Defroster Wire Slopes

Read data through two choices of graph axes

HS-PSII-5.3 "Describe the slope of the graphical representation of current vs. voltage or voltage vs. current in terms of the resistance of the device."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the two descriptions of slope as a ratio, then circle the two phrases that tell how higher resistance changes a line's steepness.

Testing Defroster Wires

1 A repair crew tests two heating wires before installing them in a window defroster. For each wire, they set a voltage and measure the current that flows. The table records their results for two devices, A and B. Both show a steady pattern: increasing the voltage by the same amount increases the current by the same amount.

DEFROSTER WIRE MEASUREMENTS

Voltage (V)	Device A current (A)	Device B current (A)
2	0.20	0.10
4	0.40	0.20
6	0.60	0.30
8	0.80	0.40

2 A graph's slope is the change in its vertical value divided by the change in its horizontal value. If current is on the vertical axis and voltage is on the horizontal axis, slope is change in current divided by change in voltage. Its unit is amperes per volt. For constant resistance, this slope equals one divided by resistance.

3 Reversing the axes changes the slope's meaning. With voltage vertical and current horizontal, slope is change in voltage divided by change in current, measured in ohms. This slope equals resistance for a device that obeys Ohm's law. Check the axes before comparing lines: higher resistance makes a voltage versus current line steeper but a current versus voltage line flatter.

2 ANSWER WITH EVIDENCE

Use the passage

1. On a voltage versus current graph, what is the slope of device A's line? Give its unit.

2. On a current versus voltage graph, what is the slope of device B's line? Give its unit.

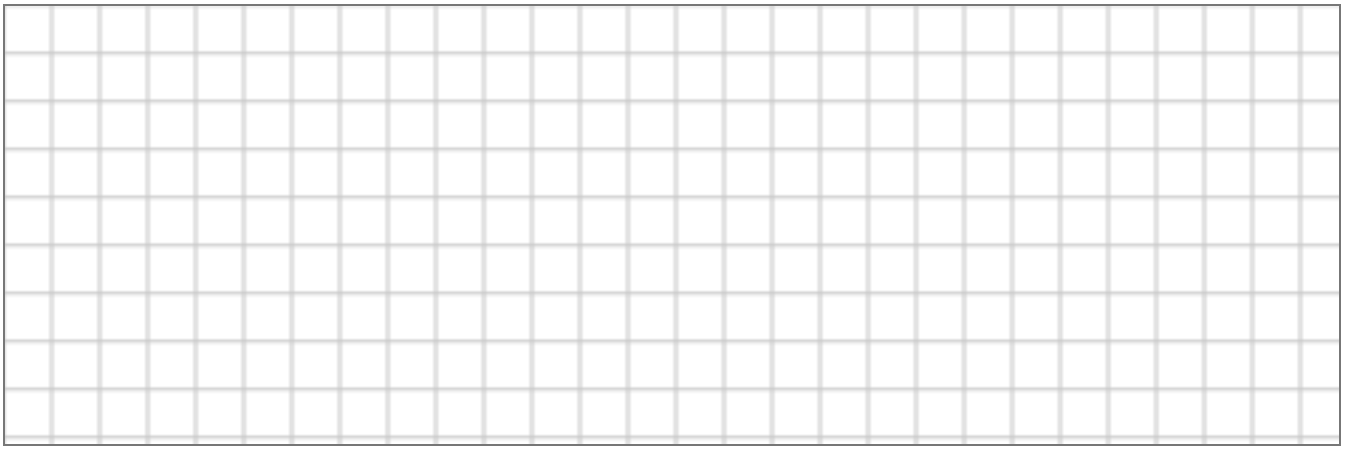
3. If voltage is on the vertical axis, which device has the steeper line? Explain using resistance.

4. If current is on the vertical axis instead, which device has the steeper line? Use the slopes to explain why the answer changes.

3 YOUR TURN

Your own words

On the grid, invent two devices with different whole-number resistances. Graph voltage versus current for each device using the origin and two nonzero current values, label both axes and lines, then write two sentences giving each slope and explaining which line is steeper.



ANSWER KEY

Defroster Wire Slopes

PART 1 · READ AND MARK

Underline the two descriptions of slope as a ratio, then circle the two phrases that tell how higher resistance changes a line's steepness. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	On a voltage versus current graph, what is the slope of device A's line? Give its unit.	**10 ohms. For example, (4 V − 2 V) ÷ (0.40 A − 0.20 A) = 10 ohms.**
2	On a current versus voltage graph, what is the slope of device B's line? Give its unit.	**0.05 amperes per volt. For example, (0.20 A − 0.10 A) ÷ (4 V − 2 V) = 0.05 A/V.**
3	If voltage is on the vertical axis, which device has the steeper line? Explain using resistance.	**Device B. Its resistance is 20 ohms, greater than device A's 10 ohms, so its voltage versus current line is steeper.**
4	If current is on the vertical axis instead, which device has the steeper line? Use the slopes to explain why the answer changes.	**Device A. Its slope is 0.10 A/V, while device B's is 0.05 A/V. On these axes, slope is one divided by resistance.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Horizontal axis: current (A). Vertical axis: voltage (V). Device C, 5 ohms: (0 A, 0 V), (1 A, 5 V), (2 A, 10 V). Device D, 8 ohms: (0 A, 0 V), (1 A, 8 V), (2 A, 16 V). Device C's slope is 5 ohms, and device D's slope is 8 ohms. Device D's line is steeper because its resistance is greater.

Accept any correctly calculated slope using two table rows. For the graph, accept any two distinct positive whole-number resistances with correctly plotted points and a matching comparison of slopes.