FLUENCY

1. Write the following products as polynomials in either x or t. The first is done as an example for you.

(a)
$$5x(2x-4)$$

= $(5x)(2x)-(6x)$

(b)
$$3t(t+7)$$

(c)
$$-4x(5x+1)$$

$$= (5x)(2x) - (5x)(4)$$

= $(5 \cdot 2)(x \cdot x) - (5 \cdot 4)(x)$

$$= 10x^{2} - 20x$$
(d) $4(t^{2} - 5t + 2)$ (e) $x(x^{2} - 5t + 2)$

(e)
$$x(x^2-2x-3)$$

$$(f) -5t(2t^2 + 3t - 7)$$

2. Perhaps the most important type of polynomial multiplication is that of two binomials. Make sure you are fluent with this skill. Write each of the following products as an equivalent polynomial written in standard form. The first problem is done as an example using repeated distribution.

(a)
$$(x+5)(x-3)$$

(b)
$$(x-10)(x-4)$$

(c)
$$(x+3)(x+12)$$

$$= (x+5)(x)+(x+5)(-3)$$

$$= (x)(x)+(5)(x)+(x)(-3)+(-5)(3)$$

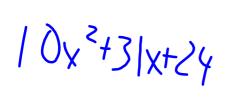
(a)
$$(x+5)(x-3)$$
 (b) $(x-10)(x-4)$
= $(x+5)(x)+(x+5)(-3)$ \times - 14 \times -

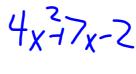
$$=x^2+5x-3x-15$$

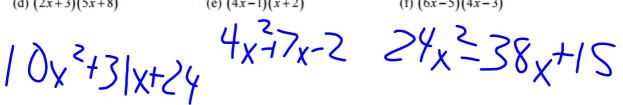
$$= \frac{x^2 + 2x - 15}{\text{(d) } (2x+3)(5x+8)}$$
 (e) $(4x-1)(x+2)$

(e)
$$(4x-1)(x+2)$$

(f)
$$(6x-5)(4x-3)$$







3. Never forget that squaring a binomial also a process of repeated distribution. Write each of the following perfect squares as trinomials in standard form.

4. An interesting thing happens when you multiply two conjugate binomials. Conjugates have the property of having the same terms but differ by the operation between the two terms (in one case addition and in one case subtraction). Multiply each of the following conjugate pairs and state your answers in standard form. The first is done as an example

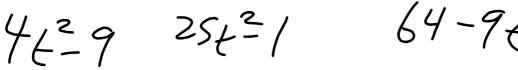
(a)
$$(x+3)(x-3)$$
 (b) $(x-5)(x+5)$ (c) $(10+x)(10-x)$

$$= x(x-3)+3(x-3)$$

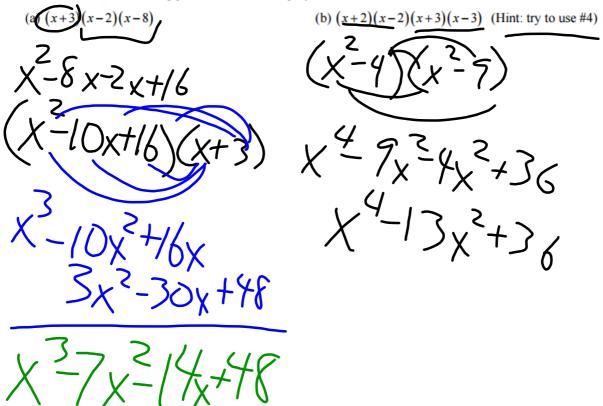
$$= x^2-3x+3x-9$$

$$= x^2-9$$
(d) $(2t+3)(2t-3)$ (e) $(5t+1)(5t-1)$ (f) $(8-3t)(8+3t)$

$$= 25t^2 / 64 - 9t^2$$



5. Write each of the following products in standard polynomial form.



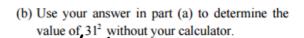
REASONING

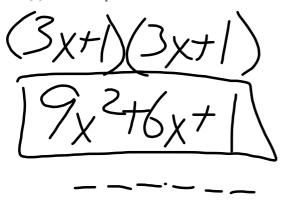
6. Notice again how similar polynomials are to integers, i.e. the set {...-3, -2, -1, 0, 1, 2, 3 ...}. Write a statement below for polynomials based on the statement about integers.

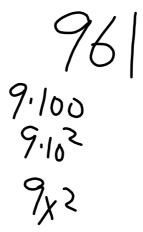
Statement About Integers: An integer times an integer produces an integer.

Statement About Polynomials: A polynomial hars a po

- 7. Consider the product $(3x+1)^2$
 - (a) Write this product in standard trinomial form.







Bell Ringer:

Choose your breath:

Initial (monitor breath's rhythm)

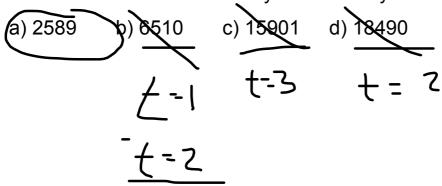
Heart/Belly

Calming (2 in, 4 out)

Energizing (4 in, 2 out)

Bell Ringer:

The value in dollars, v(x), of a certain car after x years is represented by the equation $v(x)=25,000(0.86)^{x}$. To the nearest dollar, how much more is the car worth after 2 years than 3 years?



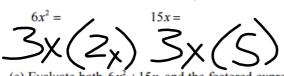
Factoring expressions is one of the **gateway skills** that is necessary for much of what we do in algebra for the rest of the course. The word **factor** has two meanings and both are important.

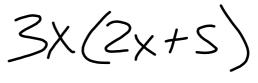
THE TWO MEANINGS OF FACTOR

- 1. Factor (verb): To rewrite an algebraic expression as an equivalent product.
- 2. Factor (noun): An algebraic expression that is one part of a larger factored expression.

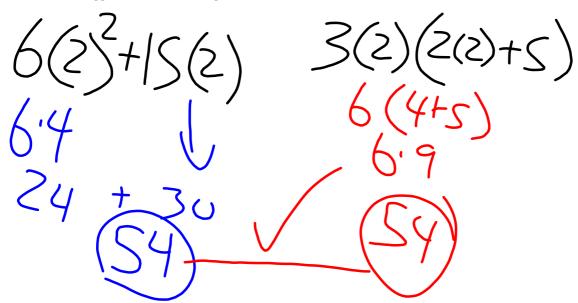
Exercise #1: Consider the expression $6x^2 + 15x$.

- (a) Write the individual terms $6x^2$ and 15x as completely factored expressions. Determine their **greatest common factor**.
- (b) Using the Distributive Property, rewrite $6x^2 + 15x$ as a product involving the **gcf** from (a).





(c) Evaluate both $6x^2 + 15x$ and the factored expression you wrote in (b) for x = 2. What do you find? What does this support about the two expressions?



It is important that you are **fluent** reversing the **distributive property** in order to factor out a common factor (most often the greatest common factor). Let's get some practice in the next exercise just identifying the greatest common factors.

Exercise #2: For each of the following sets of monomials, identify the greatest common factor of each. Write each term as an extended product (if necessary).

(a) $12x^3$ and 18x



(d) $24x^3$, $16x^2$, and 8x



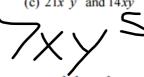
(b) $5x^4$ and $25x^2$



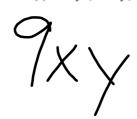
(e) $20x^3$, $-12x^2$, and 28x



(c) $21x^2y^5$ and $14xy^7$

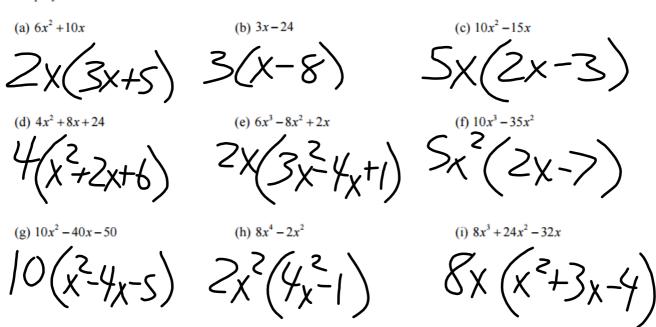


(f) $18x^2y^2$, $45x^2y$, and $90xy^2$



Once you can identify the greatest common factor of a set of monomials, you can then easily use it and the distributive property to write equivalent factored expressions.

Exercise #3: Write each polynomial below as a factored expression involving the greatest common factor of the polynomial.



Being able to fluently factor out a gcf is an essential skill. Sometimes greatest common factors are more complicated than simple monomials. We have done this type of factoring back in Unit #1.

Exercise #4: Rewrite each of the following expressions as the product of two binomials by factoring out a common binomial factor.

(a)
$$(x+5)(x-1)+(x+5)(2x-3)$$

(b)
$$(2x-1)(2x+7)-(2x-1)(x-3)$$

