

# Introduction to Factoring

Question: Do you prefer using the box or grouping method? Why?

Warm-Up

1) Simplify:  $(t^3 - 3t + 2) \div (t + 2)$

$$\begin{array}{r}
 t^3 - 3t + 2 \\
 t+2 \overline{)t^3 - 3t + 2} \\
 - (t^3 + 2t^2) \\
 \hline
 0 - 2t^2 - 3t \\
 - (-2t^2 - 4t) \\
 \hline
 0 - t + 2 \\
 \hline
 0
 \end{array}
 \quad
 \begin{array}{l}
 t^2(t+2) \\
 t^3 + 2t^2 \\
 -2t(t+2) \\
 -2t^2 - 4t
 \end{array}$$

2) Multiply:  $\begin{bmatrix} 1 & -4 \\ 2 & 2 \end{bmatrix} \cdot \begin{bmatrix} 0 & 3 \\ 9 & -1 \end{bmatrix} = \begin{bmatrix} 0+(-36) & 3+(-4) \\ 0+18 & 6+(-2) \end{bmatrix} = \begin{bmatrix} -36 & -7 \\ 18 & 4 \end{bmatrix}$

3) Simplify:  $(2x+4)(7x-1)$

$$\begin{array}{r}
 2x + 4 \\
 7x \begin{array}{|c|c|} \hline 14x^2 & 28x \\ \hline -2x & -4 \\ \hline \end{array} \\
 -1 \begin{array}{|c|} \hline 14x^2 + 26x - 4 \\ \hline \end{array}
 \end{array}$$

Notes.

What are factors?

$$\begin{array}{r}
 284 \\
 | \\
 2 \quad 142 \\
 | \quad | \\
 2 \quad 71 \\
 \boxed{2^2 \cdot 71}
 \end{array}$$

$$\begin{array}{c}
 48x^3y^2 \\
 | \quad | \quad | \\
 2 \quad 24 \quad x \quad y \\
 | \quad | \quad | \quad | \\
 2 \quad 12 \quad x \quad y \\
 | \quad | \quad | \quad | \\
 3 \quad 2 \quad x \quad y \\
 \hline
 \boxed{2^4 \cdot 3 \cdot x^3y^2}
 \end{array}$$

Define factors . . .

## Factoring Polynomials

$$\begin{array}{c} 4 \\ \diagdown \quad \diagup \\ 2 \quad 2 \end{array}$$

$$\begin{array}{c} x^2 \\ \diagdown \quad \diagup \\ x \quad -x \end{array}$$

$$\begin{array}{r} x^2 + 4x + 3 \\ \diagdown \quad \diagup \\ (x+1)(x+3) \end{array}$$

$$\begin{array}{c} x + 1 \\ \boxed{x} \left| \begin{array}{c} x^2 \\ + 3x \end{array} \right| + x \\ \boxed{3} \quad \quad \quad 3 \\ x^2 + 4x + 3 \end{array}$$

$$x^2 + x + 3x + 3$$

$$x^2 + 4x + 3$$

$$-(x+a)(x+b)$$

$$x^2 + ax + bx + ab$$

$$x^2 + (a+b)x + ab$$

Danger!  
May confuse you

Example # 2

Factor:  $x^2 + 9x + 20$   
 $(x + 4)(x + 5)$

Standard form:

linear:  $Ax + By = C$

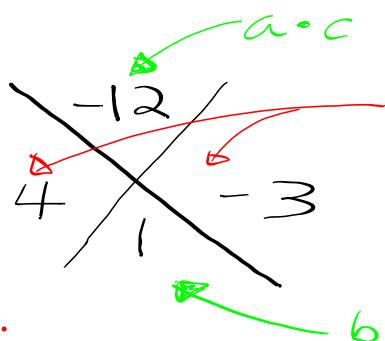
quadratic:  $ax^2 + bx + c = d$

$\uparrow$        $\uparrow$        $\uparrow$   
quadratic term   linear term   constant

Example # 3:  $6x^2 + x - 2$

Factor

$$\begin{aligned} a &= 6 \\ b &= 1 \\ c &= -2 \end{aligned}$$



two numbers that multiply to  $a \cdot c$  and add to  $b$

$$\begin{aligned} 4 \cdot -3 &= -12 \\ 4 + -3 &= 1 \end{aligned}$$

Now, you have a choice

### Grouping

$$\begin{aligned} 6x^2 + x - 2 \\ 6x^2 + 4x - 3x - 2 \\ (6x^2 + 4x) \cancel{(}-3x - 2\cancel{}) \end{aligned}$$

$$2x(3x+2) - 1(3x+2)$$

$$(2x-1)(3x+2)$$

### Box

$2x$	$-1$
$3x$	$6x^2$
$2$	$-3x$
$4x$	$-2$

$$(2x-1)(3x+2)$$

$$\underline{\#24.)} \quad 10x^2 - 13x - 3$$

$$\begin{array}{r} -30 \\ 2 \cancel{-15} \\ -13 \end{array}$$

$$10x^2 - 15x + 2x - 3$$

$$(10x^2 - 15x) + (2x - 3)$$

$$5x(2x - 3) + 1(2x - 3)$$

$$\boxed{(5x+1)(2x-3)}$$

$$(a^3b^2 - a^2b + 2a)(-ab)^{-1} \quad \frac{a^3b^2 - a^2b + 2a}{-ab}$$
$$\frac{a^3b^2 - a^2b + 2a}{-ab}$$
$$\frac{a^2b^2 - ab + 2}{-b}$$

22.)

$$\begin{array}{r} x \quad -15 \\ x+3 \overline{)x^2 - 12x - 45} \\ -(x^2 + 9x) \\ \hline -15x - 45 \\ -15x - 45 \\ \hline 0 \end{array}$$

#78)

$$x^{-3}y^2(yx^4 + y^{-1}x^3 + y^{-2}x^2)$$

$$\begin{aligned} & x^{-3}y^2 y x^4 + x^{-3}y^2 y^{-1} x^3 + x^{-3}y^2 y^{-2} x^2 \\ & x^{-3+4} y^{2+1} + x^0 y^1 + x^{-1} y^0 \\ & xy^3 + y + x^{-1} \end{aligned}$$

$$xy^3 + y + x^{-1}$$

Algebra 2 Due Thursday / Friday December 1 and 2

Name \_\_\_\_\_

## 111128 Introduction to factoring

Date \_\_\_\_\_ Period \_\_\_\_\_

**Factor each.**

1)  $x^2 + 4x + 3 = 0$

2)  $x^2 - 4 = 0$

3)  $x^2 + 9x + 20 = 0$

4)  $x^2 - 3x - 4 = 0$

5)  $x^2 - x - 6 = 0$

6)  $x^2 - 10x + 25 = 0$

7)  $x^2 - 9x + 20 = 0$

8)  $x^2 - 6x + 8 = 0$

9)  $x^2 + 6x + 8 = 0$

10)  $x^2 + x - 6 = 0$

11)  $x^2 + 4x - 5 = 0$

12)  $x^2 - 8x + 15 = 0$

Factor each... Use the diamond and box or grouping method... Show all work!

13)  $9x^2 + 9x + 2 = 0$

14)  $15x^2 + 19x + 6 = 0$

15)  $6x^2 + 13x + 6 = 0$

16)  $25x^2 - 20x + 3 = 0$

17)  $6x^2 + x - 2 = 0$

18)  $15x^2 + 31x + 10 = 0$

19)  $10x^2 + 27x + 5 = 0$

20)  $15x^2 + 14x + 3 = 0$

21)  $6x^2 - x - 2 = 0$

22)  $15x^2 + 11x + 2 = 0$

23)  $10x^2 - x - 3 = 0$

24)  $10x^2 - 13x - 3 = 0$