Lesson 5   Equations of Lines

Activity 1   Slope-Intercept Form

In England, oven cooking temperatures are often given as Gas Marks rather than degrees Fahrenheit. The table shows the equivalent oven temperatures for various Gas Marks.

Gas Mark	3	5	7	9
Degrees (F)	325	375	425	475

a. Plot the data and draw a line through the data points.

b. Calculate the slope of your line.

Estimate the y-intercept from the graph.

c. Write an equation that gives the temperature, T, in degrees Fahrenheit, in terms of the Gas Mark, G.
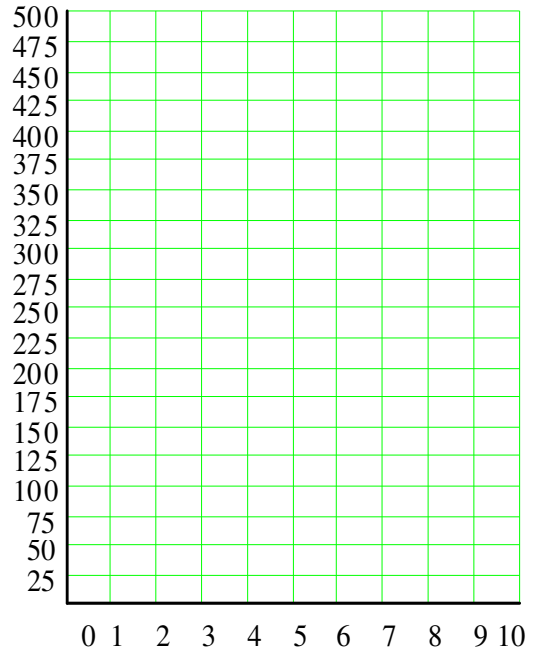
Activity 2   Working with Formulas

a. We now have several new formulas to work with. Solve each formula for the indicated variable:

$$m = \frac{\Delta y}{\Delta x} \qquad\qquad \Delta y =$$

$$\Delta y = y_2 - y_1 \qquad\qquad y_2 =$$

$$\Delta x = x_2 - x_1 \qquad\qquad x_2 =$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad\qquad y_2 - y_1 =$$

b. Suppose you are studying the graph of a line, $y = mx + b$. Explain the difference between what the statements $x = 2$ and $\Delta x = 2$ mean.

Activity 3   Finding a Linear Model

Sea water does not freeze at exactly 32° F because of its salinity. The temperature at which water freezes depends on its dissolved mineral content. A common unit for measuring salinity is parts per thousand, or ppt. For example, salinity of 8 ppt means 8 grams of dissolved salts in each kilogram of water. Here are some data for the freezing temperature of water.

Salinity (ppt), S	8	12	20
Freezing temperature (°F), T	31.552	31.328	30.88

a. Do these data points describe a linear model? Why or why not?

b. Use the point-slope formula to find a linear equation for freezing temperature, T, in terms of salinity, S.

Step 1: Find the slope $m = \dfrac{T_2 - T_1}{S_2 - S_1} =$

Step 2: Use the point-slope formula $T - T_1 = m(S - S_1)$

c. What is the salinity of water that freezes at 32° F?

d. Sea water has an average salinity of 35 ppt. What is the freezing point of sea water?

e. The conversion formula from Celsius to Fahrenheit is $F = \frac{9}{5}C + 32$. What is the freezing point of sea water in degrees Celsius?

Wrap-Up

In this Lesson, we worked on the following skills and goals related to linear models:

- Identify the slope and y-intercept from the equation for a line
- Interpret the slope and y-intercept in context
- Use the coordinate formula to calculate slope
- Use the point-slope formula to find an equation for a line
- Find a linear model from two data points

Check Your Understanding
1. Which formula did you use to find the equation of the line in Activity 1?
2. If you graph the data in Activity 3, which variable goes on the vertical axis?
3. When you calculate a slope using data, how do you know which variable goes in the numerator of the slope ratio?
4. Which two formulas do you need to find the equation of a line that goes through two given points?