

2 The Grammar

1. \( \text{program} \rightarrow \text{stmt-seq} \)
2. \( \text{stmt-seq} \rightarrow \text{stmt-seq} ; \text{stmt} | \text{stmt} \)
3. \( \text{stmt} \rightarrow \text{if-stmt} | \text{repeat-stmt} | \text{assign-stmt} | \text{read-stmt} | \text{write-stmt} \)
4. \( \text{if-stmt} \rightarrow \text{if exp then stmt-seq end} | \text{if exp then stmt-seq else stmt-seq end} \)
5. \( \text{repeat-stmt} \rightarrow \text{repeat stmt-seq until exp} \)
6. \( \text{assign-stmt} \rightarrow \text{ID := exp} \)
7. \( \text{read-stmt} \rightarrow \text{read ID} \)
8. \( \text{write-stmt} \rightarrow \text{write exp} \)
9. \( \text{exp} \rightarrow \text{simple-exp} < \text{simple-exp} | \text{simple-exp} = \text{simple-exp} | \text{simple-exp} \)
10. \( \text{simple-exp} \rightarrow \text{simple-exp} + \text{term} | \text{simple-exp} - \text{term} | \text{term} \)
11. \( \text{term} \rightarrow \text{term} * \text{factor} | \text{term} / \text{factor} | \text{factor} \)
12. \( \text{factor} \rightarrow ( \text{exp} ) | \text{NUM} | \text{ID} \)