Algebra 2

Write your questions and thoughts here!

9.5 – Properties of Logs

Name:_____

RECALL: $\log_b 1 =$

$\log_b b =$

PROPERTIES OF LOGARITHMS

Product Property: $\log_b xy =$

Quotient Property: $\log_b \frac{x}{y} =$

Power Property: $\log_b x^y =$

Expand:

1. $\log_2 3x^4y$

2. $\log \frac{a^2b}{c}$

3. $\log_5 \frac{p}{q^2r^3}$

Condense:

4. $\log_3 5 + 2\log_3 x - 6\log_3 z$

5. $2\ln a - \ln b - 3\ln c$

6. $2(\log_4 6 - \log_4 3) + 0.5\log_4 25$

CHANGE-OF-BASE FORMULA:

$$\log_C a = \text{————}$$

There are two bases that are the most convenient to work with. What are they?

Why are they convenient bases?

$\log_C a =$ or $\log_C a =$

9.5 – Properties of Logarithms

Write your questions and thoughts here!

Evaluate using a calculator:

7. $\log_5 7$

8. $\log_2 5$

Decibel Levels:

$$D(I) = 10 \log\left(\frac{I}{10^{-12}}\right)$$

$D(I)$ _____

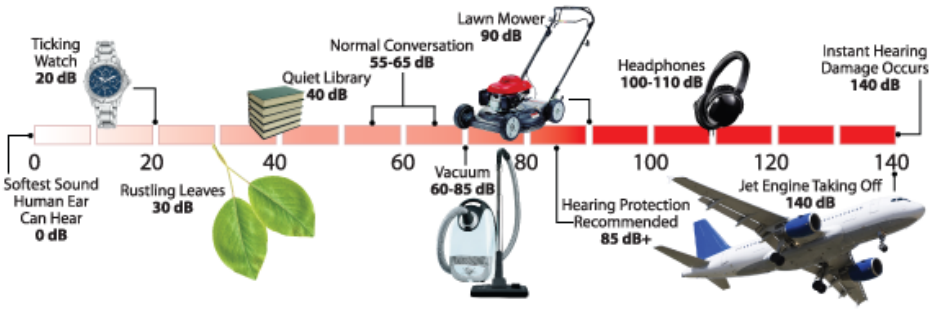
_____

I _____

_____

10^{-12} _____

_____



9. One day, Mr. Bean noticed how quietly his students were working. He borrowed a sound intensity device from the science department and measured the intensity of the noise coming from the class was 4×10^{-6} W/m^2. The next day, the noise was significantly louder. Mr. Bean realized that one student (Eluis) had been absent the day before but was in class that day. This time, Mr. Bean measured the decibel (dB) level and found it to be 73 dB.

a. Compare the dB levels of each day. How many more decibels was day 2?

b. Compare the intensities of Day 1 and Day 2. How many *times* louder was it on Day 2?

Now summarize what you learned!

9.5 Practice – Properties of Logarithms

Name: _____

Expand each logarithm.

1. $\log_2 11^5$	2. $\log_9(xy)$	3. $\log_2 \sqrt[3]{u}$
4. $\log_8 \frac{u}{v}$	5. $\log_6 \sqrt{xyz}$	6. $\log_7(x^6y^4)$
7. $\log_7 \left(\frac{6^2}{5}\right)^3$	8. $\log_8 \left(\frac{(wu)^4}{v}\right)^2$	9. $\log_6 \left(\frac{x}{y^5z}\right)^6$
10. $\log_5(x^4y^2)$	11. $\log_2(vwx\sqrt{u})$	12. $\frac{\log_3(xy)}{2}$
13. $\log_6(ab^2c)^{10}$	14. $\ln(w\sqrt[3]{xyz})$	15. $\ln \frac{wu^6}{v^4}$

Condense each expression to a single logarithm.

16. $4 \ln 11$	17. $5 \log_4 12$	18. $\log_3 a + \log_3 b$
19. $\frac{\log_5 7}{3}$	20. $\log_2 x - \log_2 y + 3 \log_2 z$	21. $\frac{\ln x}{2} - 2 \ln y$

22. $\log_8 x + \log_8 y - 5\log_8 z$

23. $15\log_9 a - 5\log_9 b$

24. $6\log_9 12 + \frac{1}{2}\log_9 11$

25. $3\ln a - \frac{\ln b}{3} - 3\ln c$

26. $5\log_7 w - 5\log_7 u - 15\log_7 v$

27. $\log_5 p + 2\log_5 q + \frac{1}{3}\log_5 r$

28. $\ln s + \ln u + 2\ln l + \ln y$

29. $\log_5 x + \frac{\log_5 y + \log_5 z}{2}$

30. $\log_6 a + \log_6 b + \frac{\log_6 c}{3} + \frac{\log_6 d}{3}$

Use a calculator to approximate to the nearest thousandth. Use the change-of-base formula to show work.

31. $\log_3 42$

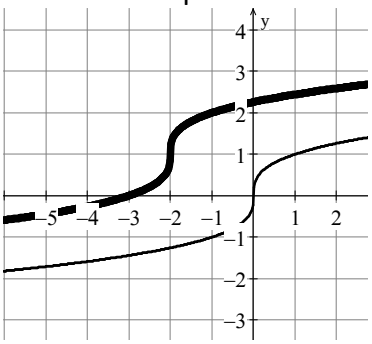
32. $\log_5 3.3$

33. $\log_5 1$

34. $\log_7 5.6$

Algebra Skillz:

1. Below are graphs of $f(x) = \sqrt[3]{x}$ (thin line) and its translation (bold line). Write an equation of the translation.



Simplify the fraction by rationalizing the denominator.

2. $\frac{4}{\sqrt{6}}$

3. $\frac{5}{2\sqrt{5}}$

Solve by factoring.

4. $3x^3 + 27x^2 - 66x = 0$

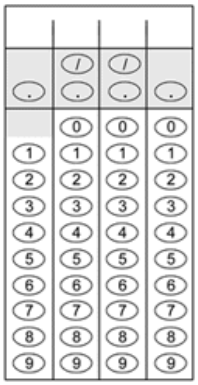
5. $25x^2 + 45x - 10 = 0$

SAT Prep:

1. Simplify: $(2^{5-x})^{3x}$

(A) $(2)^{5-2x}$
(B) $(2)^{8x-3x^2}$
(C) $(2)^{5-3x^2}$
(D) $(2)^{15x-3x^2}$

2. If $f(x) = 4(8)^{5-x}$, find $f(7)$.



9.5 Application and Extension

1. a. Expand $\log_5\left(xy^2\sqrt[3]{z}\right)$

b. Condense $\ln a - \ln b - 2\ln c$

$$D(I) = 10\log\left(\frac{I}{10^{-12}}\right)$$

2. Find the decibel level of the sound made by each object below:

a. Barking dog: $I = 10^{-4}\ \text{W/m}^2$

b. Ambulance siren: $I = 10^{0}\ \text{W/m}^2$

c. Bee: $I = 10^{-6.5}\ \text{W/m}^2$

3. Six groups of students are talking in class before the bell rings to go to lunch. Each conversation has an intensity of $1.4 \times 10^{-5}\ \text{W/m}^2$. How loud is the classroom? (measured in dB)

4. The city traffic in New York City has a decibel level on average of 70 dB (decibels). Use a graphing calculator and the point of intersection feature to help you calculate the sound intensity (in watts per square meter) of the city traffic.

hint: X-min = -0.0001 and X-max = 0.0001

5. Which is louder: New York City **<u>traffic</u>** or the **<u>classroom of kids</u>** talking and waiting for lunch? Compare the decibels and intensities and fill in the blanks below.

The _____ is louder than the _____ by _____

more decibels and has a sound intensity that is _____ times more powerful!