

Using Property of Logs to Solve

1. Simplify to use the One-to-One Property

Condense using your properties

2. Cancel out logs on each side
3. Solve for the variable

Using Log Properties to Solve

Solve each equation.

One-to-one Property.

1) ~~$\log_7(4x+6) = \log_7(-5x+9)$~~

$$4x+6 = -5x+9$$

$$9x+6 = 9$$

$$9x = 3$$

$$x = \frac{3}{9} = \frac{1}{3}$$

2) ~~$\log_{11}(3r-1) = \log_{11} 2r$~~

$$3r-1 = 2r$$

$$\begin{array}{r} -2r \\ \hline \end{array}$$

$$r-1 = 0$$

$$r = 1$$

$$3r-1 = 2r$$

$$-1 = -r$$

$$1 = r$$

$\log_7 x$ "log base seven of x"
Base

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

$$\log_3 x = \log_3 5 \quad \boxed{x=5}$$

Same log base

Can use the one-to-one property

$$3) \log_{15} (7-r) = \log_{15} -2r$$

$$7-r = -2r$$

$$7 = -r$$

$$-7 = r$$

$$5) \log_5 x - \log_5 (x+5) = \log_5 26$$

Condense

$$\log a - \log b = \log \frac{a}{b}$$

$$\log_5 \frac{x}{x+5} = \log_5 26$$

$$\frac{x}{x+5} = 26(x+5)$$

$$x = 26(x+5)$$

$$x = 26x + 130$$

$$-25x = 130$$

$$x = \frac{-130}{25} = -\frac{26}{5}$$

$$4) \log_6 n = \log_6 (4n+6)$$

$$n = 4n+6$$

$$-3n = 6 \quad n = -2$$

$$6) \log_9 x - \log_9 (x-2) = \log_9 78$$

$$\frac{x}{x+5} = \frac{26}{1}$$

$$x = 26(x+5)$$

$$6) \log_9 x - \log_9 (x-2) = \log_9 78$$

$$\cancel{\log_9} \frac{x}{(x-2)} = \cancel{\log_9} 78$$

$$\frac{x}{(x-2)} = 78$$

$$\frac{x}{(x-2)} = \frac{78}{1}$$

$$x = 78(x-2)$$

$$x = 78x - 156$$

$$-77x = -156$$

$$x = \frac{156}{77}$$

7) $\log_9 x^2 - \log_9 4 = 2$

8) $\log_4 x^2 - \log_4 9 = 5$

9) $\log_6 3x + \log_6 4 = \log_6 56$

10) $\log_8 3 - \log_8 (x - 3) = 1$

$$\log a + \log b$$

$$9) \log_6 3x + \log_6 4 = \log_6 56$$

$$\log a + \log b =$$

$$\log a \cdot b$$

$$\log_6 3x \cdot 4 = \log_6 56$$

~~$$\log_6 12x = \log_6 56$$~~

$$\frac{12x}{12} = \frac{56}{12}$$

$$x = \frac{56}{12} = \frac{28}{6} = \frac{14}{3}$$

~~$$\log_6 3x \cdot 4 = \log_6 56$$~~

$$\frac{3x \cdot 4}{4} = \frac{56}{4}$$

$$3x = 14$$

$$x = \frac{14}{3}$$

11) $\log_5 (x + 4) - \log_5 x = 2$

12) $\log_7 3 - \log_7 -5x = 1$

13) $\ln 3 - \ln 4x = 2$

14) $\log_2 5 - \log_2 (x + 3) = 3$

15) $\log_7(x+4) + \log_7(x-2) = 1$

16) $\log_4 2 - \log_4(9-5x) = 1$

17) $\log_7(x+2) - \log_7(x-1) = 2$

18) $\log_8 10 - \log_8(3x-10) = \log_8 7$

$$15) \log_7 (x+4) + \log_7 (x-2) = 1$$

Condense
 $\log a + \log b = \log a \cdot b$

$$\log_7 (x+4)(x-2) = 1$$

~~$$\log_7 (x+4)(x-2) = \log_7 7$$~~

$$(x+4)(x-2) = 7$$

$$x^2 + 4x - 2x - 8 = 7$$

$$x^2 + 2x - 8 = 7$$

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

$$-1 \cdot 15$$

$$-15 \cdot 1$$

$$-3 \cdot 5$$

$$-5 \cdot 3$$

$$(x-3)(x+5) = 0$$

$$x = 3 \quad x = -5$$

New property

$$\log_a a = 1$$

$$\log_5 5 = 1$$

$$\log_7 7 = 1$$

Algebra 2 CC

Using Log Properties to Solve

Solve each equation.

1) $\log_7 (4x + 6) = \log_7 (-5x + 9)$

2) $\log_{11} (3r - 1) = \log_{11} 2r$

3) $\log_{15} (7 - r) = \log_{15} -2r$

4) $\log_6 n = \log_6 (4n + 6)$

5) $\log_5 x - \log_5 (x + 5) = \log_5 26$

6) $\log_9 x - \log_9 (x - 2) = \log_9 78$

7) $\log_9 x^2 - \log_9 4 = 2$

8) $\log_4 x^2 - \log_4 9 = 5$

9) $\log_6 3x + \log_6 4 = \log_6 56$

10) $\log_8 3 - \log_8 (x - 3) = 1$

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15) $\log_7 (x + 4) + \log_7 (x - 2) = 1$

16) $\log_4 2 - \log_4 (9 - 5x) = 1$

17) $\log_7 (x + 2) - \log_7 (x - 1) = 2$

18) $\log_8 10 - \log_8 (3x - 10) = \log_8 7$

$$18) \log_8 10 - \log_8 (3x - 10) = \log_8 7$$

$$\frac{10}{3x-10} = 7$$

$$10 = 21x - 70$$

$$80 = 21x$$

$$\frac{80}{21} = x$$

More Formulas

$$\log_a b = \frac{\log b}{\log a}$$

* Change base

$$\log_3 5 = \frac{\log 5}{\log 3}$$

* Convert from log to exp

$$\log_3 x = 5$$

$$x = 3^5$$

* Convert from exp to log

$$5^x = 12$$

$$\log_5 12 = x$$

change of base $\Rightarrow \frac{\log 12}{\log 5}$

Algebra 2 CC

Using Log Properties to Solve

Solve each equation.

1) $\log_7 (4x + 6) = \log_7 (-5x + 9)$

$$\left\{ \frac{1}{3} \right\}$$

2) $\log_{11} (3r - 1) = \log_{11} 2r$

$$\{1\}$$

3) $\log_{15} (7 - r) = \log_{15} -2r$

$$\{-7\}$$

4) $\log_6 n = \log_6 (4n + 6)$

No solution.

5) $\log_5 x - \log_5 (x + 5) = \log_5 26$

No solution.

6) $\log_9 x - \log_9 (x - 2) = \log_9 78$

$$\left\{ \frac{156}{77} \right\}$$

7) $\log_9 x^2 - \log_9 4 = 2$

$$\{18, -18\}$$

8) $\log_4 x^2 - \log_4 9 = 5$

$$\{96, -96\}$$

9) $\log_6 3x + \log_6 4 = \log_6 56$

$$\left\{ \frac{14}{3} \right\}$$

10) $\log_8 3 - \log_8 (x - 3) = 1$

$$\left\{ \frac{27}{8} \right\}$$

11) $\log_5 (x + 4) - \log_5 x = 2$

$$\left\{ \frac{1}{6} \right\}$$

12) $\log_7 3 - \log_7 -5x = 1$

$$\left\{ -\frac{3}{35} \right\}$$

13) $\ln 3 - \ln 4x = 2$

$$\left\{ \frac{3}{4e^2} \right\}$$

14) $\log_2 5 - \log_2 (x + 3) = 3$

$$\left\{ -\frac{19}{8} \right\}$$

15) $\log_7 (x + 4) + \log_7 (x - 2) = 1$

$$\{3\}$$

16) $\log_4 2 - \log_4 (9 - 5x) = 1$

$$\left\{ \frac{17}{10} \right\}$$

17) $\log_7 (x + 2) - \log_7 (x - 1) = 2$

$$\left\{ \frac{17}{16} \right\}$$

18) $\log_8 10 - \log_8 (3x - 10) = \log_8 7$

$$\left\{ \frac{80}{21} \right\}$$

