<u>Factoring Polynomials – a Review</u>

Factoring Polynomials can be frustrating at times if you don't know or remember the following simple rules. These rules, which are learned in grade 10, are critical for grades 11 and 12 as well. Whenever you are asked to factor a polynomial (usually to determine the roots or x-intercepts) the very first thing you should look for is a common factor. Whether you have a binomial (two terms) or a trinomial (three terms) or ANY polynomial, this should be your first step.

Type	**Example**	**Method**
Common Factors:	$3x^2 + 27xy + 12x$ $= 3x(x + 9y + 4)$	Find the greatest common factor for each term and divide each term by this factor
Simple Trinomials: Trinomials whose coefficient of x^2 is 1. Ex: $ax^2 + bx + c$, $a = 1$	$x^2 + 6x + 5$ $= (x+5)(x+1)$	Find two numbers whose product is 5 and whose sum is 6 P: 5 x 1 = 5 S: 5 + 1 = 6 ∴ the two numbers are 5 and 1
Complex Trinomials: Trinomials whose coefficient of x^2 is NOT 1 Ex: $ax^2 + bx + c$, $a \neq 1$	$6x^2 + x - 12$ $= (2x+3)(3x-4)$ Note: The first is 6 The last is –12 Their product is –72 The one in the middle is 1.	The product of the first and the last, The sum of the one in the middle. Find 2 numbers that match the above Take your time continue to fiddle. Make 2 fractions with the first on the bottom, Reduce and then you can stop. The answer is there, before your eyes The *x* on the bottom, the other on top! P: (6)(-12) = - 72 S: 1 P: (9)(-8) = -72 S: 9+ (-8) = 1 $\frac{9}{6} = \frac{3}{2}$ $\frac{-8}{6} = \frac{-4}{3}$ $\therefore$ $(2x+3)$ *and* $(3x-4)$
Perfect Square Trinomials: Trinomials whose first and last terms are perfect squares and whose second term is the square root of each of these terms times two.	1) $16x^2 - 24x + 9$ $= (4x-3)^2$ 2) $4x^2 + 36x + 81$ $= (2x+9)^2$	Check to see if it is a perfect square trinomial: i) $\sqrt{16x^2} = 4x$ ii) $\sqrt{9} = 3$ iii) $4x \times 3 \times 2 = 24x$ note: the sign in front of the last term (9 in this ex) must be positive but the sign in front of the *x* term can be either positive or negative.

Difference of Squares: Just what it says: two perfect squares separated by a minus sign (hence the "difference"). $a^2 - b^2$	1) $81x^2 - 4$ $= (9x+2)(9x-2)$ 2) $121x^2 - 144$ $= (11x+12)(11x-12)$	Take the square root of the 1st term $\sqrt{81x^2} = 9x$ Take the square root the 2nd term $\sqrt{4} = 2$ Make 2 sets of brackets, put the $9x$ in the first position of each, then add and subtract the 2.