

## Intermediate Factoring

Ok...recall that factoring is the process of changing a number or expression to multiplication.

Basic Factoring might be considered to consist of Common Monomial Factoring, F.O.I.L. Backwards, The Difference of Two Squares, and Trinomial Squares. Now, Intermediate Factoring forces us to "step up" a bit. We will consider the Sum of Two Cubes and The Difference of two Cubes first. The good news is that a couple of handy dandy formulas will allow us to be successful at this. Here they are:

$$x^3 + a^3 = (x + a)(x^2 - xa + a^2) \quad \text{and} \quad x^3 - a^3 = (x - a)(x^2 + xa + a^2)$$

Here are a few examples using these formulas.

$$x^3 + 8 = (x + 2)(x^2 - 2x + 4)$$

$$27x^3 - 64 = (3x - 4)(9x^2 + 12x + 16)$$

$$x^6 - 125 = (x^2 - 5)(x^4 + 5x^2 + 25)$$

$$8q^3 - 27 = (2q - 3)(4q^2 + 6q + 9)$$

Next, we should be aware that some factoring problems might take more than one step. Here is one where we must use Common Monomial first, then the Difference of Two Cubes.

$$6x^3 - 48 = 6(x^3 - 8) = 6(x - 2)(x^2 + 2x + 4)$$

Now, how about factoring expressions that contain fractional exponents? Here are a couple in which I use Common Monomial Factoring.

$$x^{\frac{2}{3}} - x^{\frac{1}{3}} = x^{\frac{1}{3}}(x^{\frac{1}{3}} - 1)$$

$$\text{And how about } x^{\frac{2}{3}} - x^{\frac{1}{3}} = x^{\frac{1}{3}}(x^{\frac{1}{3}} - 1)$$