

Solve.

1. $5^{x-2} * 5^{3x-7} = 125$

$$5^{4x-9} = 5^3$$

$$4x - 9 = 3$$

$$4x = 12$$

$$x = 3$$

2. $\frac{9^{x-8}}{27^{-2}} = 81^{-6x+4}$

$$\frac{3^{2(x-8)}}{3^{3(-2)}} = 3^{4(-6x+4)}$$

$$\frac{3^{2x-16}}{3^{-6}} = 3^{-24x+16}$$

$$2x - 10 = -24x + 16$$

$$26x = 26$$

$$x = 1$$

Solving using logarithms

Example 1: Solve $2^x = 10$

$$x \frac{\log 2}{\log 2} = \frac{\log 10}{\log 2}$$

$$x = 3.32$$

Steps:

1. Using the property of equality, take the log of both sides.
2. Use the properties of logs to move the x out of the exponent.
3. Divide both sides by log.
4. Isolate the variable by using basic solving skills.
5. Simplify by using your calculator.

Example 2: Solve $8^{x+6} = 11$

$$(x+6) \frac{\log 8}{\log 8} = \frac{\log 11}{\log 8}$$

$$x + 6 = 1.1531$$

$$x = -4.85$$

Now you TRY!

1. $3^x = 11$

$$x \frac{\log 3}{\log 3} = \frac{\log 11}{\log 3}$$

$$x = 2.18$$

2. $3^{x+2} = 15$

$$(x+2) \frac{\log 3}{\log 3} = \frac{\log 15}{\log 3}$$

$$x+2 = 2.4658$$

$$x = .46$$

3. $3^{2x} = 20$

$$(2x) \frac{\log 3}{\log 3} = \frac{\log 20}{\log 3}$$

$$2x = 2.7268$$

$$x = 1.36$$

What happens if you have a variable on both sides?!

Solve.

$$4^{x-3} = 7^{2x}$$

$$(x-3) \frac{\log 4}{\log 4} = (2x) \frac{\log 7}{\log 4}$$

$$x-3 = (2x) 1.4037$$

$$x-3 = 2.8074x$$

$$-3 = 1.8074x$$

$$x = -1.66$$

Steps:

Practice: Solve using any method.

1. $4^x = 53$

$$x \frac{\log 4}{\log 4} = \frac{\log 53}{\log 4}$$

$$x = 2.86$$

2. $15 = 22^x$

$$\frac{\log 15}{\log 22} = x \frac{\log 22}{\log 22}$$

$$.88 = x$$

3. $3^{7x} = 11$

$$(7x) \frac{\log 3}{\log 3} = \frac{\log 11}{\log 3}$$

$$7x = 2.1827$$

$$x = .31$$

$$4. 8^{x-4} = 9$$

$$(x-4) \log 8 = \log 9$$

$$x-4 = 1.0566$$

$$x = 5.06$$

$$5. 41 = 12^{4x+3}$$

$$\log 41 = (4x+3) \log 12$$

$$1.4945 = 4x + 3$$

$$-1.5055 = 4x$$

$$x = -.38$$

$$6. 20^{x^2} = 70$$

$$(x^2) \log 20 = \log 70$$

$$x^2 = 1.4182$$

$$x = \pm 1.19$$

$$7. 2.1^{5x} = 9.32$$

$$(5x) \log 2.1 = \log 9.32$$

$$5x = 3.0086$$

$$x = .60$$

$$8. 6^{x+5} = 2^x$$

$$(x+5) \frac{\log 6}{\log 6} = x \frac{\log 2}{\log 6}$$

$$x+5 = .3869x$$

$$5 = -.6131x$$

$$x = -8.16$$

$$9. 7^{2x-1} = 5^{x+1}$$

$$(2x-1) \frac{\log 7}{\log 7} = (x+1) \frac{\log 5}{\log 7}$$

$$2x-1 = (x+1) \cdot .8271$$

$$2x-1 = .8271x + .8271$$

$$1.1729x = 1.8271$$

$$x = 1.56$$

$$10. 80 = 7^x$$

$$\frac{\log 80}{\log 7} = x \frac{\log 7}{\log 7}$$

$$2.25 = x$$

$$11. 4.4^x = 8.8$$

$$x \frac{\log 4.4}{\log 4.4} = \frac{\log 8.8}{\log 4.4}$$

$$x = 1.47$$

$$12. 9 = 10^{-2x}$$

$$\frac{\log 9}{\log 10} = (-2x) \frac{\log 10}{\log 10}$$

$$.9542 = -2x$$

$$-.48 = x$$

$$13. 2^{3x-5} = 17$$

$$(3x-5) \log 2 = \log 17$$

$$3x-5 = 4.0875$$

$$x = 3.03$$

$$14. 52 = 4^{-x+5}$$

$$\log 52 = (-x+5) \log 4$$

$$2.8502 = -x+5$$

$$x = 2.15$$

$$15. 13 = 8^{4x^2}$$

$$\log 13 = (4x^2) \log 8$$

$$1.2335 = 4x^2$$

$$.3084 = x^2$$

$$\pm 0.56 = x$$

$$16. 7^x = 3^{x+9}$$

$$x \log 7 = (x+9) \log 3$$

$$1.7712x = x+9$$

$$.7712x = 9$$

$$x = 11.67$$

$$17. 2^{4x-1} = 9^x$$

$$(4x-1) \log 2 = x \log 9$$

$$4x-1 = 3.1699x$$

$$-1 = -.8301x$$

$$x = 1.2047$$

$$18. 15^{4x-3} = 23^{9x+1}$$

$$(4x-3) \log 15 = (9x+1) \log 23$$

$$(4x-3) \cdot 8637 = 9x+1$$

$$3.4548x - 2.5911 = 9x+1$$

$$-3.5911 = 5.5452x$$

$$-.65 = x$$