4. Unit: Transforming XML with XSLT

Exercise 4.1 (XML to HTML) Write an XSLT routine performing the following task:
Map the following country data for each country to an HTML table:

- country name
- car code
- capital's name
- number of inhabitants
- the names of all listed cities, inside a nested HTML table.

Exercise 4.2 (Faculty) Write an XSLT program that computes the faculty of a natural number (i.e., $n!$ defined as $n \cdot (n-1) \cdot (n-2) \cdot 1$). The program should be invoked as `call saxonXSL dummy.xml faculty.xsl n=5` and just return $n!$.

Exercise 4.3 (Arithmetic Terms) Arithmetic terms over integer values and operators $+, -, *$ and *div* (integer division) can be represented by their syntax trees, with the syntax trees given in XML. A possible XML notation for syntax trees is given in the following example for the term

$$4 + ((7 - 2)\ div\ 2)$$

```
<term>
   <plus>
      <val>4</val>
      <div>
         <minus>
            <val>7</val>
            <val>2</val>
         </minus>
         <val>2</val>
      </div>
   </plus>
</term>
```

a) Write down the syntax tree for the term $((91\ div\ (19 - (3 * 8))) + 3)$, using the XML notation from the above example.

b) Write a DTD for the given notation. Each term should be considered a single XML document instance.

c) Write three XSLT stylesheets that take a syntax tree in the notation depicted above as input, and produce as output
   - the term as text in *inorder* notation (outcome should be `(4+((7-2) div 2))` for the example),
   - the term as text in *preorder* notation (outcome should be `+ 4 div - 7 2 2`), and
   - the term as text in *postorder* notation (outcome should be `4 7 2 - 2 div +`).

   Test the stylesheets using the term $((91\ div\ (19 - (3 * 8))) + 3)$ as input.

d) Write an XSLT stylesheet that evaluates a syntax tree in the notation depicted above.