Name: ______________________ **Date:** ______________

Scaffolded Practice: Rational and Irrational Numbers and Their Properties

For problems 1–3, use the properties of exponents to simplify each expression. Rewrite the expression so that all exponents are positive. Do not evaluate.

1. $\dfrac{n^{-\frac{4}{7}}}{n^{\frac{1}{14}}}$

2. $\left(37^{\frac{6}{11}}\right)^{\frac{4}{5}}$

3. $\left(k^{\frac{12}{5}} \bullet k^{\frac{10}{3}}\right)^{\frac{1}{2}}$

For problems 4–6, simplify each expression. Then, determine whether the rewritten expression is rational or irrational.

4. $\sqrt{16+\sqrt{81}}$

5. $2+\sqrt[2]{2^5}$

6. $\sqrt{196} \bullet \sqrt[4]{5 \bullet 4^2+1}$

continued

For problems 7 and 8, solve each equation for the given variable.

7. $\sqrt[5]{y^3} = 27$

8. $z^{\frac{1}{4}} = \frac{2}{z}$

For problems 9 and 10, use the given information to solve the problems.

9. During a networking experiment, an experimenter instructed each subject to call every person he or she knows. Then, the experimenter instructed everyone called to perform the same task. The equation that models this situation is $y = 100a^t$, where y represents the total number of calls made and t represents the time (in days) following the start of the experiment. Suppose that after two days, the number of calls reached 10,000. Determine the value of a and determine the number of calls made after 1 week.

10. A nuclear reactor stationed in a densely populated area has recently been found to have a significant risk of overheating. To mitigate this problem, professionals proposed adding a coolant that decreases the reactors' temperature faster than its natural cool-down time. The equation that models this situation is $T = 1200k^{-t}$, where T denotes the reactor's current temperature (in degrees Celsius) and t denotes the time (in minutes) after the coolant's application. Now suppose, after 1 minute, the reactor's temperature decreased to 600°C. The target temperature occurs after 5 minutes. What is it?