

## Exponential Equations

## Practice

Solve each of the equations for x.

1.  $3^x = 9^7$

$$3^x = (3^2)^7$$

$$3^x = 3^{14}$$

$$x = 14$$

2.  $\left(\frac{1}{2}\right)^4 = 2^x$

$$(2^{-1})^4 = 2^x$$

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

$$-4 = x$$

3.  $7^x = 49^3$

$$7^x = (7^2)^3$$

$$7^x = 7^6$$

$$x = 6$$

4.  $\left(\frac{1}{25}\right)^x = 5^{x-6}$

$$(5^{-2})^x = 5^{x-6}$$

$$-2x = x - 6$$

$$-3x = -6$$

$$x = 2$$

5.  $\left(\frac{1}{10}\right)^x = 1000^{x+4}$

$$10^{-x} = 10^{3(x+4)}$$

$$-x = 3x + 12$$

$$-4x = 12$$

$$x = -3$$

6.  $5^{x+2} = 125^x$

$$5^{x+2} = 5^{3x}$$

$$x + 2 = 3x$$

$$2 = 2x$$

$$1 = x$$

7.  $4^{x-3} = 8^x$

$$(2^2)^{x-3} = (2^3)^x$$

$$2^{2x-6} = 2^{3x}$$

$$2x-6 = 3x$$

$$-6 = x$$

8.  $100^{x+2} = 1000^{x-4}$

$$(10^2)^{x+2} = (10^3)^{x-4}$$

$$2x+4 = 3x-12$$

$$16 = x$$

9.  $\left(\frac{1}{9}\right)^{x+3} = 27^{x-2}$

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

$$-2x-6 = 3x-6$$

$$0 = 5x$$

$$0 = x$$

10. Can you solve the equation  $2^x = 9$  using the method we have learned in this lesson? Why or why not? Do you think that this equation has a solution? Why or why not?

Can't write 9 in base 2.

Yes - we'll learn more about this soon.

11. When you have solved linear equations, there have been equations where there were no solutions ( $2x+5=2x+4$ ) or the solution was all real numbers ( $x+4=4+x$ ).

Can you give an example of an exponential equation that has either no solutions or a solution of all real numbers? Show that your exponential equation has either no solution or a solution of all real numbers.

$$2^x = -4$$

No exponent will yield a negative result with base 2.