

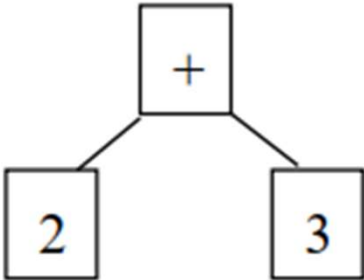
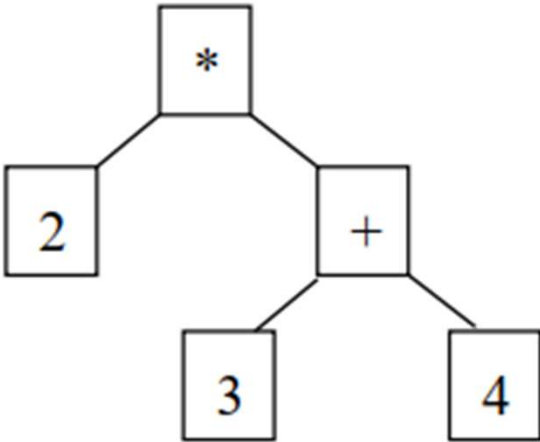
BÀI TẬP 3

Consider a basic mathematical expression which is a series of real numbers and arithmetic operations (+, -, *, /). A design option to represent this kind of expression is by using a tree.

There are two types of nodes in the expression tree:

- Number node: represents a number which has numerical value.
- Operation node: represents an operation which contains an operation symbol. Each symbol is either +, -, *, or /. Each operation node contains a left and a right node, which can either be number node or operation node.

BÀI TẬP 3

Expression	Tree representation	Sample usage code
$2 + 3$	 <pre>graph TD; A["+"] --- B["2"]; A --- C["3"];</pre>	<pre>OpNode n('+'); n.addLeft(NumNode(2)); n.addRight(NumNode(3)); double x = n.evaluate(); // x = 5</pre>
$2 * (3 + 4)$	 <pre>graph TD; A["*"] --- B["2"]; A --- C["+"]; C --- D["3"]; C --- E["4"];</pre>	<pre>OpNode n1('+'); n1.addLeft(NumNode(3)); n1.addRight(NumNode(4)); OpNode n2('*'); n2.addLeft(NumNode(2)); n2.addRight(n1); double x = n2.evaluate(); // x = 14</pre>



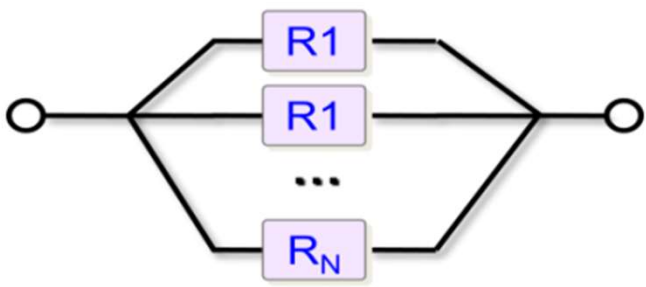
BÀI TẬP 3

Applying encapsulation, inheritance and polymorphism in object oriented programming, you are asked to do the following:

- a) Draw a class diagram to show the tree representation above. The design should include necessary functions to construct an expression tree and evaluate the value of the expression.
- b) Write C++ code to implement the design.

BÀI TẬP 4

- There are three types of basic electrical circuits:

	<p>Single circuit is a circuit containing only one resistor.</p> <p>$R \text{ (Resistance)} = U \text{ (Voltage)} / I \text{ (Current)}$.</p>
	<p>Series circuit is a circuit containing more than two sub-circuits which are connected in series.</p> <p>$R = R_1 + R_2 + \dots + R_N$.</p>
	<p>Parallel circuit is a circuit containing more than two sub-circuits which are connected in parallel.</p> <p>$1/R = 1/R_1 + 1/R_2 + \dots + 1/R_N$.</p>

BÀI TẬP 4

The sub-circuit in series or parallel circuit can be either a single circuit, another series circuit, or another parallel circuit.

You are asked to do the followings by applying encapsulation, inheritance, and polymorphism:

a) Draw a class diagram for a program to calculate circuit resistance. The design should include necessary variables and functions to:

- Construct a circuit of one type.
- Add a sub-circuit to a Series or Parallel circuit.
- Calculate resistance of a circuit.

b) Write C++ code to implement the design

HOMEWORK

HOMework

Các nhóm nộp bài tập 3 & 4 lên Moodle. Bao gồm:

1. Source code
2. File report: Danh sách nhóm, giải thích ý tưởng, thiết kế

Mỗi nhóm 1 đại diện nộp bài, đặt tên file nén là tên nhóm.

Deadline: Chủ nhật