

## FACTORIZING TRINOMIALS IN THE FORM $x^2 + bx + c$

**Example:**

<p><b>Steps:</b></p> <p>1. Find <u>two factors of 6</u> that will add to 5. (Since 6 is positive, both factors should be the same sign.)</p>	<p style="text-align: center;"><math>6+1=7</math> <math>2+3=5</math></p> <p style="text-align: center;"><math>x^2 + 5x + 6</math></p>
<p>2. Rewrite the trinomial with 4 terms using the factors from step 1.</p>	<p style="text-align: center;"><math>x^2 + 2x + 3x + 6</math></p> <p style="text-align: right; color: red;">notice: <math>2x+3x=5x</math></p>
<p>3. Factor a GCF out of the 1<sup>st</sup> two terms. Factor a GCF out of the 2<sup>nd</sup> two terms.</p>	<p style="text-align: center;"> <math>\overset{\text{GCF}}{x}(x+2) + \overset{\text{GCF}}{3}(x+2)</math>  <span style="color: green; font-size: small;">← Same →</span> </p>
<p>4. Factor out the binomial GCF, leaving the expression written as a product.</p>	<p style="text-align: center;"><math>(x+2)(x+3)</math></p>
<p>5. Check your answer by using the distributive property.</p>	<p style="text-align: center;"> <math>(x+2)(x+3) = x^2 + 3x + 2x + 6</math>  <math>= x^2 + 5x + 6 \quad \checkmark</math> </p>

**Examples:**

$6, 1$   
 $2, 3$

2.  $x^2 - 5x + 6$   
 $-2 + -3 = -5$

$= x^2 - 2x - 3x + 6$

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

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

factors  
are opp.  $6, 1$   
signs  $2, 3$

3.  $x^2 - 5x - 6$   
 $-6 + 1 = -5$

$= x^2 - 6x + x - 6$

$= x(x-6) + (x-6)$

$= (x-6)(x+1)$

4.  $x^2 + 5x - 6$   
 $6 - 1 = 5$

$= x^2 + 6x - x - 6$

$= x(x+6) - (x+6)$

$= (x+6)(x-1)$

$$\begin{array}{l} 12, 1 \\ \underline{6, 2} \\ 3, 4 \end{array}$$

$$5. x^2 + 8x + 12$$

$$x^2 + 6x + 2x + 12$$

$$x(x+6) + 2(x+6)$$

$$(x+6)(x+2)$$

$$12, 1$$

$$\underline{11, 11}$$

$$6. x^2 + 22x + 121$$

$$x^2 + 11x + 11x + 121$$

$$x(x+11) + 11(x+11)$$

$$(x+11)(x+11)$$

$$15, 1$$

$$\underline{5, 3}$$

$$7. x^2 + 2x - 15$$

$$x^2 + 5x - 3x - 15$$

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

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

$$8. x^2 + 3x - 52$$

$$52, 1$$

$$26, 2$$

$$13, 4$$

Not Factorable

$$9. x^2 + x - 72 \quad \begin{array}{l} 72, 1 \\ \underline{9, 8} \\ 12, 6 \\ 3, 24 \\ 4, 18 \end{array}$$

$$x^2 + 9x - 8x - 72$$

$$x(x+9) - 8(x+9)$$

$$(x+9)(x-8)$$

$$10. x^2 - x - 30 \quad \begin{array}{l} 30, 1 \\ 15, 2 \\ \underline{6, 5} \\ 3, 10 \end{array}$$

$$x^2 - 6x + 5x - 30$$

$$x(x-6) + 5(x-6)$$

$$(x-6)(x+5)$$

$$11. x^2 - 2x - 8 \quad \begin{array}{l} 8, 1 \\ \underline{4, 2} \end{array}$$

$$x^2 - 4x + 2x - 8$$

$$x(x-4) + 2(x-4)$$

$$(x-4)(x+2)$$

$$12. x^2 - 16x + 28 \quad \begin{array}{l} 28, 1 \\ \underline{14, 2} \\ 7, 4 \end{array}$$

$$x^2 - 14x - 2x + 28$$

$$x(x-14) - 2(x-14)$$

$$(x-14)(x-2)$$

$$13. x^2 - 17x + 42 \quad \begin{array}{l} 42, 1 \\ 21, 2 \\ 6, 7 \\ \underline{3, 14} \end{array}$$

$$x^2 - 3x - 14x + 42$$

$$x(x-3) - 14(x-3)$$

$$(x-3)(x-14)$$

$$14. x^2 + 12x + 27 \quad \begin{array}{l} 27, 1 \\ \underline{9, 3} \end{array}$$

$$x^2 + 9x + 3x + 27$$

$$x(x+9) + 3(x+9)$$

$$(x+9)(x+3)$$

$$15. x^2 + 3x - 40 \quad \begin{array}{l} 40, 1 \\ 20, 2 \\ 10, 4 \\ \underline{8, 5} \end{array}$$

$$x^2 + 8x - 5x - 40$$

$$x(x+8) - 5(x+8)$$

$$(x+8)(x-5)$$

$$16. x^2 - 6x - 27 \quad \begin{array}{l} 27, 1 \\ \underline{9, 3} \end{array}$$

$$x^2 - 9x + 3x - 27$$

$$x(x-9) + 3(x-9)$$

$$(x-9)(x+3)$$