

Part A: Variables

Read each experiment and identify the variables.

1. Jordan hangs different masses from a spring and measures how far the spring stretches. She uses the same spring and the same ruler for every trial. Name the independent variable, the dependent variable, and two constants. Which variable belongs on the x-axis of her graph?

Independent variable: the mass hung on the spring (what Jordan changes).

Dependent variable: how far the spring stretches (what she measures).

Constants: the same spring and the same ruler (also how the mass is hung, the room, etc.).

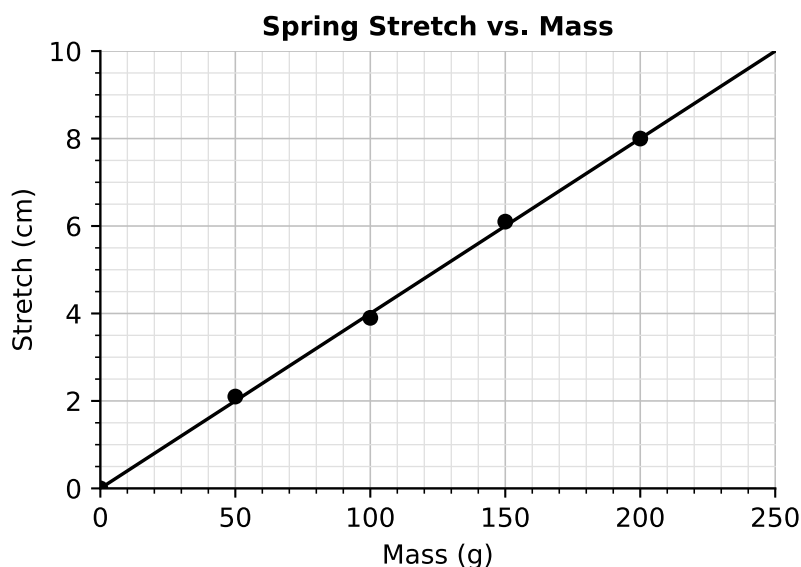
x-axis: mass, because the independent variable always goes on the x-axis.

Part B: Graphing Data

Jordan's data are shown below. Use them for problems 2 through 4.

2. Plot Jordan's data on the grid. Add a title, then draw one straight trend line of best fit. Do not connect the dots.

Mass (g)	Stretch (cm)
0	0.0
50	2.1
100	3.9
150	6.1
200	8.0



Title: **Spring Stretch vs. Mass.** Mass on the x-axis, stretch on the y-axis.

The trend line passes through (0 g, 0 cm) and (200 g, 8.0 cm), with points on both sides of it.

3. Find the slope of your trend line. Pick two points on the line (not data points), show the rise and run, and include units. Then explain what the slope means for the spring.

Points on the line: (25 g, 1.0 cm) and (250 g, 10.0 cm)

Rise: $\Delta y = 10.0 \text{ cm} - 1.0 \text{ cm} = 9.0 \text{ cm}$ **Run:** $\Delta x = 250 \text{ g} - 25 \text{ g} = 225 \text{ g}$

Slope: $m = 9.0 \text{ cm} / 225 \text{ g} = \mathbf{0.040 \text{ cm/g}}$ (about 0.038 to 0.042 cm/g is fine)

Meaning: the spring stretches 0.040 cm for every gram added, or about 2 cm for every 50 g.

4. Write the equation of your trend line using the variables s (stretch) and m (mass), with units. Then use it to predict the stretch for a 350 g mass. Is this prediction an interpolation or an extrapolation? Explain.

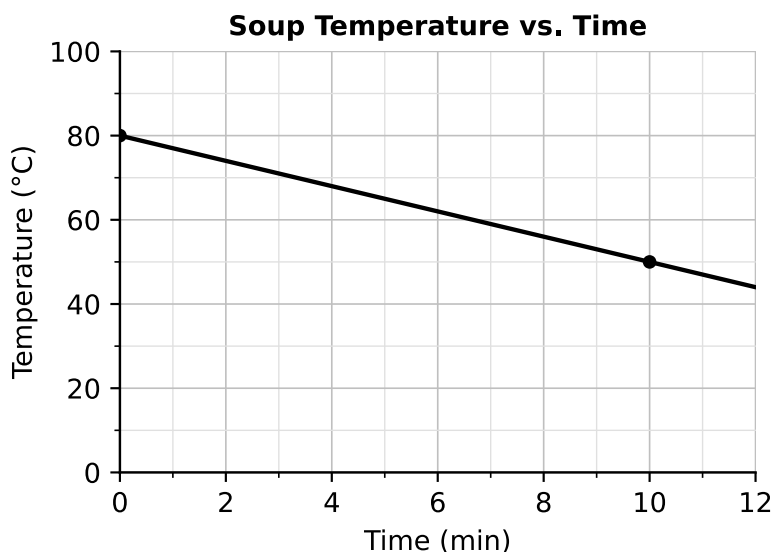
Equation: $s = (0.040 \text{ cm/g})m + 0 \text{ cm}$, so $s = \mathbf{(0.040 \text{ cm/g})m}$. The y-intercept is 0 cm because no mass means no stretch.

Prediction: $s = (0.040 \text{ cm/g})(350 \text{ g}) = \mathbf{14 \text{ cm}}$ (the grams cancel)

Extrapolation: 350 g is beyond the data (0 to 200 g). It assumes the spring keeps stretching at the same rate, which may not be true if the spring is overstretched.

Part C: Reading a Graph

5. The graph shows the trend line for a bowl of soup cooling on a counter. The two marked points are on the line.



- Find the slope of the line, with units.
 - What is the y-intercept? What does it mean?
 - Write the equation of the line using T and t .
 - Use your equation to predict when the soup reaches 20 °C.
- a.** $m = (50 \text{ °C} - 80 \text{ °C}) / (10 \text{ min} - 0 \text{ min}) = -30 \text{ °C} / 10 \text{ min} = \mathbf{-3.0 \text{ °C/min}}$. The soup cools 3.0 °C each minute.
- b.** $b = \mathbf{80 \text{ °C}}$, the soup's temperature at $t = 0$, when it was set on the counter.
- c.** $T = \mathbf{(-3.0 \text{ °C/min})t + 80 \text{ °C}}$
- d.** $20 \text{ °C} = (-3.0 \text{ °C/min})t + 80 \text{ °C}$, so $-60 \text{ °C} = (-3.0 \text{ °C/min})t$ and $\mathbf{t = 20 \text{ min}}$. This is an extrapolation (real cooling slows down near room temperature).