Unit 6, Lesson 4

Connections between Representations

Let's look at the relationship of verbal descriptions, equations, tables, and graphs.

4.1 Math Talk: Evaluating Expressions

Evaluate mentally.

- $6{,}400 - 400x$ when x is 0
- $6{,}400 - 400x$ when x is 2
- $6{,}400 \cdot \left(\frac{1}{10}\right)^x$ when x is 0
- $6{,}400 \cdot \left(\frac{1}{10}\right)^x$ when x is 2

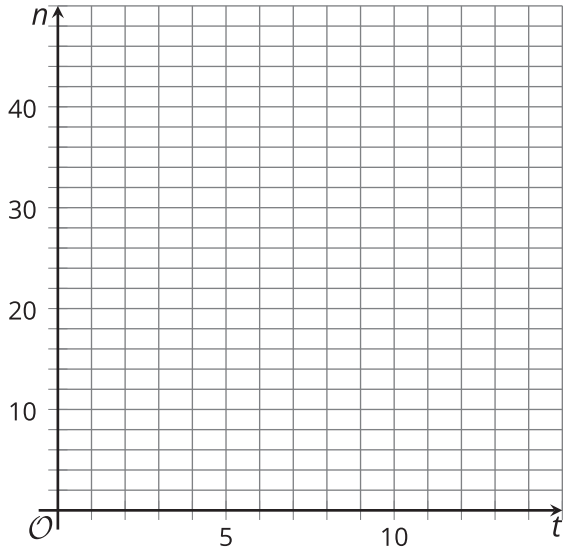
4.2 A Good Night's Sleep

Is more sleep associated with better brain performance? A researcher collected data to figure out if there was an association between hours of sleep and ability to solve problems. She administered a specially designed problem-solving task to a group of volunteers, and, for each volunteer, recorded the number of hours slept the night before and the number of errors made on the task.

The equation $n = 40 - 4t$ models the relationship between t, the time in hours a student slept the night before, and n, the number of errors the student made in the problem-solving task.

1. Use the equation to find the coordinates of 5 data points on a graph representing the model. Organize the coordinates in the table.
2. Create a graph that represents the model.

hours of sleep, t	number of errors, n



3. In the equation $n = 40 - 4t$, what does the 40 mean in this situation? Where can we see it on the graph?

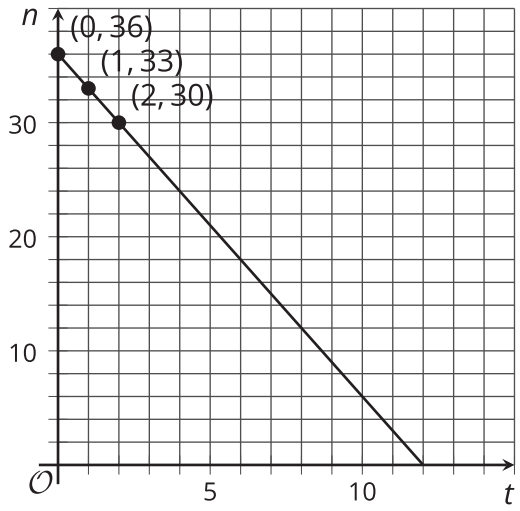
4. In the equation $n = 40 - 4t$, what does the -4 mean in this situation? Where can we see it on the graph?

5. How many errors would you expect a person to make who had slept 3.5 hours the night before?

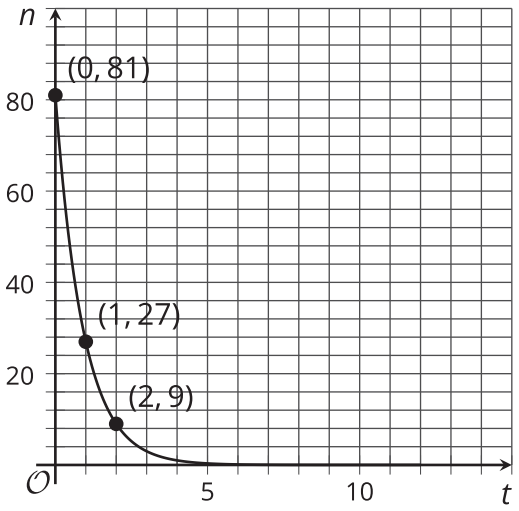
4.3 What's My Equation?

The sleep researcher repeated the study on two more groups of volunteers, collecting different data. Here are graphs representing the equations that model the different sets of data:

A



B



1. Write an equation for Model A. Explain what the numbers in your equation mean.

2. Model B is exponential.
   a. How many errors did participants make with 0 hours of sleep?
   b. How many errors with 1 hour of sleep?
   c. What fraction of the errors with 0 hours of sleep is your answer to the last question?

3. Complete the table for Model B for 3, 4, and 5 hours of sleep.

t	0	1	2	3	4	5
n	81	27	9			

4. Which is an equation for Model B? If you get stuck, test some points!

$n = 81 - 3t$ $\quad$ $n = 81 - \frac{1}{3}t$ $\quad$ $n = 81 \cdot (3)^t$ $\quad$ $n = 81 \cdot \left(\frac{1}{3}\right)^t$