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1 import components.naturalnumber.NaturalNumber;
2 import components.naturalnumber.NaturalNumber2;
3 import components.simplereader.SimpleReader;
4 import components.simplereader.SimpleReader1L;
5 import components.simplewriter.SimpleWriter;
6 import components.simplewriter.SimpleWriter1L;
7 import components.utilities.Reporter;
8 import components.xmltree.XMLTree;
9 import components.xmltree.XMLTree1;
10
11 /**
12  * Program to evaluate XMLTree expressions of {@code int}.
13  *
14  * @author David Park
15  *
16  */
17 public final class XMLTreeNNEvaluationEvaluator {
18
19     /**
20      * Private constructor so this utility class cannot be instantiated.
21      */
22     private XMLTreeNNEvaluationEvaluator() {
23     }
24
25     /**
26      * Evaluate the given expression.
27      *
28      * @param exp
29      *      the {@code XMLTree} representing the expression
30      * @return the value of the expression
31      * @requires <pre>
32      * [exp is a subtree of a well-formed XML arithmetic expression] and
33      * [the label of the root of exp is not "expression"]
34      * </pre>
35      * @ensures evaluate = [the value of the expression]
36      */
37     private static NaturalNumber evaluate(XMLTree exp) {
38         assert exp != null : "Violation of: exp is not null";
39
40         // TODO - fill in body
41
42         NaturalNumber result = new NaturalNumber2(0);
43         NaturalNumber second = new NaturalNumber2(0);
44
45         // Check the operation by xmlTree node
46         if (exp.label().equals("times")) {
47             // If the operation is multiplication, recursively evaluate with both child
48             result = evaluate(exp.child(0));
49             second = evaluate(exp.child(1));
50             result.multiply(second);
51         } else if (exp.label().equals("divide")) {
52             // If the operation is division, recursively evaluate with both child
53             result = evaluate(exp.child(0));
54             second = evaluate(exp.child(1));
55             // Check for division by zero, which is not allowed
56             if (evaluate(exp.child(1)).isZero()) {
57                 Reporter.fatalErrorToConsole(

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58         "A number divided by zero is undefined");
59     }
60     result.divide(second);
61 } else if (exp.label().equals("plus")) {
62     // If the operation is addition, recursively evaluate both child
63     // and then add the results together
64     result = evaluate(exp.child(0));
65     second = evaluate(exp.child(1));
66     result.add(second);
67 } else if (exp.label().equals("minus")) {
68     // If the operation is subtraction, recursively evaluate both child
69     // and then subtract the second result from the first
70     result = evaluate(exp.child(0));
71     second = evaluate(exp.child(1));
72     if (result.compareTo(second) < 0) {
73         Reporter.fatalErrorToConsole(
74             "A natural number cannot be negative. ");
75     }
76     result.subtract(second);
77 } else if (exp.label().equals("number")) {
78     result = new NaturalNumber2(exp.attributeValue("value"));
79 }
80 return result;
81 }
82
83 /**
84  * Main method.
85  *
86  * @param args
87  *     the command line arguments
88  */
89 public static void main(String[] args) {
90     SimpleReader in = new SimpleReader1L();
91     SimpleWriter out = new SimpleWriter1L();
92
93     out.print("Enter the name of an expression XML file: ");
94     String file = in.nextLine();
95     while (!file.equals("")) {
96         XMLTree exp = new XMLTree1(file);
97         out.println(evaluate(exp.child(0)));
98         out.print("Enter the name of an expression XML file: ");
99         file = in.nextLine();
100     }
101
102     in.close();
103     out.close();
104 }
105 }
106
```