

## Short Course in Factoring Trinomials

1<sup>st</sup> look for any common factors & factor them out (e.g.  $4x^3 + 6x^2 - 2x$  has  $2x$  as a common term. Factor it out  $\Rightarrow 2x(2x^2 + 3x - 1)$ )

### Trinomials of the form $Ax^2 + Bx + C$ when A is 1

There are 4 possible forms of the trinomials based on the signs between the monomials.

+	+	-	+
↓	↓	↓	↓
e.g. $x^2 + 5x + 6$	$x^2 - 5x + 6$		

If the last sign is "+", then both signs will be the same and they will be the same as the middle sign. So it is automatic that you will start with:

$$(x + \quad)(x + \quad) \text{ or } (x - \quad)(x - \quad)$$

Depending on the middle sign. Now just ask the question: "What numbers multiply to give you the "C" term and add to give you the "B" term. For the problems above this would give:

$$(x + 2)(x + 3) \text{ \& } (x - 2)(x - 3)$$

+	-	-	-
↓	↓	↓	↓
$x^2 + 2x - 8$		$x^2 - 2x - 8$	

If the last sign is "-", then the signs will be different + - or - +. So it is automatic that you will start with:

$$(x + \quad)(x - \quad) \text{ or } (x - \quad)(x + \quad)$$

Now just ask the question: "What numbers multiply to give you the "C" term and subtract to give you the "B" term. The larger numbers sign is the same as the "B" terms sign. For the problems above this would give:

$$(x + 4)(x - 2) \text{ \& } (x + 2)(x - 4)$$

### Trinomials of the form $Ax^2 + Bx + C$ when A is not 1

We want to force this to a factor by Grouping problem so find two #'s whose sum is "B" & their product is  $A \cdot C$ .

Example 1) Take the trinomial  $7x^2 + 22x + 3$

Remember that standard form is:  $Ax^2 + Bx + C$  so  $A \cdot C$  is 21 & B is 22.

So I list possible factors that multiply to give 21

Factors	Sum
$3 * 7$	10
<b><math>1 * 21</math></b>	<b>22</b> <-This is one I want

Now use the 1 & 21 to break down the "B" term:

$$7x^2 + 1x + 21x + 3 \text{ \& factor by grouping}$$

$$(7x^2 + 1x) + (21x + 3) \text{ next factor out common terms}$$

$$x(7x + 1) + 3(7x + 1) \text{ next factor out the } (7x + 1)$$

$$(7x + 1)(x + 3) \text{ this is your answer}$$

Example 2) Take the trinomial  $10x^2 - 43x + 28$

Remember that standard form is:  $Ax^2 - Bx + C$  so  $A \cdot C$  is 280 & B is -43.

So I list possible factors that multiply to give 280

Factors	Sum
$-1 * -280$	-281
$-2 * -140$	-142
$-4 * -70$	-74
$-5 * -56$	-61
$-7 * -40$	-47
<b><math>-8 * -35</math></b>	<b>-43</b> <-This is one I want

Now use the -8 & -35 to break down the "B" term:  $10x^2 - 8x - 35x + 28$  & factor by grouping

$$(10x^2 - 8x) - (35x - 28) \text{ next factor out common terms}$$

$$2x(5x - 4) - 7(5x - 4) \text{ next factor out the } (5x - 4)$$

$$(5x - 4)(2x - 7) \text{ this is your answer}$$

Remember to distribute "-"