**it Gets Real

Factoring Trinomials

We've done a lot already:

Greatest Common Factor:

$$10x^2 + 5x$$

$5x(2x+1\ \ )$

Grouping:

$$2x^2 + 2x + 5x^3y + 5x^2y$$

$2x(x+1) + 5x^2y(x+1)$

$(x+1)(2x\ \ + 5x^2y)$

$x(y+1)(2\ +5xy)$

Difference of Squares:

$$4x^2 - 16$$

$\rightarrow 4(x^2 - 4)$

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

$a = 2x \quad b = 4$

$a^2 - b^2 = (a+b)(a-b)$

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

$2(x-2)\,2(x+2)$

$$a^3 \pm b^3 = (a \mp b)(a^2 \pm ab + b^2)$$

Sum/Difference of Cubes: $8x^3 + 27$ → $a = 2x$ $b = 3$

$$(2x)^3 + (3)^3$$
$$a^3 + b^3 = (2x + 3)(4x^2 - 6x + 9)$$

Now we will spend 2 days on the main type of equation that we will be factoring. Quadratics. These are polynomials with one variable and degree 2.

They have the form: $ax^2 + bx + c$ where a, b, and c are constants.

First, lets reverse engineer what we are trying to do:

$$(x+1)(x+2)$$
$$= x^2 + 2x + x + 2$$
$$= x^2 + 3x + 2$$

Now, we want to be able to go the other way:

$$x^2 + 3x + 2$$
$$= (x+n)(x+n)$$
$$= (x+2)(x+1)$$

m, n

$m(n) = 2$ ✓

$m + n = 3$ ✓

$m = 2$

$n = 1$

➔ Find two numbers, (m, n) that multiply to "c" and add to "b".

- $ax^2 + bx + c$

➔ We put those in the brackets:

- $(x + m)(x + n)$

Lets Try:

$x^2 + 4x - 32$ $m(n) = -32$ $m + n = 4$ $(x+8)(x-4)$ $m = 8$ $n = -4$	$x^2 + 9x + 18$ $m(n) = 18$ $m + n = 9$ $(x+6)(x+3)$ $m = 6$ $n = 3$
$x^2 - 9x + 14$	$x^4 - 8x^2 + 7$ $\boxed{\text{Let } x^2 = R}$ $= R^2 - 8r + 7$ $m(n) = 7$ $m + n = -8$ $= (R-7)(R-1)$ $m = -7$ $n = -1$ $= (x^2-7)(x^2-1)$

Class work	
1. $x^2 + 3x - 10$ 2. $x^2 + 2x - 24$ 3. $x^2 - 9x + 18$ 4. $6x^2 - 5x - 12$ 5. $x^2 + 5x + 6$	6. $3x^2 + 5x + 2$ 7. $x^2 + 1.5x - 10$ 8. $x^2 - x + 9$ 9. $8x^2 - 62x + 99$ 10. $24x^2 - 22x - 35$