

$$\frac{1}{x^3} = x^{-3}$$

Algebra 2 7.5

Simplify and evaluate expressions using the properties of logarithms

Solve logarithmic equations

Compute pH from logarithms

logarithm = exponent

product rule

quotient rule

power^{power}

$$\frac{1}{8} = 8^{-1} \quad \frac{1}{5} = 5^{-1}$$

$$\log_{10} 5 = 0.6990$$

$$\log_{10} 10 = 1$$

$$\log_{10} 7 = 0.8451$$

$$7. \log_{10} 0.2 = ?$$

$$\log_{10} \left(\frac{1}{5} \right) =$$

$$\log_{10} 5 = .6990$$

$$-.6990$$

Hint: divide out -1 to solve for log
Write in exp form

Real-World Example 2 Quotient Property

SCIENCE The pH of a substance is defined as the concentration of hydrogen ions $[H^+]$ in moles. It is given by the formula $pH = -\log_{10} H^+$. Find the amount of hydrogen in a liter of acid rain that has a pH of 4.2.

$$pH = -1 \cdot \log_{10}(H^+)$$

$$4.2 = -\log_{10} X$$

Note change in formula

Write in exp form

$$\begin{aligned} 10^{(-4.2)} &= X \\ 0.000063096 & \\ 6.309 \times 10^{-5} & \end{aligned}$$

$$\begin{aligned} \frac{4.2}{-1} &= \frac{-1 \log_{10} X}{-1} \\ -4.2 &= \log_{10} X \end{aligned}$$

4B. $\log_6 \frac{9}{4} + \log_6 (x+5) = 2$

$$\log_6 x(x+5) = 2$$

$$\log_6 (x^2 + 5x) = 2$$

$$x^2 + 5x = 36$$

$$x^2 + 5x - 36 = 0$$

$$\frac{-36}{9 \times -4} \\ \frac{5}{5}$$

$$(x+9)(x-4) = 0$$

$$\downarrow \quad \downarrow \\ x = -9 \quad x = 4$$

Solve each equation. Check your solutions.

8. $\log_4 48 - \log_4 n = \log_4 6$

How is this problem different?

(15)

$$\log_3 y = -\log_3 16 + \frac{1}{3} \log_3 64$$

$$\log_3 y = \log_3 \frac{1}{16} + \log_3 4 \quad \frac{1}{16} \cdot 4$$

~~$$\log_3 y = \log_3 \left(\frac{1}{4}\right)$$~~

9. $\log_3 2x + \log_3 7 = \log_3 28$

①⑦ $\log_{10}(3n-5) + \log_{10}(n) = \log_{10} 2$ a b c
 $3n^2 - 5n - 2 = 0$

$\log_{10}(3n-5)n = \log_{10} 2$

~~$\log_{10}(3n^2-5n) = \log_{10} 2$~~

$3n^2 - 5n = 2$

$n = 2$
 ~~$n = \frac{2}{3}$~~

$n = \frac{5 \pm \sqrt{25 - 4 \cdot 3 \cdot (-2)}}{6}$

$n = \frac{5 \pm \sqrt{25 + 24}}{6}$

$\frac{5 \pm \sqrt{49}}{6} = \frac{5 \pm 7}{6}$
 $\frac{12}{6} \quad \frac{-2}{6}$

10. $3 \log_2 x = \log_2 8$

Whiteboards

$$\log_6 x + \log_6 9 = \log_6 54$$

$$\cancel{\log_6 (9x)} = \cancel{\log_6 54}$$

$$9x = 54$$

23. $\log_3 56 - \log_3 n = \log_3 7$

(25) $3 \log_5 (x^2 + 9) - 6 = 0$

$\log_5 (x^2 + 9) = 6$

disregard. $S^b = x^2 + 9$
 typo in prob.

$$\begin{array}{r} 3u + 14 = 10v \\ -10u \quad -14 \quad -10v \quad -14 \\ \hline -7u = -14 \\ \quad -1 \quad \quad -1 \end{array}$$

$u = 2$

$r + 4 = r^2 + r$

$$\begin{array}{r} x^2 + 9 = 15625 \\ -9 \quad \quad -9 \\ \hline \end{array}$$

$x^2 = 15616$

$x = \pm 16\sqrt{61}$

124.96

26. $\log_{10} a + \log_{10} (a + 21) = 2$

25. $5 \log_2 x = \log_2 32$

When we are multiplying...

State whether each equation is *true* or *false*.

51. $\log_8 (x - 3) = \log_8 x - \log_8 3$

Explain your reasoning

52. $\log_5 22x = \log_5 22 + \log_5 x$

$$\log_6(2x-5) + 1 = \log_6(7x+10)$$

$$\log_6(2x-5) - \log_6(7x+10) = -1$$

$$\log_6\left(\frac{2x-5}{7x+10}\right) = -1$$

$$6^{-1} = \frac{2x-5}{7x+10} \cdot \frac{1}{6}$$

$$\begin{aligned} 12x - 30 &= 7x + 30 \\ 5x &= 60 \\ x &= 12 \end{aligned}$$

55. $\log_7 \frac{x}{3} = \log_7 x - \log_7 3$

WB 7.5 prac
pds + 32

$$\log_{10} 4w = 2$$

58. $\log_9 \frac{x^2 y^3}{z^4} = 2 \log_9 x + 3 \log_9 y - 4 \log_9 z$ 100.5

25. $3 \log_5 (x^2 + 9) - 6 = 0$

$$\log_5 (x^2 + 9)^3 = 6$$

$$\sqrt[3]{5^6} = \sqrt[3]{(x^2 + 9)^3}$$

$$5^2 = x^2 + 9$$

$$\begin{array}{r} 25 = x^2 + 9 \\ -9 \quad -9 \\ \hline 16 = x^2 \end{array}$$

$$x = \pm 4$$

