## Factoring the GCF

Def: The greatest common factor is the largest factor common to all terms.

Ex: Factor out the GCF.

1. $6y^{2}-18$
2. $16t^{2}-64t$
3. $8t^{4}-4t^{2}+16t^{3}+12t$

## Factor by Grouping

Given a quadratic, $ax^{2}+bx+c$

Grouping number: $a∙c$

B-term: $b$

12

-7

$$x^{2}-7+12=x^{2}-4x-3x+12=x\left(x-4\right)-3\left(x-4\right)=\left(x-4\right)(x-3)$$

$$y^{3}+3y^{2}-4y-12=y^{2}\left(y+3\right)-4\left(y+3\right)=\left(y+3\right)\left(y^{2}-4\right)$$

Ex:

1. $y^{3}+6y^{2}+9y$
2. $12x^{2}+24x-96$
3. $t^{2}+7t+12$

## Trial and Error /Reverse Foil

Recall: $\left(x+a\right)\left(x+b\right)=x^{2}+bx$

 $ax+ab$

 $x^{2}+\left(a+b\right)x+ab$

So When asked to factor $x^{2}+24x+80$ we are looking for two numbers that multiply to 80 but whose sum or difference is 24.

Recall: $\left(ax+b\right)\left(cx+d\right)=acx^{2}+adx$

 $bcx+bd$

 $acx^{2}+\left(ad+bc\right)x+bd$

In the case of $6x^{2}-5x-21$ we have a tougher job than just finding two numbers that multiply to -21 and add to -5 we actually need to do some guessing and checking or we could use factor by grouping:

$\left(2x+3\right)(3x-7)$ -126

 9 -14

-5

Ex: Factor

1. $x^{2}+24x+140$
2. $x^{2}-14x+48$
3. $x^{2}+14x+45$
4. $x^{4}+3x^{2}-10$
5. $2x^{2}+30x+52$
6. $3x^{2}+x-2$
7. $3a^{2}-20a+12$
8. $8x^{3}+6x^{2}-9x$
9. $13a^{2}-8ab-5b^{2}$
10. $9x^{3}y+24x^{2}y-9xy$

## Factoring Difference of Squares and Perfect Square Trinomials

Ex: Factor each

$$x^{2}-9$$

$$x^{2}+9$$

$$x^{2}+6x+9$$

$$x^{2}-6x+9$$

Given a quadratic equation of the form $ax^{2}+bx+c$

If $a \& c $are perfect square numbers and:

1. $b=0$ and $c$ is a negative number $\rightarrow $ Difference of Squares so it factors to

 $\left(\sqrt{a}x+\sqrt{c}\right)\left(\sqrt{a}x-\sqrt{c}\right)$

1. $b=0$ and $c$ is a positive number $\rightarrow $ Prime polynomial so it won’t factor
2. $b=2ac\rightarrow $Perfect square trinomial so it factors to
* $\left(\sqrt{a}x+\sqrt{c}\right)^{2} $if b is a positive number$ $

$$or$$

* $\left(\sqrt{a}x-\sqrt{c}\right)^{2}$if b is a negative number