**Notes on Solving Exponential Equations**

One of the ways to solve exponential equations is to get the same base on both sides of the equations. Once we do that, we can ignore the bases and find the x value that makes the exponents equal.

If the bases are already equal, then our work is easy.

Example 1: 5x = 57 What is x?

If the bases are not equal, we should look to see if the bases are powers of the same number. If they are, we can rewrite the two sides of the equation of the same base.

Example 2: 25x = 54

Notice that 25 and 5 are both powers of 5. Let’s write 25 differently.

 (52)x = 54

Since the bases are the same, we can make both sides equal if the exponents are the same. In other words, we can now ignore the bases.

 2x = 4. What is x?

Remember, we can check our solution by plugging the value of x into the original equation.

 Try 252 and 54 on your calculator! Do they come out to the same number?

The power chart that you developed at the beginning of this unit is valuable now.

What family (2, 3, 4, 5, 6, 7, 9 or 10) do each of the following numbers belong to?

81 125   216 256

**Guided Practice for Solving Exponential Equations**

**Solve for x in each equation below.**

**Level One (Intuitively Obvious to the Most Casual Observer)**

1. 5x = 53 2. 7-2 = 7x

**Level Two (Use your powers chart.)**

3. 2x = 8 4. = 3x

**Level Three (Do a little linear equation solving.)**

5. 62x + 1 = 67 6. 10-6 = 102x

**Level Four (Find a common base. Then make the exponents equal.)**

7. 24 = 4x 8. 27x = 36

**Level Five (It’s like Level 4, but sometimes you get a fraction or a negative exponent.)**

9. 9x = 27 10. 4x =

**Level Six (If they’re not round roots, they’re square roots.)**

11. 16x = 4 12. 100x = 10

**Level Seven (Did you call me a zero?)**

13. 2x = 1 14. 9x+3 = 1

Now that you have solved these equations, try using your graphing calculator to check the answers to the fourteen problems above. This check will not only help you to solve difficult problems, but it will also train you to use the graphing calculator for exponential functions. Give it a whirl!