Ms.Ban Algebra 1 _ ILCHS
Factoring Worksheet

Using the master product!

Example done for you:

Factor: $2x^2 + 7x - 15$

The master product is the product of the leading coefficient and the constant

MP = -30

Next find all the pairs which multiply to 30:

30
1 30
2 15
3 10
5 6

Next, we will look at the signs. The master product is actually -30. Therefore the pairs are incorrect. One of the numbers must be negative and the other must be positive in order to multiply to a negative MP.
The sign of the larger number in each pair will always be the same sign as that of the middle term in your original polynomial ($+7x$). Since the larger number is positive, the smaller number in each pair must be negative!
So we have:

-30
-1 $+30$
-2 $+15$
-3 $+10$
-5 $+6$

Now we must circle the pair that adds up to the coefficient of the middle term in the original polynomial: $+7x$

-30
-1 $+30$
-2 $+15$
-3 $+10$
-5 $+6$

At this point we factor by grouping. Your trinomial will turn into a polynomial with 4 terms by changing the $+7x$ into $-3x+10x$.

$$2x^2+7x-15 \;=\; \underline{2x^2-3x}+\underline{10x-15}$$

$$\downarrow$$

$$x(2x-3)+5(2x-3)$$

$$(2x-3)(x+5)$$ Work complete!

Let's try some more:

Easier ones (with leading coefficient 1). You can use the "Shortcut" here.

1. $x^2-8x+15$

2. $x^2+8x+16$

3. $x^2-9x-10$

4. x^2-5x+6

5. x^2+5x-6

Hopefully, along the way you figured out that the pair of numbers which multiplies to the MP and adds to the middle coefficient are the numbers which can be inserted into the binomials.

Harder ones (leading coefficient $\neq 1$)

Must use the master product here:

6. $6x^2 + x - 40$

7. $5x^2 - 6x + 1$

8. $30x^2 - 11x - 6$

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Special Factoring:

When your polynomials is the difference of squares:

$$(A)^2 - (B)^2$$

Then your polynomial will factor into conjugates.

$$(A+B)(A-B)$$

Example: $4x^2 - 9$

This is the same as:

$$(2x)^2 - 3^2$$

So it factors into: $(2x+3)(2x-3)$

Note: The sum of squares does not factor!

For example:

$x^2 + 9 \neq (x+3)(x-3)$

or

$x^2 + 9 \neq (x+3)(x+3)$

In fact, $x^2 + 9$ is prime

Now do these:

9. $x^2 - 81$

10. $9x^2 - 4$

11. $16x^2 - 25y^2$

12. $x^4 - 81$

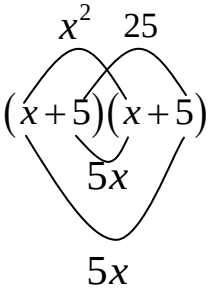
Perfect square trinomials.

$x^2 + 2xy + y^2 = (x+y)(x+y)$ **or** $(x+y)^2$

$x^2 - 2xy + y^2 = (x-y)(x-y)$ **or** $(x-y)^2$

Example: $x^2 + 10x + 25 = (x+5)(x+5)$ Check using FOIL: $(x+5)(x+5)$

$(x)^2$ $(5)^2$



The two middle terms add up to 10*x*.

Try these:

13. $x^2 + 20x + 100$

14. $x^2 - 14x + 49$

15. $49x^2 + 112x + 64$

16. $9x^2 - 30x + 25$

Check your answers: Show your work on the loose leaf paper ☺

1. $(x-3)(x-5)$
2. $(x+4)(x+4)$
3. $(x-10)(x+1)$
4. $(x-3)(x-2)$
5. $(x+6)(x-1)$
6. $(3x+8)(2x-5)$
7. $(5x-1)(x-1)$
8. $(10x+3)(3x-2)$
9. $(x-9)(x+9)$
10. $(3x-2)(3x+2)$
11. $(4x-5y)(4x+5y)$
12. $(x-3)(x+3)(x^2+9)$
13. $(x+10)(x+10)$
14. $(x-7)(x-7)$
15. $(7x+8)(7x+8)$
16. $(3x-5)(3x-5)$
17. $(9x^5+27x^4-3x^3+18x^2)\div 3x$
18. $(5x^5+30x^4-x^3+15x^2)\div 5x^3$
19. $(9x^5-18x^4-4x^3+6x^2)\div 2x^4$
20. $(x^3+21x^2-3x+1)\div 7x$
21. $\dfrac{15x^3}{5x}$
22. $\dfrac{24x^3y^4}{40x^7y^2}$
23. $\dfrac{24x^7y^2}{48x^{11}y^4}$
24. $\dfrac{(6x^3y)^2}{24x^6y^5}$

Solve x in the equation

25. $(x-3)(x-5)=0$
2. $(x+4)(x+4)=0$
3. $(x-10)(x+1)=0$
4. $(x-3)(x-2)=0$