SNC1D
UNIT 3: CHARACTERISTICS OF ELECTRICITY
CHAPTER 11: ELECTRIC CIRCUITS

11.4: MEASURING ELECTRICAL RESISTANCE

BLM 11-8

Calculating Resistance

Read the Sample Problem on page 463 in your textbook. Use it as a sample to help calculate answers to the following questions. Write the equation, then solve it. *The first one is done for you.*

1. Only 2.5×10^{-3} A of current pass through a portable CD player. If the CD player is operated by a 9 V battery, what is the resistance within the circuit?
Calculations:

Current, $I = 2.5 \times 10^{-3}$ A
Potential difference, $V = 9$ V
$V = IR$
$R = \frac{V}{I} = \frac{9\ V}{0.0025\ A} = 36000 \frac{V}{A} = 36\ 000\ \Omega$

2. In a portable radio, 0.5 A of current are flowing through a conductor that provides 18 Ω of resistance. What potential difference is provided by the battery?
Calculations:

3. A clothes dryer uses a 220 V power source. The coils of the heater provide an average resistance of 12 Ω. What amount of current is flowing through the heating coils?
Calculations:

4. A 9 V battery maintains a current of 3 A through a portable radio. What is the resistance of the conductor?
Calculations:

5. A portable CD player operates with four 1.5 V batteries connected in series, provides a resistance of 15 000 Ω. What current is flowing through the CD player?
Calculations:

6. An electric motor has an operating resistance of 25 Ω when a 4.8 A current is flowing through it. What is the potential difference of the outlet the motor is plugged into?
Calculations:

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Graphing Resistance

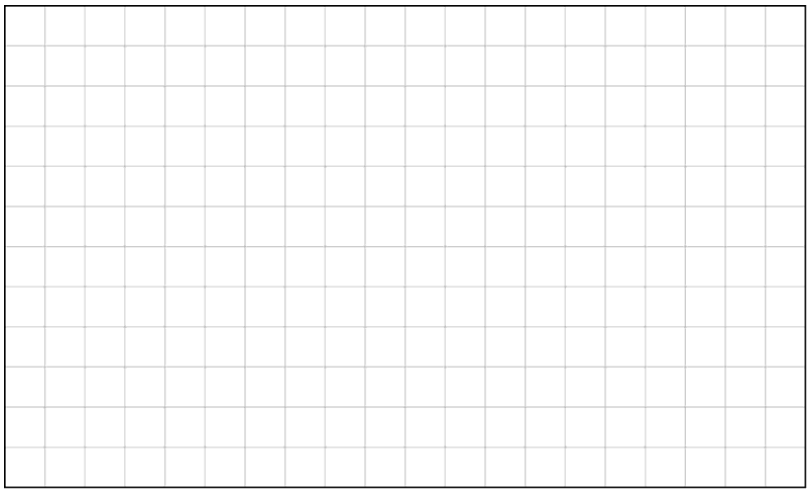
Calculating resistance with the mathematical relationship $R = \frac{V}{I}$.

Graph potential difference versus current for a set of data to find the slope of the line of best fit.

1. Complete the table below.

Potential Difference, *V* (V)	**Current, *I* (A)**	**Resistance, *R* (Ω)**
1.0	3.4	
3.0	10.5	
6.0	20.5	
8.0	27.5	
11.0	38.0	
	Average Resistance	

2. Plot the graph of potential difference (*y*-axis) versus current (*x*-axis) on the grid below. Remember to label the axes and title the graph.



3. Calculate the slope of the line in #2. Remember to include units in your answer.

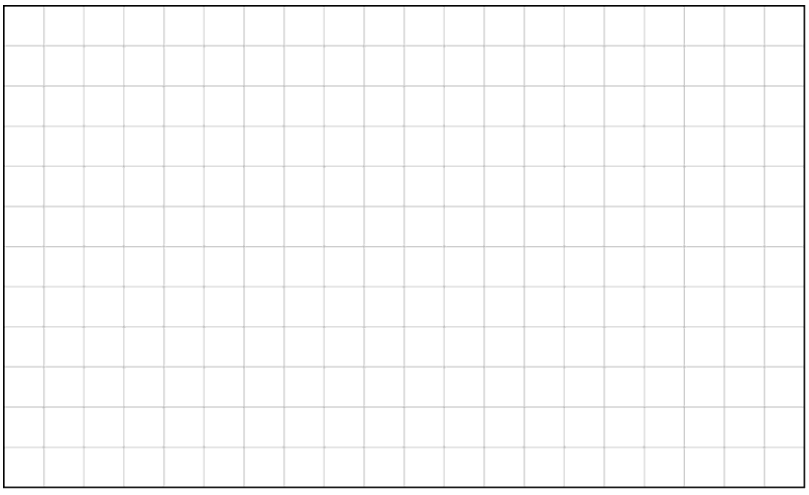
Slope = $\frac{\text{rise}}{\text{run}}$

4. Compare the slope in #3 to the average resistance in #1. How close are the values?

5. The table below contains a set of data for a Nichrome wire resistor. Calculate the resistance for the information in each row. Write your answers in the appropriate space.

Potential Difference, *V* (V)	**Current, *I* (A)**	**Resistance, *R* (Ω)**
1.0	0.0075	
2.0	0.014	
3.0	0.020	
4.0	0.027	
5.0	0.033	
6.0	0.040	
7.0	0.047	
8.0	0.053	
9.0	0.059	
10.0	0.066	
11.0	0.068	
12.0	0.070	
13.0	0.071	

6. Use the grid below to plot a graph of the data from #5. Put potential difference on the *y*-axis and the current on the *x*-axis. Remember to label the axes and title the graph.



7. Is Nichrome wire an ohmic resistor? Explain how you know.

8. Over which range of voltages does Nichrome wire follow Ohm's law?

9. Calculate the slope of the line over the range you have determined in #8.

10. Compare the slope in #9 to the values for resistance you calculated in #5. Explain the significance.

REVIEW 11.4

1. Complete the table.

Circuit	Potential Difference	Resistance	Current
Circuit 1	12 V		0.80 A
Circuit 2		5.0 Ω	0.030 A
Circuit 3	100 V	7.41 Ω	

2. Circle the correct answer for each blank.

Just before an incandescent light bulb burns out, the filament evaporates during operation and becomes (thicker/thinner). A (thicker/thinner) wire has (increased/decreased) resistance and will (glow more brightly/become dimmer). When the filament breaks, there is a(n) (open/closed) circuit and there can be no current.

3. It is not safe to connect several extension cords together because _____

_____

_____

We should use relatively thick wires in extension cords because _____

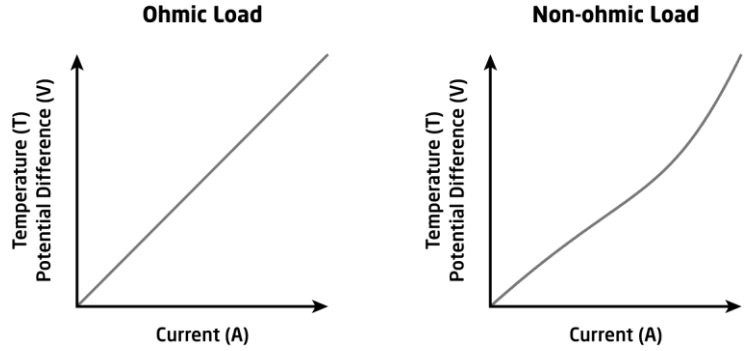
_____

_____

4. Draw a circuit with two incandescent light bulbs. Make one of the bulbs have a long filament, and one have a short filament.

5. Below is a wire used in an incandescent light bulb. Circle the parts that are most likely to melt and break. In a different colour, circle the parts that will glow the brightest. Why is this wire not good to use in incandescent bulbs?

6. Does a superconducting wire obey Ohm's law? Explain your answer.



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