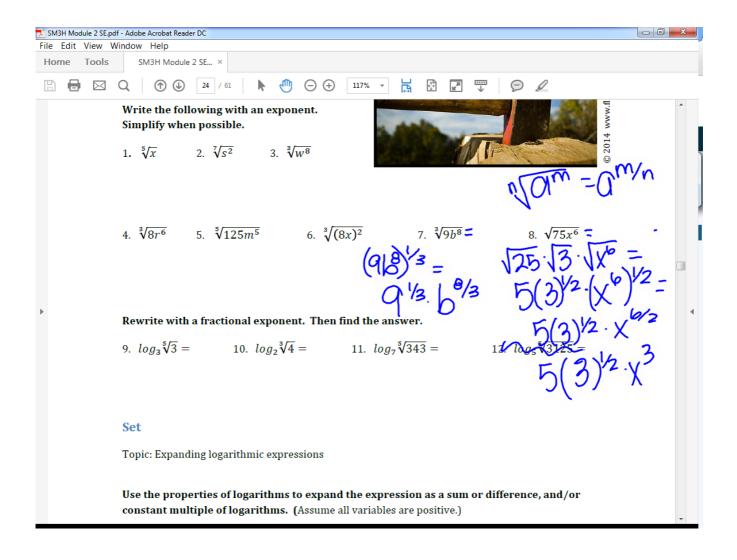# Questions on 2.3 HW? Quiz soon...

Rebekah   Hansen

Highland HS

$$\log_3 2x$$

Write the following with an exponent. Simplify when possible.

1. $\sqrt[5]{x}$ 2. $\sqrt[7]{s^2}$ 3. $\sqrt[3]{w^8}$

$\sqrt[n]{a^m} = a^{m/n}$

4. $\sqrt[3]{8r^6}$ 5. $\sqrt[5]{125m^5}$ 6. $\sqrt[3]{(8x)^2}$ 7. $\sqrt[3]{9b^8} =$ 8. $\sqrt{75x^6} =$

$(9b^8)^{1/3} =$

$9^{1/3} \cdot b^{8/3}$

$\sqrt{25} \cdot \sqrt{3} \cdot \sqrt{x^6} =$

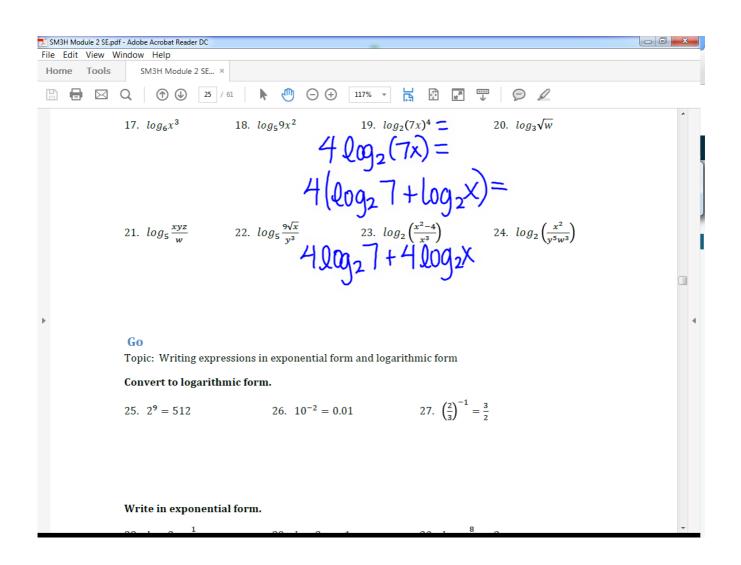$5(3)^{1/2} \cdot (x^6)^{1/2} =$

$5(3)^{1/2} \cdot x^{6/2}$

$5(3)^{1/2} \cdot x^3$

Rewrite with a fractional exponent. Then find the answer.

9. $\log_3 \sqrt[5]{3} =$ 10. $\log_2 \sqrt[3]{4} =$ 11. $\log_7 \sqrt[3]{343} =$ 12. $\log_5 \sqrt[5]{3125} =$

Set

Topic: Expanding logarithmic expressions

Use the properties of logarithms to expand the expression as a sum or difference, and/or constant multiple of logarithms. (Assume all variables are positive.)

Rewrite with a fractional exponent. Then find the answer.

9. $log_3 \sqrt[5]{3} =$ 10. $log_2 \sqrt[3]{4} =$ 11. $log_7 \sqrt[5]{343} =$ 12. $log_5 \sqrt[5]{3125} =$

$$log_7 (343)^{1/5} =$$

$$log_7 (7^3)^{1/5} =$$
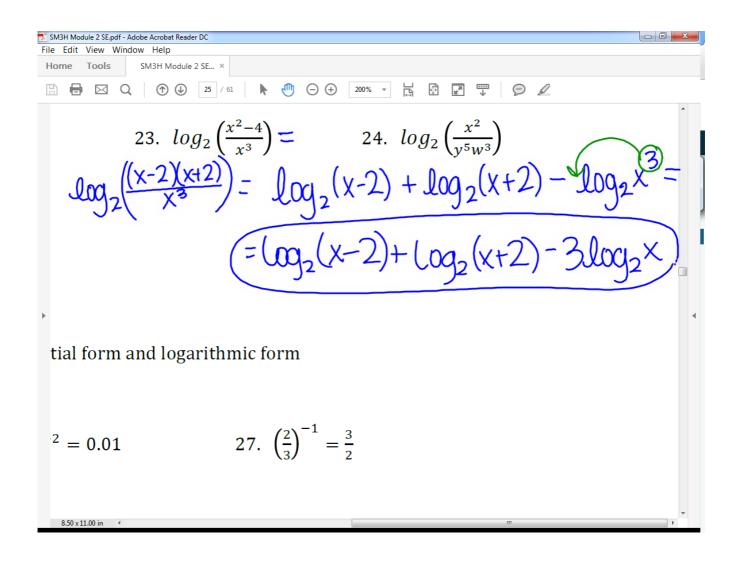
$$log_7 7^{3/5} = \frac{3}{5}$$

Set

Topic: Expanding logarithmic expressions

Use the properties of logarithms to expand the expression as a sum or difference, and/or constant multiple of logarithms. (Assume all variables are positive.)

13. $log_5 7x$ 14. $log_5 10a$ 15. $log_5 \frac{5}{b}$ 16. $log_5 \frac{d}{4}$

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Secondary Mathematics III

Sep 22-1:27 PM

3

Use the properties of logarithms to expand the expression as a sum or difference, and/or constant multiple of logarithms. (Assume all variables are positive.)

13. $log_5 7x$ 14. $log_5 10a =$ 15. $log_5 \frac{5}{b}$ 16. $log_5 \frac{d}{4} =$

$$log_5 10 + log_5 a$$

$$log_5 d - log_5 4$$

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17. $log_6 x^3 = 3 \cdot log_6 x$

Secondary Mathematics III

25

Name			Logarithmic Functions	2.3

17. $log_6 x^3$ 18. $log_5 9x^2$ 19. $log_2 (7x)^4$ 20. $log_3 \sqrt{w}$

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4

17. $log_6 x^3$ 18. $log_5 9x^2$ 19. $log_2 (7x)^4 =$ 20. $log_3 \sqrt{w}$

$$4 \log_2 (7x) =$$
$$4 (\log_2 7 + \log_2 x) =$$

21. $log_5 \frac{xyz}{w}$ 22. $log_5 \frac{9\sqrt{x}}{y^3}$ 23. $log_2 \left(\frac{x^2-4}{x^3}\right)$ 24. $log_2 \left(\frac{x^2}{y^5 w^3}\right)$

$$4 \log_2 7 + 4 \log_2 x$$

Go

Topic: Writing expressions in exponential form and logarithmic form

Convert to logarithmic form.

25. $2^9 = 512$ 26. $10^{-2} = 0.01$ 27. $\left(\frac{2}{3}\right)^{-1} = \frac{3}{2}$

Write in exponential form.

Sep 22-1:33 PM

23. $log_2 \left(\frac{x^2 - 4}{x^3} \right) =$ 24. $log_2 \left(\frac{x^2}{y^5 w^3} \right)$

$log_2 \left(\frac{(x-2)(x+2)}{x^3} \right) = log_2(x-2) + log_2(x+2) - log_2 x^3 =$

$= log_2(x-2) + log_2(x+2) - 3 log_2 x$

tial form and logarithmic form

$^2 = 0.01$ 27. $\left(\frac{2}{3} \right)^{-1} = \frac{3}{2}$

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Logarithms Quiz #2: Properties

Use the properties of logarithms to expand the expression as a sum or difference, and/or constant multiple of logarithms.

$$\log_2\left(\frac{x}{6}\right)$$

1) $\log_2(5x)$ 2) $\log_2 \dfrac{x}{6}$

Sep 21-2:17 PM

2.4 Log-Arithm-etic
A Practice Understanding Task

Abe and Mary are feeling good about their log rules and bragging about mathematical prowess to all their friends when this exchange occurs:

Stephen: I guess you think you're pretty smart because you figured out some log rules, but I want to know what they're good for.

Abe: Well, we've seen a lot of times when equivalent expressions are handy. Sometimes when you write an expression with a variable in it in a different way it means something different.

1. What are some examples from your previous experience where equivalent expressions were useful?

- proofs   - algebraic expressions
- expanding logs   ? 3 = 5x + 2 ?
                    2(x+6) = 2x+12

Mary: I was thinking about the Log Logic task where we were trying to estimate and order certain log values. I was wondering if we could use our log rules to take values we know and use them to find values that we don't know.

For instance: Let's say you want to calculate $\log_2 6$. If you know what $\log_2 2$ and $\log_2 3$ are then you can use the product rule and say:

$$\log_2 6 = \log_2(2 \cdot 3) = \log_2 2 + \log_2 3$$

Stephen: That's great. Everyone knows that $\log_2 2 = 1$, but what is $\log_2 3$?

Abe: Oh, I saw this somewhere. Uh, $\log_2 3 = 1.585$. So Mary's idea really works. You say:

$$\log_2(2 \cdot 3) = \log_2 2 + \log_2 3$$
$$= 1 + 1.585$$
$$= 2.585$$

$$\log_2 6 = 2.585$$

2. Based on what you know about logarithms, explain why 2.585 is a reasonable value for $\log_2 6$.

$2 < 2.585 < 3$

$$2^{2.585} = 6$$

$$2^2 < 2^{2.585} < 2^3$$

- $2^2 = 4$ and $2^3 = 8$, so it makes sense that $2^{2.585} = 6$.

$$4 < 6 < 8$$

Stephen: Oh, oh! I've got one. I can figure out $\log_2 5$ like this:

$$\log_2(2 + 3) = \log_2 2 + \log_2 3$$

$$= 1 + 1.585$$

$$= 2.585$$

$$\log_2 5 = 2.585$$

3. Can Stephen and Mary both be correct? Explain who's right, who's wrong (if anyone) and why. *No, Mary's correct ; using log rules.*

Now you can try applying the log rules yourself. Use the values that are given and the ones that you know by definition like $\log_2 2 = 1$ to figure out each of the following values. Explain what you did in the space below each question.

$\log_2 3 = 1.585$ $\log_2 5 = 2.322$ $\log_2 7 = 2.807$

The three rules, written for any base $b > 1$ are:

Log of a Product Rule:	$\log_b(xy) = \log_b x + \log_b y$
Log of a Quotient Rule:	$\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$
Log of a Power Rule:	$\log_b(x^k) = k\log_b x$

4. $\log_2 9 = \log_2(3^2) = 2\log_2 3 = 2(1.585) = 3.17$

5. $\log_2 10 = \log_2(2 \cdot 5) = \log_2 2 + \log_2 5 = 1 + 2.322 = 3.322$

6. $\log_2 12 = \log_2(2^2 \cdot 3) = \log_2 2^2 + \log_2 3 = 2 \cdot \log_2 2 + \log_2 3$
    $= 2 \cdot 1 + 1.585 = 3.585$

7. $\log_2\left(\frac{7}{3}\right) = \log_2 7 - \log_2 3 = 2.807 - 1.585 = 1.222$

Mar 28-11:30 AM

8. $\log_2\left(\frac{30}{7}\right) = \log_2\left(\frac{2 \cdot 3 \cdot 5}{7}\right) = \log_2 2 + \log_2 3 + \log_2 5 - \log_2 7 =$

$1 + 1.585 + 2.322 - 2.807 =$

$\underline{\underline{2.1}}$

9. $\log_2 486 = \log_2(2 \cdot 3^5) = \log_2 2 + 5\log_2 3 =$

$1 + 5 \cdot 1.585 = 8.925$

10. Given the work that you have just done, what other values would you need to figure out the value of the base 2 log for any number?

All prime #s with the $\log_2 X$.

Sometimes thinking about equivalent expressions with logarithms can get tricky. Consider each of the following expressions and decide if they are always true for the numbers in the domain of the logarithmic function, sometimes true, or never true. Explain your answers. If you answer "sometimes true" then describe the conditions that must be in place to make the statement true.

11. $\log_4 5 - \log_4 x = \log_4 \left(\frac{5}{x}\right)$ _____

12. $\log 3 - \log x - \log x = \log\left(\frac{3}{x^2}\right)$_____

13. $\log x - \log 5 = \frac{\log x}{\log 5}$ _____

14. $5\log x = \log x^5$ _____

15. $2\log x + \log 5 = \log(x^2 + 5)$ _____

16. $\frac{1}{2}\log x = \log \sqrt{x}$ _____

17. $\log(x - 5) = \frac{\log x}{\log 5}$ _____

Homework

Finish 2.4 "Ready, Set, Go"

Mar 28-11:26 AM