



# 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

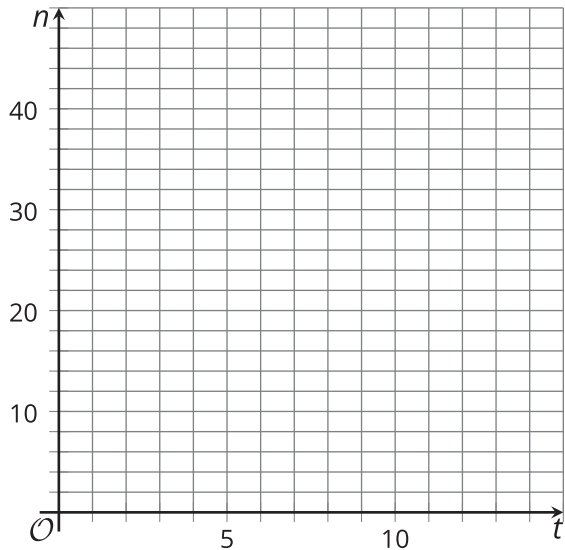
A Good Night’s Sleep

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, $n$



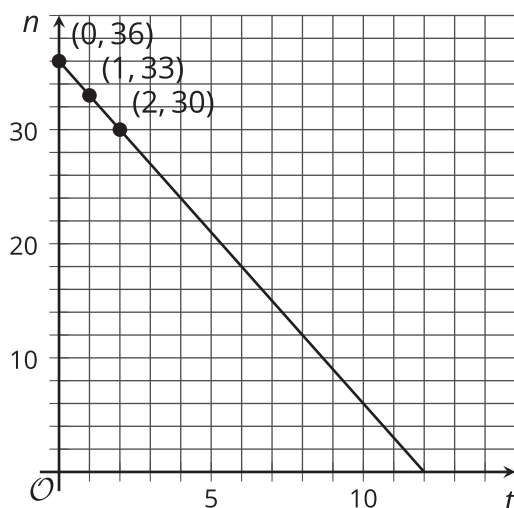
- 3. In the equation  $n = 40 - 4t$ , what does the 40 mean in this situation? Where can we see it on the graph?
- 4. In the equation  $n = 40 - 4t$ , what does the -4 mean in this situation? Where can we see it on the graph?
- 5. How many errors would you expect a person to make who had slept 3.5 hours the night before?



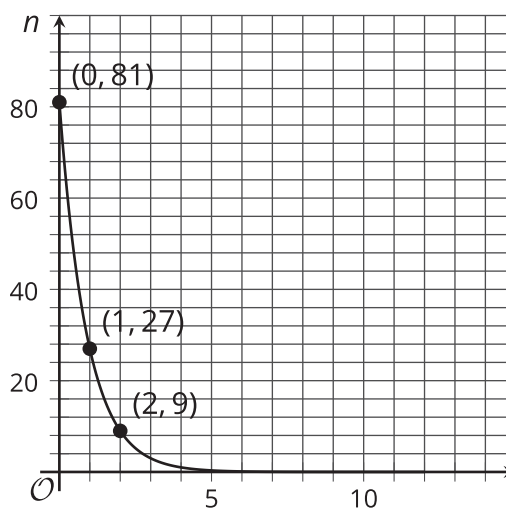
## 4.3 What's My Equation?

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**



- Write an equation for Model A. Explain what the numbers in your equation mean.
- Model B is exponential.
  - How many errors did participants make with 0 hours of sleep?
  - How many errors with 1 hour of sleep?
  - What fraction of the errors with 0 hours of sleep is your answer to the last question?

- 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			

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

$$n = 81 - 3t$$

$$n = 81 - \frac{1}{3}t$$

$$n = 81 \cdot (3)^t$$

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