

# Factoring Trinomials

Lesson 8-5

# Lesson 8-5 Factoring Trinomials: $x^2 + bx + c$

Factoring  $x^2 + bx + c$ : To factor quadratic trinomials of the form  $x^2 + bx + c$ , find two factors,  $m$  and  $n$ , whose sum is equal to  $b$  and whose product is equal to  $c$ . Then write  $x^2 + bx + c$  using the pattern ( $x+m$ )( $x+n$ ).

$b$  is Negative and  $c$  is Positive

A.  $x^2 - 12x + 27$   
 $(x - 3)(x - 9)$

Factors of 27	Sum of Factors
1, 27	28
3, 9	12
-3, -9	-12

The "b" term is negative and the "c" term is positive, so both factors have to be negative.

$b$  is Positive and  $c$  is Negative

B.  $x^2 + 3x - 18$   
 $(x + 6)(x - 3)$

(Since  $b$  is positive and  $c$  is negative, then one factor must be positive and the other factor must be negative.)

I think: multiply to get 18 and subtract to get 3

Factors of -18	Sum of Factors
-1, 18	17
-2, 9	7
-3, 6	3

# Lesson 8-5 Factoring Trinomials: $x^2 + bx + c$

Practice:

Factor each trinomial.

1.  $x^2 + 3x + 2$   
 $(x + 2)(x + 1)$

Factors of 2	Sum of Factors
1, 2	3

2.  $x^2 - 10x + 16$   
 $(x - 2)(x - 8)$

Factors of 16	Sum of Factors
1, 16	17
2, 8	10

Middle term determines the sign.

3.  $x^2 + 4x - 5$   
 $(x + 5)(x - 1)$

Factors of -5	Sum of Factors
5, -1	4

4.  $x^2 + 11x + 24$   
 $(x + 3)(x + 8)$

Factors of 24	Sum of Factors
1, 24	25
2, 12	14
3, 8	11

5.  $72 + 27a + a^2$   
 Rewrite:  $a^2 + 27a + 72$   
 $(a + 4)(a + 18)$

Factors of 72	Sum of Factors
1, 72	73
2, 36	38
3, 24	27
4, 18	22

# Lesson 8-5 Factoring Trinomials: $x^2 + bx + c$

$b$  is Negative and  $c$  is Negative

- C.  $x^2 - x - 20$   
 $(x-5)(x+4)$
- (Since  $c$  is negative, then one factor must be positive and the other factor must be negative. Since  $b$  is negative, then the larger factor is negative.)

Factors of -20	Sum of Factors
-20, 1	-19
-10, 2	-8
-5, 4	-1

Solve and Equation by Factoring

Always write in standard form  
 $Ax + By + C = 0$

- D. Solve  $x^2 + 2x = 15$   
 $x^2 + 2x - 15 = 0$
- Rewrite equation so that it equals zero.

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

$x-3 = 0$  OR  $x+5 = 0$

$\begin{array}{r} +3 \\ \hline x = 3 \end{array}$        $\begin{array}{r} -5 \\ \hline x = -5 \end{array}$

Factors of -15	Sum of Factors
-1, 15	14
-3, 5	2

The solution is  $\{3, -5\}$ .

- E. Solve  $x^2 - 20 = x$   
 $x^2 - x - 20 = 0$
- Rewrite equation so that it equals zero.

$(x-5)(x+4) = 0$  Factor

$x-5 = 0$  OR  $x+4 = 0$

$\begin{array}{r} +5 \\ \hline x = 5 \end{array}$        $\begin{array}{r} -4 \\ \hline x = -4 \end{array}$

The solution is  $\{5, -4\}$

Hint: Check by putting the original in  $\boxed{y=}$ . Graph and look at  $x$ -intercepts!

# Lesson 8-5 Factoring Trinomials: $x^2 + bx + c$

Practice:

Factor completely

5.  $p^2 - 2p - 35$

$(p+5)(p-7)$

Factors of $-35$	Sum of Factors
1, -35	-34
5, -7	-2

Solve each equation.

6. Solve  $x^2 + 7x + 6 = 0$

$(x+1)(x+6) = 0$  Factor

$x+1 = 0$  OR  $x+6 = 0$

$\frac{-1 \quad -1}{\underline{\quad \quad}} \quad \frac{-6 \quad -6}{\underline{\quad \quad}}$

$x = -1 \quad x = -6$

The solution is  $\{-1, -6\}$ .

Factors of 6	Sum of Factors
1, 6	7

7. Solve  $y^2 + 9 = -10y$

$\frac{+10y \quad +10y}{y^2 + 10y + 9 = 0}$  Rewrite

$(y+9)(y+1) = 0$  Factor

$y+9 = 0$  OR  $y+1 = 0$

$\frac{-9 \quad -9}{\underline{\quad \quad}} \quad \frac{-1 \quad -1}{\underline{\quad \quad}}$

$y = -9 \quad y = -1$

The solution is  $\{-9, -1\}$

Factors of 9	Sum of Factors
1, 9	10

These are the Solutions, the X-intercepts, the Zeros, and the Roots