Pre-Assessment Review

Adding LOGs

Rule: \( \log A + \log B = \log AB \)
*To add LOGS we multiply their arguments.*

Practice:
Express each as a single LOG:
1. \( \log 5 + \log 2 = \log 10 \)
2. \( \log 16 + \log 4 = \log 64 \)
3. \( \log 15 + \log 2 = \log 30 \)

Express each as a sum of LOGS:
4. \( \log (5\cdot4) = \log 5 + \log 4 \)
5. \( \log 3x = \log 3 + \log x \)
6. \( \log xy = \log x + \log y \)

Subtracting LOGs

Rule: \( \log A - \log B = \log A/B \)
*To subtract LOGS we divide their arguments.*

Practice:
Express each as a single LOG:
1. \( \log 20 - \log 4 = \log 5 \)
2. \( \log 10 - \log 5 = \log 2 \)
3. \( \log 256 - \log 128 = \log 2 \)

Express each LOG as the difference of LOGS:
4. \( \log \frac{10}{5} = \log 10 - \log 5 \)
5. \( \log \frac{x}{4} = \log x - \log 4 \)
6. \( \log \frac{x}{y} = \log x - \log y \)

Important Vocabulary:
The number that comes after the word \( \log \) is referred to as the argument.
Multiple LOGs & Fractions of LOGs

Rule: \( B \cdot \log A = \log A^B \)

To multiply a \( \log \) by a constant we can raise the argument to power of that constant.

Practice:
Express each product as a single \( \log \):

1. \( 3 \cdot \log 4 = \log \frac{4^3}{1} \)
2. \( 2 \cdot \log 5 = \log 5^2 \)
3. \( \frac{1}{2} \cdot \log 25 = \log \sqrt{25} = \log 5 \)
4. \( \frac{1}{5} \cdot \log 1024 = \log \sqrt[5]{1024} = \log 4 \)

Express each \( \log \) as product:

5. \( \log 2 \cdot \frac{5}{2} = \log 5 \cdot \log x \)
6. \( \log 7^9 = 9 \cdot \log 7 \)
7. \( \log x^{10} = 10 \cdot \log x \)
8. \( \log Z^x = x \cdot \log Z \)

LOG 1

Rule: \( \log 1 = 0 \)
The \( \log 1 \) is always equal to zero.

Practice:
1. \( \log 1 = 0 \)
2. \( \log 5 - \log 5 = \log \frac{1}{5} = 0 \)
3. \( \left( \frac{234}{245672} \right)^{\log 1} = 1 \)

4. Why is there is no \( \log 1 \) piece in your set of FiCycle LOGs?
   \( \log 1 = 0 \)

Putting it all together.... and taking it all apart

Using the \( \log \) rules, break apart each single \( \log \) into a sum, product, and/or difference of as many different \( \log \)s as possible.

Example:

\[
\log \left( \frac{4x}{7y} \right)^2 = 2 \cdot \log \frac{4x}{7y}
\]

\[
= 2 \cdot (\log 4x - \log 7y)
\]

\[
= 2 \log 4x - 2 \log 7y
\]

\[
= 2(\log 4 + \log x) - 2(\log 7 + \log y)
\]

\[
= 2 \log 4 + 2 \log x - 2 \log 7 - 2 \log y
\]

Practice:
1. \( \log \frac{6x}{11y} = \frac{\log 6x - \log 11y}{\log 6 + \log x - \log 11 + \log y} \)
2. \( \log \left( \frac{2x}{3y} \right)^9 = 9 \cdot \log \frac{2x}{3y}
\]

Where do LOGs come from?
Both John Napier (1550-1617),
Scottish baron, and Joost
Bürgi (1552-1632), a Swiss
craftsman, independently invented
the idea of LOGs within a years of
each another!