7-5A Properties of Logarithms

Since logarithms are actually exponents, they follow the same simplifying rules as exponents.

$x^{3+4} = x^3 \cdot x^4 = x^7$

Product Property of Logarithms

- **Ex: $\log_3 4 + \log_3 7 =$** $\log_3 28$

7-5B

- **Ex: $\log_5 20 =$** $\log_5 4 + \log_5 5$

7-5A

$= \log_5 2 + \log_5 10$

$\log_5 1 + \log_5 20$

Quotient Property of Logarithms

$\frac{x^7}{x^5} = x^2$

- ***Ex: $\log_5 \frac{12}{7} =$*** $\log_5 12 - \log_5 7$

7-5A

- **Ex: $\log_3 10 - \log_3 2 =$** $\log_3 \left(\frac{10}{2}\right)$

7-5B

$\log_3 5$

Power Property of Logarithms

$(x^3)^4 = x^{12}$

Ex: $\log_2 5^3 = 3 \cdot \log_2 5$

7-5A

Ex: $3\log_7 4 = \log_7 4^3$

$\log_7 64$

7-5B

Use the following decimal approximates to evaluate the following logarithms.

1. If $\log_2 3 \approx 1.5850$, then find $\log_2 48$.

$\log_2 48 = \log_2(2^4 \cdot 3)$

$\log_2 48 = \log_2 2^4 + \log_2 3$

$\log_2 48 = 4 + 1.5850$

$\log_2 48 \approx 5.5850$

2. If $\log_5 2 \approx 0.4307$, then find $\log_5 250$.

$\log_5 250 = \log_5(5^3 \cdot 2)$

$\log_5 250 = \log_5 5^3 + \log_5 2$

$\log_5 250 = 3 + 0.4307$

$\log_5 250 \approx 3.4307$

3. If $\log_6 8 \approx 1.1606$ and $\log_6 32 \approx 1.9343$, then find $\log_6 4$.

$\log_6 4 = \log_6 \left(\frac{32}{8}\right)$

$\log_6 4 = \log_6 32 - \log_6 8$

$\log_6 4 = 1.9343 - 1.1606$

$\log_6 4 \approx 0.7737$

$\log 3 = \log_{10} 3$

$10^? = 3$

$2^5 = 32$

$2^? = 48$

$2^6 = 64$

$2^{5.\_\_}$

Use the following decimal approximates to evaluate the following logarithms.

4. If $\log_3 5 \approx 1.4652$ and $\log_3 20 \approx 2.7268$, then find $\log_3(1/4)$.

$\frac{1}{4}$ 3,5,20 $\left(\frac{5}{20}\right)$

$\log_3\left(\frac{1}{4}\right) = \log_3\left(\frac{5}{20}\right)$

$\log_3(1/4) = \log_3 5 - \log_3 20$

$\log_3(1/4) = 1.4652 - 2.7268$

$\log_3(1/4) \approx -1.2616$

5. If $\log_4 6 \approx 1.2925$, then find $\log_4 36$.

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4, 6

6×6 6^2

$\log_4 36 = \log_4(6^2)$

$\log_4 36 = 2 \cdot \log_4 6$

$\log_4 36 = 2(1.2925)$

$\log_4 36 \approx 2.5850$

$\log_4 36 = \log_4(6 \cdot 6)$

$\log_4 36 = \log_4 4 + \log_4 6$

$\log_4 36 = 1.2929 + 1.2925$

$\log_4 36 \approx 2.5850$

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12 - ~~16~~ evens

20 - 22 e

28 - 34 e

Step 1 Step 2

$\times \rightarrow +$

$\div \rightarrow -$

$\wedge \rightarrow \times$

Step 3: Subst.

Step 4: Simplify eval.