

Applying Properties (Laws) of Logarithms

NAME:

PER:

1. $\log_3 x$, $\log_6 x$, $\log_2 x$, and $\log_5 x$ are all examples of _____ logarithms.

2. A **COMMON** logarithm has a base of _____.

Therefore it can be written as _____, but is

usually abbreviated as

3. A **NATURAL** logarithm has a base of _____.

Therefore it can be written as _____ or _____,

but is usually abbreviated as

4. a) The number $e \approx$ _____

b) $\log_{10} =$ _____ c) $\ln e =$ _____ d) $\log 1 =$ _____

e) $\log 0 =$ _____ f) $\log -10 =$ _____

Solve for x using properties of logarithms. Show all steps by applying one property at a time. NO CALCULATOR!

5. $\frac{1}{2} \log x + \log 3 = \log 27$

6. $\frac{1}{2} \ln x + \ln 3 = \ln 27$

7. $2 \log_2 x + \log_2 9 = 4$

→ Careful!! "Merge" logs together on the left side of the equation then solve by rewriting in exponential form.

8. $2 \log 5 - \log x = 2$

9. $\ln x - 3 \ln 4 = 5$

10. $2 \ln x + \frac{1}{2} \ln 25 = \ln x$

11. $\ln \sqrt{x+2} + \ln 5 = 0$

12. $2 \log_3 x + \frac{1}{2} \log_3 81 = 0$

13. Solve for x by forming "like bases" on both sides of the equation to solve for x. **NO CALCULATOR!**

a. $81^x = \frac{1}{729}$ b. $4^{\frac{2}{3}x} = 32$ c. $27 = 81^{x+1}$

14. Evaluate by rewriting in exponential form and using like bases. **NO CALCULATOR!**

a. $\log_4 128$

b. $\log_{\sqrt{3}} 81$

CHECK ANSWERS:

$$-\frac{49}{25} \quad -\frac{3}{2} \quad -\frac{1}{4}$$

$$\frac{1}{5} \quad \frac{1}{4} \quad \frac{1}{3}$$

$$\frac{4}{3} \quad \frac{7}{2} \quad \frac{15}{4}$$

$$2.718 \quad 10$$

$$e \quad 8 \quad 64e^5$$

$$\log_{10} x \quad \log x$$

$$\log_e x \quad \ln_e x$$

$$\ln x \quad 81 \quad 81$$

$$0 \quad 1 \quad 1$$

general

undefined

undefined

Use properties of logarithms to evaluate each expression. Clearly show all steps by applying one property at a time. NO CALCULATOR.

15. Given that $\log 16 = 1.204$, find $\log 400$.

16. Given that $\log 8 = 0.903$, find $\log 200,000$

Given that $\log 4 = 0.602$, $\log 9 = 0.9542$, and $\log 12 = 1.0792$, evaluate each logarithm. Clearly show all steps by applying one property at a time. NO CALCULATOR.

17. $\log 400,000$

18. $\log 1.2$

19. $\log 3600$

20. $\log 18000$

**CHECK
ANSWERS**

-2.3188

-1.2219

0.0792

2.602

3.5562

4.2552

5.602

5.301

$\ln \frac{2}{5}$

#21-22 → Same directions as above, although it is ok to use a calculator only on the very last step when you are computing fractions and decimals together.

21. $\log 0.0048$

22. $\log 0.06$

23. Solve for x. Clearly show all steps and use the proper order of operations when applying properties of logarithms. NO CALCULATOR.

$$\ln\left(\frac{4e^{5x}}{25}\right) = 7x$$