Unit 4 Lesson 14: Solving Exponential Equations

1 A Valid Solution? (Warm up)

Student Task Statement

To solve the equation $5 \cdot e^{3a} = 90$, Lin wrote the following:

$$5 \cdot e^{3a} = 90$$
$$e^{3a} = 18$$
$$3a = \log_e 18$$
$$a = \frac{\log_e 18}{3}$$

Is her solution valid? Be prepared to explain what she did in each step to support your answer.

2 Natural Logarithm

Student Task Statement

1. Complete the table with equivalent equations. The first row is completed for you.

	exponential form	logarithmic form
a.	$e^0 = 1$	$\ln 1 = 0$
b.	$e^1 = e$	
c.	$e^{-1} = \frac{1}{e}$	
d.		$\ln \frac{1}{e^2} = -2$
e.	$e^x = 10$	

2. Solve each equation by expressing the solution using $\ln$ notation. Then, find the approximate value of the solution using the "ln" button on a calculator.

   a. $e^m = 20$

   b. $e^n = 30$

   c. $e^p = 7.5$

3 Solving Exponential Equations

Student Task Statement

Without using a calculator, solve each equation. It is expected that some solutions will be expressed using log notation. Be prepared to explain your reasoning.

1. $10^x = 10{,}000$

2. $5 \cdot 10^x = 500$

3. $10^{(x+3)} = 10{,}000$

4. $10^{2x} = 10{,}000$

5. $10^x = 315$

6. $2 \cdot 10^x = 800$

7. $10^{(1.2x)} = 4{,}000$

8. $7 \cdot 10^{(0.5x)} = 70$

9. $2 \cdot e^x = 16$

10. $10 \cdot e^{3x} = 250$