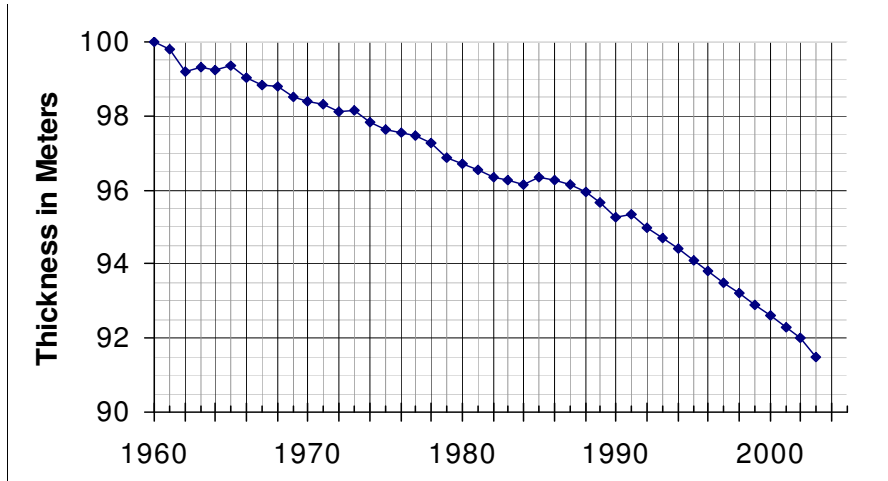# Examples of Activities

Activity 1 Calculating Rate of Change

The graph shows how the thickness of a typical land-based glacier has changed over 43 years.

a. What was the **total change**, ΔH, in thickness from 1960 to 2003?

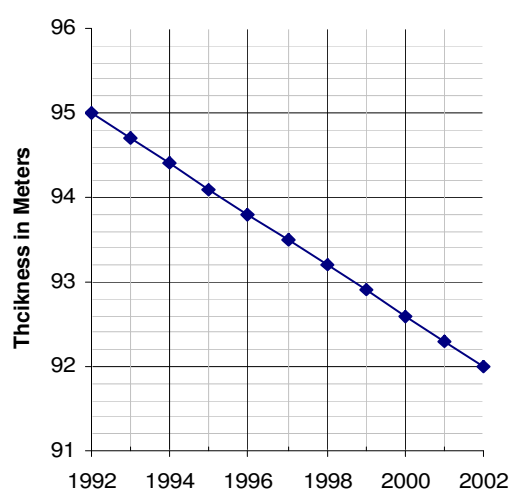| Year, t	Thickness, H
1960	
2003	

$\Delta H =$

Calculate the **average yearly change** in thickness, $\dfrac{\Delta H}{\Delta t}$, over that time interval. Give units with your answers.

$$\frac{\Delta H}{\Delta t} =$$

b. The graph appears to be almost linear from 1992 to 2002. Read the graph to complete the table.

Year, t	Thickness, H
1992	
2002	

c. Calculate the slope of the graph from 1992 to 2002. Include units in your answer.

d. What does the slope tell us about glaciers?

Activity 2   Slope and Linear Models

The taxi fare in three different cities is described below. In each city, you pay an initial charge when you get into the taxi, and then your fare is based on the distance you travel. Each city uses a different distance unit to compute the fare.

City	Initial Charge	Distance Unit	Charge per Unit
Boston	1.45	$\frac{1}{8}$ mile	0.30
Honolulu	2.25	$\frac{1}{4}$ mile	0.75
New York	2.50	$\frac{1}{5}$ mile	0.40

a. Compute the charge per mile in each city. (Do not include the initial charge.) In which city do taxis charge the highest mileage rate?

b. Write a linear model for the taxi fare in each city, using miles as the input variable. (**Hint:** What is the initial value for each model?)

c. In which city do taxis charge the lowest fare for a 5 mile ride?

d. For what distance are the taxi fares in Boston and New York equal? (**Hint**: Use the appropriate models from part (b).)

e. Choose the correct graph for each city.
   Explain how you decided.

   Boston:

   Honolulu:

   New York:
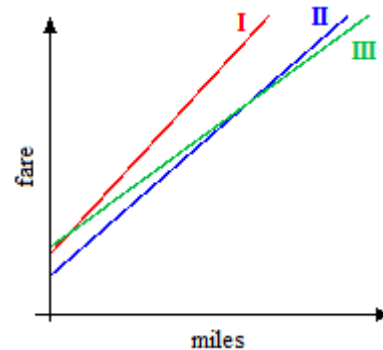
Activity 3   Interpreting Slope as a Rate

The table shows the amount of salt that can be dissolved in a beaker of water at different temperatures.

Temperature (°C), T	10	12	15	21	25	40	52
Salt (g), S	33	34	35.5	38.5	40.5	48	54

a. Which variable is the input, and which is the output?

   input: output:

   If you plot the data, which variable goes on the horizontal axis, and which on the vertical?

   horizontal: vertical:

b. Will the points lie on a straight line? Why or why not?

c. Calculate the slope, and interpret it as a rate of change. Include units in your answer.

d. Use the slope to answer the question: If you increase the temperature $5°C$ from the current temperature, how much more salt will dissolve?

Activity 2   Heart Rate

An animal's heart rate is related to its size or mass, with smaller animals generally having faster heart rates. The heart rates of mammals are given approximately by the power function

$$H = f(m) = km^{-1/4}$$

where m is the animal's mass and k is a constant.

a. A typical human male weighs about 70 kilograms and has a resting heart rate of 70 beats per minute. Find the constant of proportionality, k, and write a formula for H as a function of m.

b. Complete the table with the heart rates of the mammals whose masses are given

Animal	Cat	Wolf	Horse	Polar Bear	Elephant
Mass (kg)	4	80	300	800	5400
Heart Rate					

c. Sketch a graph of H for masses up to 6000 kilograms.
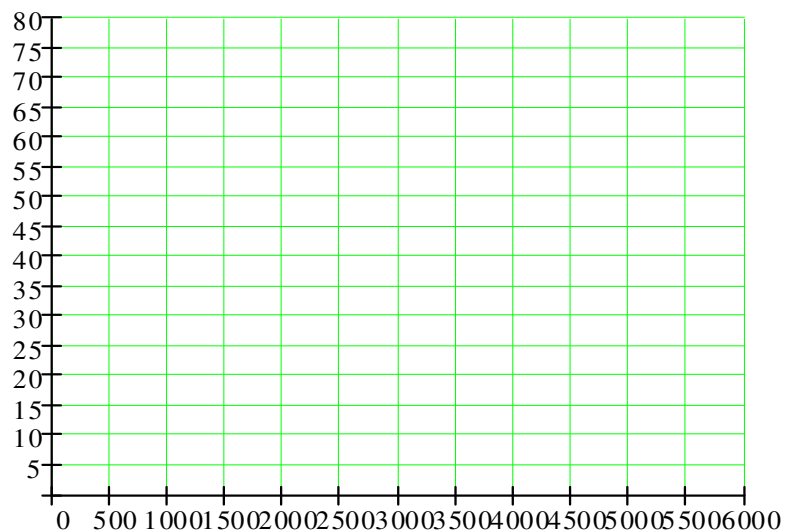
d. What would be the mass of a mammal whose heart rate is 40 beats per minute?

e. Write the formula for H using a decimal fraction for the exponent.

Write the formula for H using a radical.

Examples of Reading Questions

RQ3 What sort of variables can be described by a linear model?
a. Increasing variables
b. Variables that change at a constant rate
c. Variables that describe time
d. Variables that can be graphed

RQ3 Describe the intercept method of graphing.
a. Make a table of values and plot the points.
b. Extend the line until it crosses both axes.
c. Solve for y in terms of x.
d. Plot the points $(x, 0)$ and $(0, y)$ and draw the line through them.

RQ4 True or False.
a. The notation $f(t)$ indicates the product of f and t.
b. If $y = f(x)$, then $f(x)$ gives the value of the input variable.
c. If Q is a function of M, we may write $M = f(Q)$.
d. In the equation $d = g(n)$, the letters d, g, and n are variables.

RQ2 True or False.
a. An exponential function $f(x) = b^x$ is always positive.
b. The function $f(x) = ab^x$ has a horizontal asymptote at $y = 0$.
c. The value of b determines how rapidly the graph of $f(x) = ab^x$ increases or decreases.
d. The graph of $f(x) = ab^x$ is decreasing if $b < 0$.

Examples of Concept Questions

1. What are the x-intercepts of the graph of $y = 3(2x - 7)(x + 2)$?
    a. $\frac{7}{2}$ and -2 **b.** $-\frac{7}{2}$ and 2
    c. 3, $\frac{7}{2}$ and -2 **d.** 3, $-\frac{7}{2}$ and 2

2. What happens to the x-intercepts when you multiply the right side of $y = ax^2 + bx + c$ by 3?
    a. The are tripled   **b.** They are divided by 3
    c. They move 3 units to the right   **d.** They are unchanged

3. If the perimeter of a rectangle is 56 inches and its width is x inches, what is an expression for its length?
    a. $56 - x$ **b.** $28 - x$ **c.** $56x$ **d.** $\dfrac{28}{x}$

4. Which statement is true?
    a. All rectangles with the same perimeter have the same area.
    b. The solutions of $x(18 - x) = 80$ are $x = 80$ and $x = 18$.
    c. If the perimeter of a rectangle is 20 cm, the largest area it can have is 20 sq cm.
    d. If you know the x-intercepts of the graph of $y = x^2 + bx + c$, you can write it in factored form.