

## 7.2/7.3 Quadratics: Factoring and Solving by Factoring

### Vocabulary

**Factoring** - Using X-method/box method/diamond method/guess and check to find the factors (not solutions).

**Solving** - Using algebra (including factoring) to find the x-values/solutions.

### X-method with a=1 (ax<sup>2</sup>+bx+c)

① Factor GCF

② Find 2 numbers that multiply to "c" & add to "b"

EX#1  $x^2 + 9x + 14$

$$\begin{array}{ccc} & 14 & \\ 7 & \times & 2 \\ & 9 & \\ \hline & + & \\ \hline \end{array} = \boxed{(x+7)(x+2)}$$

$x^2 + 2x + 7x + 14$   
 $x^2 + 9x + 14$

EX#2  $x^2 - 7x - 30$

$$\begin{array}{ccc} & -30 & \\ -10 & \times & 3 \\ & -7 & \\ \hline & + & \\ \hline \end{array} = \boxed{(x-10)(x+3)}$$

EX#3  $x^2 - 12x + 36$

$$\begin{array}{ccc} & 36 & \\ -6 & \times & -6 \\ & -12 & \\ \hline & + & \\ \hline \end{array} = \boxed{(x-6)(x-6) = (x-6)^2}$$

EX#4  $x^2 - 144$

$$\begin{array}{ccc} & -144 & \\ 12 & \times & -12 \\ & 0 & \\ \hline & + & \\ \hline \end{array} = \boxed{(x+12)(x-12)}$$

EX#5  $5x^2 + 40x + 75$

$= 5(x^2 + 8x + 15)$

$$\begin{array}{ccc} & 15 & \\ 5 & \times & 3 \\ & 8 & \\ \hline & + & \\ \hline \end{array} = \boxed{5(x+5)(x+3)}$$

EX#6  $-12x^2 + 108$

$= -12(x^2 - 9)$

$$\begin{array}{ccc} & -9 & \\ 3 & \times & -3 \\ & 0 & \\ \hline & + & \\ \hline \end{array} = \boxed{-12(x+3)(x-3)}$$

### X-method when a ≠ 1

① Factor GCF

② Find 2 numbers that multiply to "ac" & add "b"

③ Divide the 2 #s by "a" to help setup factors

Note: start from the bottom

$$\text{EX\#7 } 10x^2 + 11x + 3$$

$$\uparrow \left(\frac{1}{2}\right) = \frac{5}{10} \quad \frac{30}{11} \quad \frac{6}{10} = \left(\frac{3}{5}\right) \uparrow$$

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

$10x^2 + 6x + 5x + 3$   
 $10x^2 + 11x + 3$

$$\text{EX\#8 } 4x^2 + 17x - 15$$

$$\textcircled{5} = \frac{20}{4} \quad \frac{-60}{17} \quad \frac{-3}{4}$$

$$= (x+5)(4x-3)$$

$$\text{EX\#9 } 2x^2 - 13x + 21$$

$$\textcircled{-3} = \frac{-6}{2} \quad \frac{42}{-13} \quad \frac{-7}{2}$$

$$= (x-3)(2x-7)$$

$$\text{EX\#10 } 6x^2 - 19x - 36$$

$$\textcircled{-\frac{9}{2}} = \frac{-27}{6} \quad \frac{-216}{-19} \quad \frac{8}{6} = \left(\frac{4}{3}\right)$$

$$= (2x-9)(3x+4)$$

### Solving by Factoring

Solutions/x-values are opposites of factors.

$$\text{EX\#11 } x^2 + 8x - 9 = 0$$

$$\begin{array}{c} -9 \\ 9 \quad -1 \\ 8 \end{array}$$

$$(x+9)(x-1) = 0$$

$$x = -9 \text{ \& } x = 1$$

$x+9=0 \quad x-1=0$   
 $x=-9 \quad x=1$

$$\text{EX\#12 } x^2 + 6x = -8$$

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

$$\begin{array}{c} 8 \\ 4 \quad 2 \\ 6 \end{array}$$

$$(x+4)(x+2) = 0$$

$$x = -4 \text{ \& } x = -2$$

$$\text{EX\#13 } 5x^2 + 2x = 3$$

$$5x^2 + 2x - 3 = 0$$

$$\textcircled{1} = \frac{-5}{5} \quad \frac{-15}{2} \quad \frac{-3}{5}$$

$$(x+1)(5x-3) = 0$$

$$x = -1 \text{ \& } x = \frac{3}{5}$$

$$\text{EX\#14 } 4x^2 + 12x + 9 = 0$$

$$\textcircled{\frac{3}{2}} = \frac{6}{4} \quad \frac{36}{12} \quad \frac{6}{4} = \left(\frac{3}{2}\right)$$

$$(2x+3)(2x+3) = 0$$

$$x = -\frac{3}{2}$$

$$\text{EX\#15 } 18x^2 - 98 = 0$$

$$2(9x^2 - 49) = 0$$

$$\textcircled{\frac{7}{3}} = \frac{21}{9} \quad \frac{-441}{0} \quad \frac{-21}{9} = \left(\frac{7}{3}\right)$$

$$2(3x+7)(3x-7) = 0$$

$$x = \pm \frac{7}{3}$$

ripout pgs #101-224