

Polynomials and Special Products:

Sum and difference of same terms: $(u + v)(u - v) = u^2 - v^2$

Example: $(x + 2)(x - 2) = x^2 + 2x - 2x - 2^2 = x^2 - 2^2 = x^2 - 4$

Square of a Binomial: 1) $(u + v)^2 = (u + v)(u + v) = u^2 + 2uv + v^2$

And: **2)** $(u - v)^2 = (u - v)(u - v) = u^2 - 2uv + v^2$

Notice the middle term is always: $2 * \text{first} * \text{second}$

Using method **1) example:** $(x + 2)^2 = (x + 2)(x + 2) = x^2 + 2(x)(2) + 2^2 = x^2 + 4x + 4$

Using method **2) example:** $(x - 2)^2 = (x - 2)(x - 2) = x^2 - 2(x)(2) + 2^2 = x^2 - 4x + 4$

Cube of a Binomial: 1) $(u + v)^3 = u^3 + 3u^2v + 3uv^2 + v^3$

And: **2)** $(u - v)^3 = u^3 - 3u^2v + 3uv^2 - v^3$

Using method **1) example:**

$(x + 2)^3 = (x + 2)(x + 2)(x + 2) = x^3 + 3x^2(2) + 3x(2^2) + 2^3 = x^3 + 6x^2 + 12x + 8$

Using method **2) example:**

$(x - 2)^3 = (x - 2)(x - 2)(x - 2) = x^3 - 3x^2(2) + 3x(2^2) - 2^3 = x^3 - 6x^2 + 12x - 8$

Factoring of Special Polynomials:

Factored Form	Example
Difference of two squares $u^2 - v^2 = (u + v)(u - v)$	$16x^2 - 4 = (4x)^2 - 2^2 = (4x + 2)(4x - 2)$
Perfect Square Trinomial 1) $u^2 + 2uv + v^2 = (u + v)^2$ 2) $u^2 - 2uv + v^2 = (u - v)^2$	1) $x^2 + 8x + 16 = x^2 + 2(x)(4) + 4^2 = (x + 4)^2$ 2) $x^2 - 8x + 16 = x^2 - 2(x)(4) + 4^2 = (x - 4)^2$
Sum or Difference of Two Cubes 1) $u^3 + v^3 = (u + v)(u^2 - uv + v^2)$ 2) $u^3 - v^3 = (u - v)(u^2 + uv + v^2)$	1) $x^3 + 27 = x^3 + 3^3 = (x + 3)(x^2 - 3x + 9)$ 2) $x^3 - 27 = x^3 - 3^3 = (x - 3)(x^2 + 3x + 9)$