CCSS Algebra 4 AA6: Pre-Polynomials Intro Name____________

Before we start working with polynomials, I need you to understand how factoring and distributing work with numbers. Polynomials are really numbers written with a base of x, so the structure of polynomials is analogous to the structure of real numbers. (We will also learn about the term **real number** in this unit, and why not all numbers are real.)

Decimal System:

Example: If x = 327,152, then x = 300,000 + 20,000 + 7,000 + 100 + 50 + 2, and

$x = 3 \cdot 100,000 + 2 \cdot 10,000 + 7 \cdot 1,000 + 1 \cdot 100 + 5 \cdot 10 + 2 \cdot 1$, and

$x = 3 \cdot 10^5 + 2 \cdot 10^4 + 7 \cdot 10^3 + 1 \cdot 10^2 + 5 \cdot 10^1 + 2 \cdot 10^0$ (remember $10^0 = 1$)

This is why our number system is called the **decimal** system. The word **decimal** means "part of 10," so all numbers can be written in terms of powers of 10s.

Your turn: Write each number as a sum of powers of 10

1. $x = 387$ $3 \cdot 10^2 + 8 \cdot 10^1 + 7 \cdot 10^0$
2. $x = 549,125$
   $5 \cdot 10^5 + 4 \cdot 10^4 + 9 \cdot 10^3 + 1 \cdot 10^2 + 2 \cdot 10^1 + 5 \cdot 10^0$
3. $x = 2.5$
   $2 \cdot 10^0 + 5 \cdot 10^{-1}$
4. $x = 549.125$
   $5 \cdot 10^2 + 4 \cdot 10^1 + 9 \cdot 10^0 + 1 \cdot 10^{-1} + 2 \cdot 10^{-2} + 5 \cdot 10^{-3}$
5. $x = 0.00045$
   $4 \cdot 10^{-4} + 5 \cdot 10^{-5}$

Conceptual Understanding: Remember to write notes in your notebook if you figure out something new.

1. How do you represent big numbers with powers of 10?
   Positive exponents
2. How do you represent decimals with powers of 10?
   Negative exponents
3. How do the powers of 10 relate to the names of the place values (tenths, hundreds, etc)
   The power = # of zeros in place value
   If negative, = # of places past decimal pt.

Multiplying Decimals:

Example: $3,251 \cdot 83$

This problem is a pain to do mentally. So break down each number, and multiply the pieces.

	$3 \cdot 10^3$	$2 \cdot 10^2$	$5 \cdot 10^1$	$1 \cdot 10^0$
$8 \cdot 10^1$	$24 \cdot 10^4$	$16 \cdot 10^3$	$40 \cdot 10^2$	$8 \cdot 10^1$
$3 \cdot 10^0$	$9 \cdot 10^3$	$6 \cdot 10^2$	$15 \cdot 10^1$	$3 \cdot 10^0$

So, $3,251 \cdot 83 = 24 \cdot 10^4 + (9+16) \cdot 10^3 + (6+40) \cdot 10^2 + (15+8) \cdot 10^1 + 3 \cdot 10^0$

$= 240,000 + 25,000 + 4,600 + 230 + 3$

$= 269,833$

Conceptual Understanding:

1. Where did the original factors go in the table? Why does that make sense?
   On the outsides. Multiply side lengths to find area of a rectangle.
2. What does this table remind you of from earlier in this course?
   Factoring!
3. How did I know which terms to combine?
   Same exponent
4. How did I convert the powers of 10 back to regular numbers?
   Power = # of zeros

Your turn:

1. $35 \cdot 29$

	$3 \cdot 10^1$ +	$5 \cdot 10^0$
$2 \cdot 10^1$	$6 \cdot 10^2$	$10 \cdot 10^1$
$9 \cdot 10^0$	$27 \cdot 10^1$	$45 \cdot 10^0$

$600 + 370 + 45$

$970 + 45 = 1015$

2. $425 \cdot 13$

	$4 \cdot 10^2$	$2 \cdot 10^1$	$5 \cdot 10^0$
$1 \cdot 10^1$	$4 \cdot 10^3$	$2 \cdot 10^2$	$5 \cdot 10^1$
$3 \cdot 10^0$	$12 \cdot 10^2$	$6 \cdot 10^1$	$15 \cdot 10^0$

$4000 + 1400 + 110 + 15$

5525

3. $3.75 \cdot 25$

	$3 \cdot 10^0$	$7 \cdot 10^{-1}$	$5 \cdot 10^{-2}$
$2 \cdot 10^1$	$6 \cdot 10^1$	$14 \cdot 10^0$	$10 \cdot 10^{-1}$
$5 \cdot 10^0$	$15 \cdot 10^0$	$35 \cdot 10^{-1}$	$25 \cdot 10^{-2}$

$60 + 29 + 4.5 + .25$

$89 + 4.75$

93.75

4. $1.25 \cdot 3.52$

	$1 \cdot 10^0$	$2 \cdot 10^{-1}$	$5 \cdot 10^{-2}$
$3 \cdot 10^0$	$3 \cdot 10^0$	$6 \cdot 10^{-1}$	$15 \cdot 10^{-2}$
$5 \cdot 10^{-1}$	$5 \cdot 10^{-1}$	$10 \cdot 10^{-2}$	$25 \cdot 10^{-3}$
$2 \cdot 10^{-2}$	$2 \cdot 10^{-2}$	$4 \cdot 10^{-3}$	$10 \cdot 10^{-4}$

$= 3 + 1.1 + .27 + .029 + .0010$

$4.37 + .03 = 4.67$