Solving Exponential Equations	1. Use the properties of exponents to **SIMPLIFY** each side of the equation 2. Rewrite the equation so both sides have the **SAME BASE** 3. Drop the bases and **SET THE EXPONENTS EQUAL TO EACH OTHER.**

Type 1- Equations with a Common Base

1. $2^{x+1} = 2^9$ $x+1=9$ $x=8$	**2.** $5^{4n+5} = 5^{n-7}$ $4n+5=n-7$ $3n=-12$ $n=-4$

Type 2- Equations without a Common Base

3. $6^{2x-10} = 36$ $6^{2x-10}=6^2$ $2x-10=2$ $2x=12$ $x=6$	**4.** $2^{p-7} = 8$ $2^{p-7}=2^3$ $p-7=3$ $p=10$
5. $27^{2x+6} = 3^{2x}$ $3^{3(2x+6)}=3^{2x}$ $6x+18=2x$ $\frac{18}{-4}=\frac{-4x}{-4}$ $-\frac{9}{2}=x$	**6.** $4^{y+2} = 16^{y-3}$ $4^{y+2}=4^{2(y-3)}$ $y+2=2y-6$ $8=y$

What if a common base is NOT possible?	1. **ISOLATE** the exponential expression. 2. **TAKE THE LOG** of **both sides** 3. You may need to **EXPAND** the log (Use the power rule) Cannot take log of a neg.

Type 3- Equations with NO POSSIBLE Common Base

7. $2^x = 61$ $\log 2^x=\log 61$ $\frac{x\cdot \log 2}{\log 2}=\frac{\log 61}{\log 2}$ $x=5.931$	**8.** $4^{3x} - 5 = 3$ $4^{3x}=8$ $\log 4^{3x}=\log 8$ $\frac{3x \log 4}{3\log 4}=\frac{\log 8}{3\log 4}$ $x=0.5$
9. $4 \cdot 3^x + 15 = 359$ $4\cdot 3^x=344$ $3^x=86$ $\log 3^x=\log 86$ $\frac{x \log 3}{\log 3}=\frac{\log 86}{\log 3}$ $x=4.055$	**10.** $8 \cdot 11^{7k} - 3 = 213$ $8\cdot 11^{7k}=216$ $11^{7k}=27$ $\log 11^{7k}=\log 27$ $\frac{7k \log 11}{7\log 11}=\frac{\log 27}{7\log 11}$ $k=0.196$

Logarithmic Equations **Type 1: LOG=LOG**	1. **CONDENSE** each logarithm. 2. **Use the One-to-One Property:** If $\log_b m = \log_b n$, then 3. **SOLVE** and **CHECK FOR EXTRANEOUS SOLUTIONS.**

Type 1: LOG=LOG

11. $\cancel{\log_5}(5x+9) = \cancel{\log_5}(6x)$

$5x+9=6x$

$\boxed{9=x}$

$\log(5(9)+9)=\log(54)$

$\log(54)=\log(54)$ ✓

12. $3 \cdot \log_7 4 = \log_7(4x-8)$

$\log_7 4^3 = \log_7(4x-8)$

$64 = 4x-8$

$72=4x$

$\boxed{18=x}$

$\log_7 64 = \log_7(4(18)-8)$ ✓

13. $\log_4 68 - \log_4 4 = \log_4(3n+11)$

$\log_4 \frac{68}{4} = \log_4(3n+11)$

$17 = 3n+11$

$6=3n$

$\boxed{2=n}$

$\log_4 17 = \log_4(6+11)$ ✓

14. $\log 2 + \log(k^2) = \log(k^2+16)$

$\log 2k^2 = \log(k^2+16)$

$2k^2 = k^2+16$

$k^2=16$

$\boxed{k=\pm 4}$

$\log 2(16) = \log(16+16)$ ✓ ✓

Logarithmic Equations **Type 2: LOG=NUMBER**	1. **CONDENSE** and **ISOLATE** the logarithm. 2. Write the equation in **EXPONENTIAL FORM** 3. **SOLVE** and **CHECK FOR EXTRANEOUS SOLUTIONS.**

Type 1: LOG=NUMBER

15. $\log_2(x-4) = 6$

$2^6 = x-4$

$64 = x-4$

$\boxed{68=x}$

$\log_2(64)=6$ ✓

16. $\log_6(4x+8) - 7 = -3$

$\log_6(4x+8) = 4$

$6^4 = 4x+8$

$1296 = 4x+8$

$1288 = 4x$

$\boxed{322=x}$

17. $\log(2x) + \log(x-5) = 2$

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

$10^2 = (2x)(x-5)$

$100 = 2x^2 - 10x$

$0 = 2x^2 - 10x - 100$

$0 = 2(x^2-5x-50)$

$(x-10)(x+5)$

$\boxed{x=10}$, -5 ext

18. $2 \cdot \log x - \log 4 = 2$

$\log x^2 - \log 4 = 2$

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

$10^2 = \frac{x^2}{4}$

$100 = x^2/4$

$400 = x^2$

$\pm 20 = x$

$x=20$