Complex Circuit Challenge

Goal: Construct a complex circuit that will produce a certain total resistance given by your instructor. Use the DC Circuit Simulator at http://phet.colorado.edu/index.php.

Virtual materials:

- 9 V battery
- resistors: 220 KΩ, 100 KΩ, 47 KΩ, (2)10 KΩ, 5.6 KΩ, 2.2 KΩ, (2)1.0 KΩ
- wire
- voltmeter
- non-contact ammeter

Procedure:

1. Obtain a value for your total resistance from your instructor.
2. Brainstorm circuit designs. Continue until you discover a complex circuit (at least one series portion and one parallel portion) that produces your target total resistance.
3. Determine the total resistance either by calculating it on paper or by first constructing it on the website and measuring the voltage and current using the virtual tools.

Report:

1. Be sure to explain your procedure, especially the experimenting part of the exercise. What did you try? What were the results? How did you proceed through the exercise? You will receive credit for describing your method for solving this problem. (5 points)
2. Include a diagram of the circuit design you found. (2 point)
3. Include the mathematics you used to solve for the total resistance. (3 points)
4. For extra credit, you may build your circuit on a breadboard. Make actual measurements to calculate the total resistance. Calculate the percent error of the actual circuit versus the theoretical one.