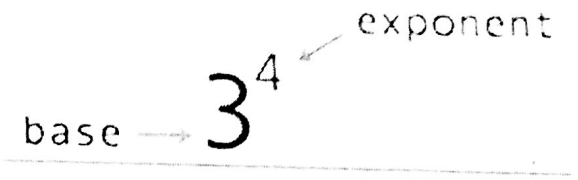
Solving Exponential Equations

Steps to follow:

1. Make the bases the same.
2. Set the exponents equal.
3. Solve for x.



Let's practice ***making bases equal***. For each set of numbers, write the numbers so that they have the same base.

1. 2 *and* 4

$2^1 \quad 2^2$

2. 4 *and* 16

$4^1 \quad 4^2$

$2^2 \quad 2^4$

3. 5 *and* 625

$5^1 \quad 5^4$

4. 3 *and* 27

$3^1 \quad 3^3$

Examples

Solve the following exponential equations.

1. $3^8 = 3^x$

$8 = x$

2. $5^{1-x} = 5^2$

$1 - x = 2$

$-1 \quad -1$

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

$x = -1$

3. $x^{x+1} = x^4$

$x + 1 = 4$

$-1 \quad -1$

$x = 3$

4. $4^x = 16$

$4^x = 4^2$

$x = 2$

5. $3^{2x-1} = 27$

$3^{2x-1} = 3^3$

$2x - 1 = 3$

$+1 \quad +1$

$\frac{2x}{2} = \frac{4}{2}$

$x = 2$

6. $6^{2x+3} = 1$

$6^{2x+3} = 6^0$

$2x + 3 = 0$

$-3 \quad -3$

$\frac{2x}{2} = \frac{-3}{2}$

$x = -3/2$

Practice Problems

Solve the following exponential equations.

1. $3^3 = 3^x$

$3 = x$

2. $5^{x+2} = 1$

$5^{x+2} = 5^0$

$x + 2 = 0$

$-2 \quad -2$

$x = -2$

3. $3^{x+1} = 3^4$

$x + 1 = 4$

$-1 \quad -1$

$x = 3$

4. $7^{2x} = 7^{-2x-1}$

$2x = -2x - 1$

$+2x \quad +2x$

$\frac{4x}{4} = \frac{-1}{4}$

$x = -1/4$

5. $10^{1-x} = 10^2$

$1 - x = 2$

$-1 \quad -1$

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

$x = -1$

6. $9^x = 3^{4x-12}$

$3^{2x} = 3^{4x-12}$

$2x = 4x - 12$

$-4x \quad -4x$

$\frac{-2x}{-2} = \frac{-12}{-2}$

$x = 6$

7. $4^{2x+3} = 1$

$4^{2x+3} = 4^0$

$2x + 3 = 0$

$-3 \quad -3$

$\frac{2x}{2} = \frac{-3}{2}$

$x = -3/2$

8. $3^{1-2x} = 81$

$3^{1-2x} = 3^4$

$1 - 2x = 4$

$-1 \quad -1$

$\frac{-2x}{-2} = \frac{3}{-2}$

$x = -3/2$

9. $5^{3x-2} = 1$

$5^{3x-2} = 5^0$

$3x - 2 = 0$

$+2 \quad +2$

$\frac{3x}{3} = \frac{2}{3}$

$x = 2/3$