Unit 4 Lesson 4: Representing Functions at Rational Inputs

1 Math Talk: Unknown Exponents (Warm up)

Student Task Statement

Solve each equation mentally.

1. $5^q = 125$

2. $\frac{1}{5^r} = \frac{1}{125}$

3. $5^t = \frac{1}{125}$

4. $125^u = 5$

2 Population of Nigeria

Student Task Statement

In 1990, Nigeria had a population of about 95.3 million. By 2000, there were about 122.4 million people, an increase of about 28.4%. During that decade, the population can be reasonably modeled by an exponential function.

1. Express the population of Nigeria $f(d)$, in millions of people, d decades since 1990.

2. Write an expression to represent the population of Nigeria in 1996.

3. A student said, "The population of Nigeria grew at a rate of 2.84% every year."
   a. Explain or show why the student's statement is incorrect.

   b. Find the correct annual growth rate. Explain or show your reasoning.
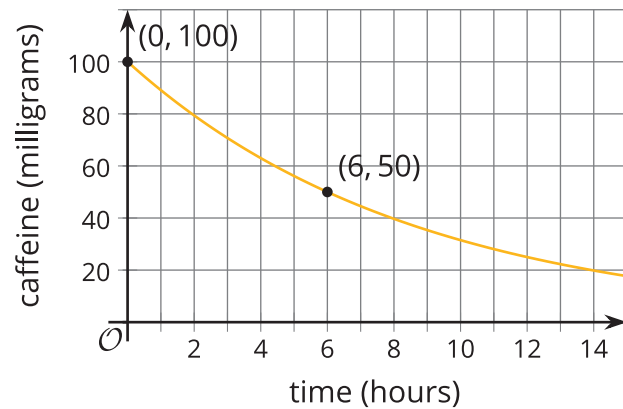
3 Got Caffeine?

Student Task Statement

In healthy adults, caffeine has an average half-life of about 6 hours. Let's suppose a healthy man consumes a cup of coffee that contains 100 mg of caffeine at noon.

1. Each of the following expressions describes the amount of caffeine in the man's body some number of hours after consumption. How many hours after consumption?

   a. $100 \cdot \left(\frac{1}{2}\right)^1$

   b. $100 \cdot \left(\frac{1}{2}\right)^3$

   c. $100 \cdot \left(\frac{1}{2}\right)^{\frac{1}{6}}$

   d. $100 \cdot \left(\frac{1}{2}\right)^t$

2.   a. Write a function g to represent the amount of caffeine left in the body, h hours after it enters the bloodstream.

      b. The function f represents the amount of caffeine left in the body after t 6-hour periods. Explain why $g(6) = f(1)$.

Activity Synthesis

Function g

Function f