## Unit 4 Lesson 8: Unknown Exponents

### 1 A Bunch of $x$’s (Warm up)

#### Student Task Statement

Solve each equation. Be prepared to explain your reasoning.

1. $\frac{x}{3}=12$
2. $3x^{2}=12$
3. $x^{3}=12$
4. $\sqrt[3]{x}=12$
5. $\sqrt{3x}=12$
6. $\frac{3}{x}=12$

### 2 A Tessellated Trapezoid

#### Student Task Statement

Here is a pattern showing a trapezoid being successively decomposed into four similar trapezoids at each step.



1. If $n$ is the step number, how many of the smallest trapezoids are there when $n$ is 4? What about when $n$ is 10?
2. At a certain step, there are 262,144 smallest trapezoids.
	1. Write an equation to represent the relationship between $n$ and the number of trapezoids in that step.
	2. Explain to a partner how you might find the value of that step number.

### 3 Successive Splitting

#### Student Task Statement



In a lab, a colony of 100 bacteria is placed on a petri dish. The population triples every hour.

1. How would you estimate or find the population of bacteria in:
	1. 4 hours?
	2. 90 minutes?
	3. $\frac{1}{2}$ hour?
2. How would you estimate or find the number of hours it would take the population to grow to:
	1. 1,000 bacteria?
	2. double the initial population?

### 4 Missing Values (Optional)

#### Student Task Statement

Complete the tables.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| $x$ |   |   | -1 | 0 | $\frac{1}{2}$ | 1 |   |   | 5 |   |   |
| $2^{x}$ | $\frac{1}{32}$ | $\frac{1}{4}$ | $\frac{1}{2}$ |   |   |   | 4 | 16 |   | 256 | 1,024 |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| $x$ |   |   |   | $\frac{1}{3}$ | $\frac{1}{2}$ |   |   |   |   |
| $5^{x}$ | $\frac{1}{25}$ | $\frac{1}{5}$ | 1 |   |   | 5 | 125 | 625 | 3,125 |

Be prepared to explain how you found the missing values.



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