Name:	Date:
Topic:	Class:

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. $\log_3 9 = 2$

$3^2 = 9$

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

$9^{\frac{3}{2}} = 27$

Converting EXP ➲ LOG

Directions: Write each equation in **logarithmic form**.

7. $14^2 = 196$

$\log_{14} 196 = 2$

8. $3^4 = 81$

$\log_3 81 = 4$

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

$\log_8 16 = \frac{4}{3}$

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.

* $\log_{\text{anybase}} 1$ = 0

* $\log_{12} 12$ = 1

13. $\log_7 49 = x$

$7^x = 49$

$7^x = 7^2$

$x = 2$

14. $\log_3 27 = x$

$3^x = 27$

$3^x = 3^3$

$x = 3$

15. $\log 100 = x$

$10^x = 100$

$10^x = 10^2$

$x = 2$

16. $\log_{12} 1 = x$

$12^x = 1$

$12^x = 12^0$

$x = 0$

17. $\log_2 64 = x$

$2^x = 64$

$2^x = 2^6$

$x = 6$

18. $\log_3 243 = x$

$3^x = 343$

$3^x = 3^5$

$x = 5$

19. $\log_9 \frac{1}{81} = x$

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

$9^x = 81^{-1}$

$9^x = 9^{-2}$

$x = -2$

20. $\log_{64} 4 = x$

$64^x = 4$

$4^{3x} = 4^1$

$3x = 1$

$x = \frac{1}{3}$

CHANGE OF BASE FORMULA

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

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

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

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

21. $\log_{16} 64 = 1.5$

22. $\log_8 32$

1.67

23. $\log_2 54 = x$

$2^x = 54$

$\frac{\log 54}{\log 2}$

≈ 5.75

24. $\log_{10} 294$

2.47

25. $\log_4 136$

3.54

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

-2