Homework 7 - Circuits

PROG 1403 - Java I

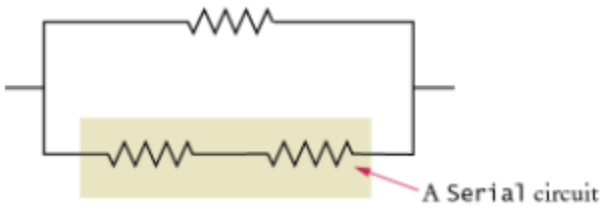
A Circuits made up of smaller Circuits which contain much smaller Circuits which contain…

Summary

For this assignment we will use classes and inheritance to solve a complex problem and model something we see in the real world.

Specifications

1. Provide an abstract superclass Circuit with an abstract method getResistance.
    a. Each subclass of Circuit will override the getResistance method. You will add other methods as needed.
    b. Provide a subclass Resistor representing a single resistor.
    c. Provide subclasses Serial and Parallel, each of which contains a List<Circuit>.
    d. A Serial circuit models a series of circuits, each of which can be a single resistor or another circuit.
    e. Similarly, a Parallel circuit models a list of circuits in parallel.
    f. For example, the following circuit is a Parallel circuit containing a single resistor and one Serial circuit:



2. The circuit modeled above can be modeled in code as below:
    a. var circuit1 = new Parallel();
    b. circuit1.add(new Resistor(100));
    c. var circuit2 = new Serial();
    d. circuit2.add(new Resistor(100));
    e. circuit2.add(new Resistor(200));
    f. circuit1.add(circuit2);
    g. System.out.printf("Combined resistance: %s", circuit1);
3. The combined resistance of the circuit above should be 75.00
4. We will use Ohm's law to calculate the resistance.
    a. Resistance for a series circuit is the sum of the resistances of the circuits.
    b. Resistance for a parallel circuit is 1/Rt = 1/R1 + 1/R2 + 1/R3 + ...

5. Remember, to override the methods from Object and implement the Comparable Interface which will compare based on the total resistance.
6. Do not forget the JavaDoc comments.

Documentation

A text document (.docx, .rtf, .pdf) which contains the following:

- Your name and assignment.
- Screenshots of your code output for three complex circuits (must include a combination of serial and parallel circuits). Beside the test cases, draw the circuit you are modeling in your code (like what is shown above).
- You will also need to calculate the resistance by hand to show your code is working as expected.
- No user input is required for this assignment.
- Do not forget to include your JavaDoc and override the required methods from Object.
- Explain the following, in detail –
    - What is constructor chaining and what impact does it have on our code.
    - Explain the difference between Overriding vs Overloading.
    - Give specific of runtime polymorphism in your code.
    - What is the difference between and abstract and concrete class?
    - What is an abstract method?
    - Explain the difference between final and abstract when applied to classes and methods.
- Remember to be specific in your responses.

What to Submit

You need to submit your document and your .java files. DO NOT Zip your files.