Logarithms Day 1 **March 25, 2019**

Main Ideas/Questions	Notes/Examples
What is a **LOGARITHM?**	A logarithm (log) is another way of writing exponents. Logarithmic Form $\log_b a = x$ ➡ Exponential Form $b^x = a$ Read as "**log base b of a equals x.**"
Converting **LOG ⇨ EXP**	**Directions:** Write each equation in **exponential form.**

1. $\log_3 9 = 2$

2. $\log_6 216 = 3$ $6^3 = 216$

3. $\log_7 1 = 0$ $7^0 = 1$

4. $\log_2 16 = 4$ $2^4 = 16$

5. $\log_4 \frac{1}{16} = -2$ $4^{-2} = \frac{1}{16}$

6. $\log_9 27 = \frac{3}{2}$

2^{exponent} (base: 2)

Converting **EXP ⇨ LOG**	**Directions:** Write each equation in **logarithmic form.**

7. $14^2 = 196$ $\log_{14} 196 = 2$

8. $3^4 = 81$

9. $12^1 = 12$ $\log_{12} 12 = 1$

10. $36^{\frac{1}{2}} = 6$ $\log_{36} 6 = \frac{1}{2}$

11. $2^{-3} = \frac{1}{8}$ $\log_2 \frac{1}{8} = -3$

12. $8^{\frac{4}{3}} = 16$

COMMON LOGARITHM

A logarithm with base 10 is called a **common logarithm** and can be written without the base. $\log_{10} x \longrightarrow \log x$

EVALUATING LOGARITHMS

Directions: Use your knowledge of exponents to evaluate the following logarithms.

13. $\log_7 49 = x$ (2)

$7^{\square} = 49$

14. $\log_3 27$ (3)

$3^3 = 27$

15. $\log 100$ (2)

$10^{\square} = 100$

16. $\log_{12} 1$ (0)

$12^0 = 1$

17. $\log_2 64$ (6)

$2^{6} = 64$

18. $\log_3 243$ (5)

$3^5 = 243$

19. $\log_9 \frac{1}{81}$ (-2)

$9^{\square} = \frac{1}{81}$

20. $\log_{64} 4$ (1/3)

$64^{1/3} = 4$

CHANGE OF BASE FORMULA

Choose BASE 10 because there is a calculator button for it!

Some logarithms are not as easy to evaluate as those above, and will require the **change of base formula**.

$\log_b a = \frac{\log a}{\log b}$

Directions: Evaluate each log using the change of base formula.

21. $\log_{16} 64$ ← a, b

$\frac{\log 64}{\log 16} = 1.5$

22. $\log_8 32$

1.6

23. $\log_2 54$

5.7549

24. $\log_{10} 294$

2.4683

25. $\log_4 136$

3.5437

26. $\log_6 \frac{1}{36}$

-2