Use the properties of logarithms to expand each expression to match with an equivalent one below. Then decode the answer to: **Why does a moon rock taste better than an Earth rock?**

1. $\log_4(xyz)$

$\log_4 x + \log_4 y + \log_4 z$

A

2. $\log_4\left(\frac{x}{yz}\right)$

$\log_4 x - \log_4 y - \log_4 z$

S

3. $\log_4 3x^4$

$\log_4 3 + \log_4 x^4$

$\log_4 3 + 4\log_4 x$

R

4. $\log_4\left(\frac{x^2y}{z}\right)$

$\log_4 x^2 + \log_4 y - \log_4 z$

$2\log_4 x + \log_4 y - \log_4 z$

M

5. $\log_4\left(\frac{3x^5}{y^2z}\right)$

$\log_4 3 + \log_4 x^5 - \log_4 y^2 - \log_4 z$

$\log_4 3 + 5\log_4 x - 2\log_4 y - \log_4 z$

O

6. $\log_4\left(\frac{6x^2y^8}{z^3}\right)$

$\log_4 6 + 2\log_4 x + 8\log_4 y - 3\log_4 z$

I

7. $\log_4\left(\frac{6y^2z^5}{x^4}\right)$

$\log_4 6 + 2\log_6 y + 5\log_6 z - 4\log_4 x$

T

8. $\log_4\left(\frac{3y^2z}{x^7}\right)$

$\log_4 3 + 2\log_4 y + \log_4 z - 7\log_4 x$

E

9. $\log_4\left(\frac{xz^6}{\sqrt{y}}\right)$

$\log_4 x + 6\log_4 z - \frac{1}{2}\log_4 y$

L

$\log_4 3 + 5\log_4 x - 2\log_4 y + \log_4 z$ P	$4\log_4 3 + 4\log_4 x$ H
(8) $\log_4 3 - 7\log_4 x + 2\log_4 y + \log_4 z$ E	(4) $2\log_4 x + \log_4 y - \log_4 z$ M
(5) $\log_4 3 + 5\log_4 x - 2\log_4 y - \log_4 z$ O	(1) $\log_4 x + \log_4 y + \log_4 z$ A
(7) $\log_4 6 - 4\log_4 x + 2\log_4 y + 5\log_4 z$ T	(2) $\log_4 x - \log_4 y - \log_4 z$ S
$5\log_4 3 + 5\log_4 x - 2\log_4 y - \log_4 z$ H	$\log_4 x - \log_4 y + \log_4 z$ N
(6) $\log_4 6 + 2\log_4 x + 8\log_4 y - 3\log_4 z$ I	(3) $\log_4 3 + 4\log_4 x$ R
$6\log_4 x - \frac{1}{2}\log_4 y + 6\log_4 z$ C	(9) $\log_4 x - \frac{1}{2}\log_4 y + 6\log_4 z$ L

I	T		I	S		A		L		I	T	T	L	E		M	E	T	E	O	R
6	7		6	2		1		9		6	7	7	9	8		4	8	7	8	5	3

10.04 Solving Exponential Equations **Evens** Classwork

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2) $\left(\frac{9}{16}\right)^{3x-2} = \left(\frac{3}{4}\right)^{5x+4}$

$\downarrow$

$\left(\frac{3}{4}\right)^{2(3x-2)} = \left(\frac{3}{4}\right)^{5x+4}$

$2(3x-2) = 5x+4$

$6x-4 = 5x+4$

$1x = 8$

$x=8$

4) $8^x - 1 = 3.4$

$8^x = 4.4$

$\log 8^x = \log 4.4$

$x(\log 8) = \log 4.4$

$x = \frac{\log 4.4}{\log 8}$

$x = 0.713$

6) $\frac{2.5e^{x+4}}{2.5} = \frac{14}{2.5}$

$e^{x+4} = 5.6$

$\ln e^{x+4} = \ln 5.6$

$(x+4)\ln e = \ln 5.6$

$x+4 = \ln 5.6$

$x = -2.277$

8) $7^{2x+1} = 3^{x+3}$

$\log 7^{2x+1} = \log 3^{x+3}$

$(2x+1)\log 7 = (x+3)\log 3$

$2x\log 7 + 1\log 7 = x\log 3 + 3\log 3$

$2x\log 7 - x\log 3 = -\log 7 + 3\log 3$

$x(2\log 7 - \log 3) = -\log 7 + 3\log 3$

$x = \frac{-\log 7 + 3\log 3}{2\log 7 - \log 3}$

$x = 0.483$

10) $e^{2x} - 15e^{x} + 56 = 0$

* let $x = e^{x}$

* factor this

* $x^2 - 15x + 56 = 0$

$(x - 7)(x - 8) = 0$

$(e^{x} - 7)(e^{x} - 8) = 0$

$e^{x} - 7 = 0$	$e^{x} - 8 = 0$
$e^{x} = 7$	$e^{x} = 8$
$\ln e^{x} = \ln 7$	$\ln e^{x} = \ln 8$
$x \ln e = \ln 7$	$x \ln e = \ln 8$
$x = \ln 7$	$x = \ln 8$

12) $300 = \dfrac{400}{1 + 3e^{-2x}}$

~~$\dfrac{300}{1} = \dfrac{400}{1 + 3e^{-2x}}$~~

$300(1 + 3e^{-2x}) = 400(1)$

$300 + 900e^{-2x} = 400$

$\dfrac{900e^{-2x}}{900} = \dfrac{100}{900}$

$e^{-2x} = \dfrac{1}{9}$

$\ln e^{-2x} = \ln\left(\frac{1}{9}\right)$

$-2x \ln e = \ln\left(\frac{1}{9}\right)$

$-2x = \ln\left(\frac{1}{9}\right)$

$x = \dfrac{\ln\left(\frac{1}{9}\right)}{-2}$

$x = 1.099$