Solving Exponentials and Logs Mixed Practice Name:_____ A#____

1. The list below shows examples of each type of exponential and logarithmic equation you have solved. For each equation write the type of function (exponential or log) and then identify where the unknown value is located (base, exponent, or argument).

$log_x(12) = 3$ Type of Function: Where is the unknown?	$4^{5.1} = x - 1$ Type of Function: Where is the unknown?	$x^{5.5} = 22$ Type of Function: Where is the unknown?
$log_8(x) = 0.3$ Type of Function: Where is the unknown?	$2^{x+2} = 32$ Type of Function: Where is the unknown?	$\log_5(3) = x + 2$ Type of Function: Where is the unknown?

2. Using the examples above you will create a decision tree to help you determine how to approach each type of exponential or log problem that you may encounter. Write each example from above in the appropriate blank and then write the first step to solving this type of equation.

Solving Exponential and Logarithmic Equations					
Exponential Equations			Logarithmic Equations		
Base is unknown	Exponent is unknown	Argument/answer is unknown	Base is unknown	Exponent is unknown	Argument/answer is unknown
Example Key Step to Solve	Example Key Step to Solve	Example Key Step to Solve	Example Key Step to Solve	Example Key Step to Solve	Example Key Step to Solve

3. Put a * next to each example above that requires a logarithm to solve. What do you notice, and why does this make sense?

Using the decision tree as a guideline, solve the following exponential and log equations.

4. $6^{x-5}+7=259$ a) What type of function? b) Where is the unknown? c) What's the first step to solving? d) Solve	5. $log_{12}(3x)=5$ a) What type of function? b) Where is the unknown? c) What's the first step to solving? d) Solve
6. $x^{5.4}-3=15$ a) What type of function? b) Where is the unknown? c) What's the first step to solving? d) Solve	7. $log_4(15)=x-2$ a) What type of function? b) Where is the unknown? c) What's the first step to solving? d) Solve

We will still be using the solving practices from our decision tree, but now with word problems. Answer each of the following questions.

8. If 1000 grams of a radioactive element decays to 825 grams in 50 days, what is its half-life?	a) What type of function does this scenario represent? If exponential, be specific. b) Write the formula that you would be using for this problem. Don't actually fill in the numbers yet, just the formula. c) What are you looking for in this problem? (What is the unknown?) d) Write the equation filling in the numbers leaving a variable in the spot of the unknown. e) Using your equation solve for the unknown. Remember to use the steps from your decision tree.

9. The pH scale is a scale for measuring the acidity or alkalinity of a substance, which is determined by the concentration of hydrogen ions. The formula for pH is $pH = -\log(H^+)$ where H^+ is the concentration of hydrogen ions in moles per cubic liter. Vinegar has a pH of 2.2. Determine the concentration of hydrogen ions in vinegar.	a) What type of function does this scenario represent? If exponential, be specific. b) Write the formula that you would be using for this problem. Don't actually fill in the numbers yet, just the formula. c) What are you looking for in this problem? (What is the unknown?) d) Write the equation filling in the numbers leaving a variable in the spot of the unknown. e) Using your equation solve for the unknown. Remember to use the steps from your decision tree.
10. A sum of $3250 was invested for 10 years, and the interest was compounded semi-annually. If this sum amounted to $5000 in the given time, what was the interest rate?	a) What type of function does this scenario represent? If exponential, be specific. b) Write the formula that you would be using for this problem. Don't actually fill in the numbers yet, just the formula. c) What are you looking for in this problem? (What is the unknown?) d) Write the equation filling in the numbers leaving a variable in the spot of the unknown. e) Using your equation solve for the unknown. Remember to use the steps from your decision tree.
11. A coroner uses a formula derived from Newton's Law of Cooling, a general cooling principle, to calculate the elapsed time since a person has died. The formula is $t = -10 \ln\left(\frac{T-R}{98.6-R}\right)$ where T is the body's measured temperature in °F, R is the constant room temperature in °F, and t is the elapsed time since death in hours. At 8:30 AM a coroner was called to the home of a person who had died. The constant temperature of the room where the body was found is 70°F. At 9:00AM the body's measured temperature was 85.5 °F. Use this body temperature to estimate the time of death.	a) What type of function does this scenario represent? If exponential, be specific. b) Write the formula that you would be using for this problem. Don't actually fill in the numbers yet, just the formula. c) What are you looking for in this problem? (What is the unknown?) d) Write the equation filling in the numbers leaving a variable in the spot of the unknown. e) Using your equation solve for the unknown. Remember to use the steps from your decision tree.

12. Gina, a social media manager, uses the model for continuous population growth to project the monthly increase in the number of followers on her client' social media sites. Gina claims that when she started working with an up-and-coming boy band, they had 18,450 online followers and she was able to increase their followers by 26% per month. If Gina started working with the band on May 1st, how many online followers did they have by September 1st?	a) What type of function does this scenario represent? If exponential, be specific. b) Write the formula that you would be using for this problem. Don't actually fill in the numbers yet, just the formula. c) What are you looking for in this problem? (What is the unknown?) d) Write the equation filling in the numbers leaving a variable in the spot of the unknown. e) Using your equation solve for the unknown. Remember to use the steps from your decision tree.
13. A decibel is a unit used to measure the loudness of sound. The formula for the loudness of a sound is given by $dB = 10\log(I)$ where dB is the decibel level. The quantity I represent the number of times more intense a sound is than the threshold sound (a sound that can barely be perceived). The sound of a crying baby registers 115 decibels. How many times more intense is this sound than the threshold sound?	a) What type of function does this scenario represent? If exponential, be specific. b) Write the formula that you would be using for this problem. Don't actually fill in the numbers yet, just the formula. c) What are you looking for in this problem? (What is the unknown?) d) Write the equation filling in the numbers leaving a variable in the spot of the unknown. e) Using your equation solve for the unknown. Remember to use the steps from your decision tree.

14. $-3e^{x+1} = -27$

15. $\frac{1}{5}\left(4^{x+2}\right) = 300$

16. $\ln(x+4) = 3.8$

17. $log_{1-x}(8) = 14.7$

18. $7 + e^{2-x} = 28$

19. $7 - 2^{-x} = 5$