AGENDA

Objective: SWBAT Use the definitions of exponential and logarithmic functions to solve equations bases other than 10

Language Objective: SWBAT

1) Take out HW to be checked/DO NOW
2) HW Questions
3) Mini Quiz
4) Change of Base formula

HW: "Logs worksheet #4"

DO NOW:

1) Change from exponential form to Logarithmic form:

$b^x = y$ $\log_b y = x$

2) Properties:

a) Product Rule: $log_b(n \cdot p)$ = $\log_b n + \log_b p$

b) Quotient Rule: $\log_b(n/p)$ = $log_b(n) - log_b(p)$

c) Product Rule: $log_b(n^p)$ = $p \cdot \log(n)$

3) Simplify:

a) $\log_3 81 = x$ b) $7^x = 1$ c) $\log(4567)$ d) $x^4 = 10{,}000$

$3^x = 81$, $x = 4$ $x = 0$ 3.66 $x = 10$

DO NOW:

1) Change from exponential form to Logarithmic form:

$b^x = y$ ____________________

2) Properties:

a) Product Rule: $log_b(n \cdot p)$ = ____________________

b) Quotient Rule: ________________ = $log_b(n) - log_b(p)$

c) Product Rule: $log_b(n^p)$ = ____________________

3) Simplify:

a) $\log_3 81 = x$ b) $7^x = 1$ c) $\log(4567)$ d) $x^4 = 10{,}000$

DO NOW:

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$b^x = y$ ________________

2) Properties:

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b) Quotient Rule: ______________ = $log_b(n)$ - $log_b(p)$

c) Product Rule: $log_b(n^p)$ = ____________________

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DO NOW:

1) Change from exponential form to Logarithmic form:

$b^x = y$ ________________

2) Properties:

a) Product Rule: $log_b(n \cdot p)$ = ____________________

b) Quotient Rule: ______________ = $log_b(n)$ - $log_b(p)$

c) Product Rule: $log_b(n^p)$ = ____________________

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a) $\log_3 81 = x$ b) $7^x = 1$ c) log(4567) d) $x^4 = 10{,}000$

~*~MINI QUIZ~*~

Solve for the variable:

1) $log_4(x) = log_4(4)$	_____ = _____
2) $log_5(25) = log_5(y)$	_____ = _____
3) $log_n(r) = log_n(7)$	_____ = _____
4) $log_{10}(25) = log_{10}(z)$	_____ = _____
5) $log_b(y) = log_b(a)$	_____ = _____
6) $log(100) = log(k)$	_____ = _____
7) $log(a) = log(b)$	_____ = _____

Think… Pair…Share…

Do you think it is safe to say we could go "backwards" and **take the log** to both sides of an equation in order to **solve**? **Why or why not?**

If so how might you figure out which **base** to use? Is there a base that might provide advantages over others?

Solve for the variable:

1) $log_4(x) = log_4(4)$	x = 4
2) $log_5(25) = log_5(y)$	y = 25
3) $log_n(r) = log_n(7)$	r = 7
4) $log_{10}(25) = log_{10}(z)$	z = 25
5) $log_b(y) = log_b(a)$	y = a
6) $log(100) = log(k)$	k = 100
7) $log(a) = log(b)$	a = b

Think... Pair...Share...

Do you think it is safe to say we could go "backwards" and **take the log** to both sides of an equation in order to **solve**? **Why or why not?**

yes - as long as you take logs with the same base to both sides. Just like you can add the same thing to both sides, taking the Log is an operation. If it is applied to both sides of an equation, equality is preserved.

If so how might you figure out which **base** to use? Is there a base that might provide advantages over others?

It does not matter what the base is - as long as you take logs with the same base to both sides to preserve equality.

It would be advantageous to take the COMMON LOG because we can use calculators!

GOAL: To solve logarithms other than the common log with the calculator!

Discover: Change of Base formula!

Directions: Solve for x. We seem to be stuck…	$log_2 56 = x$
1) Try rearranging to exponential form:	
2) Take the *common log* of both sides:	
3) Simplify the left side using the power rule:	
4) Divide both sides by $log(2)$.	
5) Substitute $log_2 56$ in for x: You should have just discovered the change of base formula!	
6) Since we now have an equation with the common log, you can NOW USE your calculator to solve for x!	

Change of Base formula: $log_b(y) =$ ______

GOAL: To solve logarithms other than the common log with the calculator!

Discover: Change of Base formula!

Directions: Solve for x. We seem to be stuck…	$log_2 56 = x$
1) Try rearranging to exponential form:	$2^x = 56$
2) Take the *common log* of both sides:	$log(2^x) = log\,(56)$
3) Simplify the left side using the power rule:	$x \cdot log\,(2) = log\,(56)$
4) Divide both sides by $log(2)$.	$x = \frac{log\,(56)}{log\,(2)}$
5) Substitute $log_2 56$ in for x: You should have just discovered the change of base formula!	$log_2 56 = \frac{log\,(56)}{log\,(2)}$
6) Since we now have an equation with the common log, you can NOW USE your calculator to solve for x!	$log_2 56 \approx 5.81$

Change of Base formula: $log_b(y) = \frac{\log\,(y)}{\log\,(b)}$

Change of Base formula: $log_b(y) = \frac{\log(y)}{\log(b)}$

Let's try some...

1) $\log_5 25$ = ____________________ = _____

2) $\log_3 81$ = ____________________ = _____

3) $\log_9 200$ = ____________________ = _____

4) $\log_4 765$ = ____________________ = _____

Change of Base formula: $log_b(y) = \frac{\log(y)}{\log(b)}$

Let's try some...

1) $\log_5 25 = \frac{\log(25)}{\log(5)} = 5$

2) $\log_3 81 = \frac{\log(81)}{\log(3)} = 4$

3) $\log_9 200 = \frac{\log(200)}{\log(9)} = 2.41$

4) $\log_4 765 = \frac{\log(765)}{\log(4)} = 4.78$

HW: "Logs worksheet #4"

The Change of Base Formula

Use a calculator to approximate each to the nearest thousandth.

1) $\log_3 3.3$

2) $\log_2 30$

3) $\log_4 5$

4) $\log_2 2.1$

5) $\log 3.55$

6) $\log_6 13$

7) $\log_6 40$

8) $\log_4 3.5$

9) $\log_2 2.9$

10) $\log_6 22$

HW: "Logs worksheet #4"

The Change of Base Formula

Use a calculator to approximate each to the nearest thousandth.

1) $\log_3 3.3$

1.087

2) $\log_2 30$

4.907

3) $\log_4 5$

1.161

4) $\log_2 2.1$

1.07

5) $\log 3.55$

0.55

6) $\log_6 13$

1.432

7) $\log_6 40$

2.059

8) $\log_4 3.5$

0.904

9) $\log_2 2.9$

1.536

10) $\log_6 22$

1.725

HW: "Logs worksheet #4" continued...

*Hint - Change exponential form to logarithmic form. See below:

Simplify each expression.

31) $12^{\log_{12} 144} = y$

$\log_{12}(y) = \log_{12}(144)$

$(y) = 144$

32) $5^{\log_5 17} = y$

33) $x^{\log_x 72} = y$

34) $9^{\log_3 20} = y$

Solve each equation. Round your answers to the nearest ten-thousandth.

1) $3^b = 17$

2) $12^r = 13$

3) $9^n = 49$

4) $16^v = 67$

5) $3^a = 69$

6) $6^r = 51$

7) $6^n = 99$

8) $20^r = 56$

HW: "Logs worksheet #4" continued...

Simplify each expression.

31) $12^{\log_{12} 144}$

144

32) $5^{\log_5 17}$

17

33) $x^{\log_x 72}$

72

34) $9^{\log_3 20}$

400

Solve each equation. Round your answers to the nearest ten-thousandth.

1) $3^b = 17$

2.5789

2) $12^r = 13$

1.0322

3) $9^n = 49$

1.7712

4) $16^v = 67$

1.5165

5) $3^a = 69$

3.854

6) $6^r = 51$

2.1944

7) $6^n = 99$

2.5646

8) $20^r = 56$

1.3437