Algebra 2: Converting and Evaluating Logs

Name: Key Hour: ________

Convert the following exponential equations to logarithmic equations.

Ex 1: $144 = 12^2$. This would convert to: $\log_{12} 144 = 2$. The base of the log is the base of the exponential. The answer is always an exponent.

Ex 2: $\left(\frac{1}{4}\right)^2 = \left(\frac{1}{16}\right)$. This converts to: $\log_{\frac{1}{4}}\left(\frac{1}{16}\right) = 2$. Everything still goes in the same place as it did in example 1. The base became the base. The exponent is the answer.

Ex 3: $13^{\log_4 7} = x$. This converts to: $\log_{13} x = \log_4 7$. The base of the log is 13, since it's the base of the exponential. Then the answer is always the exponent, which in this case is $\log_4 7$.

1. $y = 3^x$ $\log_3 y = x$
2. $6859 = 19^3$ $\log_{19} 6859 = 3$
3. $12^2 = 144$ $\log_{12} 144 = 2$
4. $\left(\frac{1}{2}\right)^3 = \frac{1}{8}$ $\log_{\frac{1}{2}} \frac{1}{8} = 3$
5. $\left(\frac{3}{7}\right)^3 = \frac{27}{343}$ $\log_{\frac{3}{7}} \frac{27}{343} = 3$
6. $\left(\frac{1}{2}\right)^5 = \frac{1}{32}$ $\log_{\frac{1}{2}} \frac{1}{32} = 5$
7. $\left(\frac{5}{8}\right)^4 = \frac{625}{4096}$ $\log_{5/8} \frac{625}{4096} = 4$
8. $\left(\frac{2}{3}\right)^4 = \frac{16}{81}$ $\log_{2/3} \frac{16}{81} = 4$
9. $\left(\frac{7}{12}\right)^3 = y$ $\log_{7/12} y = 3$
10. $\left(\frac{4}{5}\right)^2 = \frac{16}{25}$ $\log_{4/5} \frac{16}{25} = 2$
11. $e^x = y$ $\log_e y = x$
12. $e^{\frac{1}{2}} = x$ $\log_e x = \frac{1}{2}$
13. $61^x = y$ $\log_{61} y = x$
14. $22^{43} = y$ $\log_{22} y = 43$
15. $11^{\log_{11} 5} = x$ $\log_{11} x = \log_{11} 5$
16. $y = 9^{\log_9 x}$ $\log_9 y = \log_9 x$
17. $64 = 4^x$ $\log_4 64 = x$
18. $343 = 7^3$ $\log_7 343 = 3$
19. $71^x = 14.5$ $\log_{71} 14.5 = x$
20. $9^{\log_2 8} = x$ $\log_9 x = \log_2 8$

Convert the following Logarithmic Equations to Exponential Equations.

To do this, remember the circle trick we learned. The base of the log turns into the base of the exponential. The answer to the logarithmic equation is an exponent.

Ex 1: $\log_{105} 11025 = 2$ ... Converts to $105^2 = 11025$

Ex 2: $\log_8 4096 = 4$ ... Converts to $8^4 = 4096$

21. $\log_2 32 = 5$ $2^5 = 32$
22. $\log_5 1 = 0$ $5^0 = 1$
23. $\log_{10} 10 = 1$ $10^1 = 10$
24. $\log_{10} 0.1 = -1$ $10^{-1} = 0.1$

25. $\log_{\frac{1}{2}} 2 = -1$ $\left(\frac{1}{2}\right)^{-1} = 2$

26. $\log_3 81 = 4$ $3^4 = 81$

27. $\log_5 0.04 = -2$ $5^{-2} = 0.04$

28. $\log_{\frac{1}{2}} 8 = -3$ $\left(\frac{1}{2}\right)^{-3} = 8$

29. $\log_9 3 = 2$ $9^2 = 3$? uh... no?

30. $\log_4 1024 = 5$ $4^5 = 1024$

31. $\log_5 \left(\frac{1}{5}\right) = -1$ $5^{-1} = \frac{1}{5}$

32. $\log_{36} \left(\frac{1}{6}\right) = -\frac{1}{2}$ $36^{-1/2} = \frac{1}{6}$

33. $\log_8 512 = 3$ $8^3 = 512$

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

Evaluating Log Expressions.

To evaluate log expressions, you have to think about the expression as an exponential expression.

Ex 1: $\log_2 8 = 3$ This converts to $2^x = 8$. This equals 3. Since 2 raised to the 3rd power gives you 8.

35. $\log_5 125 =$ 3

36. $\log_7 343 =$ 3

37. $\log_8 1 =$ 0

38. $\log_{12} 12 =$ 1

39. $\log_6 36 =$ 2

40. $\log_4 16 =$ 2

41. $\log_9 729 =$ 3

42. $\log_7 2401 =$ 4

43. $\log_{\frac{1}{4}} \frac{1}{4} =$ 1

44. $\log_6 1 =$ 0

45. $\log 100 =$ 2

46. $\log_e 1 =$ 0