

# FACTORING TRINOMIALS

$$ax^2 + bx + c$$

If 'a' cannot be factored out by GCF, we use a method called Slip & Slide.



Step 1: "Slip" \_\_\_\_\_ to the end of the trinomial and multiply by \_\_\_\_\_.

Step 2: Factor this new basic trinomial.

Step 3: Divide both your factors by the value you "slipped" over in Step 1.

Step 4: Reduce fractions and "slide" any denominators up next to the variable.

Example 1

$$2x^2 + 5x + 3 \quad 2 \cdot 3 = 6$$

$$\begin{aligned} &2x^2 + 2x + 3x + 3 \\ &2x(x+1) + 3(x+1) \\ &(x+1)(2x+3) \end{aligned}$$

Example 2

$$5m^2 - 17m + 6 \quad 5 \cdot 6 = 30$$

$$\begin{aligned} &5m^2 - 15m - 2m + 6 \\ &5m(m-3) - 2(m-3) \\ &(m-3)(5m-2) \end{aligned}$$

Example 3

$$6y^2 - 5y - 4 \quad 6 \cdot (-4) = -24$$

$$\begin{aligned} &6y^2 - 8y + 3y - 4 \\ &2y(3y-4) + 1(3y-4) \\ &(3y-4)(2y+1) \end{aligned}$$

Example 4

$$12c^2 + 11c - 5 \quad 12 \cdot (-5) = -60$$

$$\begin{aligned} &12c^2 + 15c - 4c - 5 \\ &3c(4c+5) - 1(4c+5) \\ &(4c+5)(3c-1) \end{aligned}$$

Now you try!

Factor the following trinomials. Use FOIL to check.

1.  $4x^2 - 19x - 5 \quad 4 \cdot (-5) = -20$

$$\begin{aligned} &4x^2 - 20x + 1x - 5 \\ &4x(x-5) + 1(x-5) \\ &(x-5)(4x+1) \end{aligned}$$

2.  $6k^2 + 7k + 2 \quad 6 \cdot 2 = 12$

$$\begin{aligned} &6k^2 + 3k + 4k + 2 \\ &3k(2k+1) + 2(2k+1) \\ &(2k+1)(3k+2) \end{aligned}$$

3.  $8y^2 - 10y - 3 \quad 8 \cdot (-3) = -24$

$$\begin{aligned} &8y^2 - 12y + 2y - 3 \\ &~~2y(4y-3) + 1(2y-3)~~ \\ &4y(2y-3) + 1(2y-3) \\ &(2y-3)(4y+1) \end{aligned}$$

<p>4. <math>3w^2 - w - 10</math> <math>3 \cdot 10 = -30</math></p> <p><math>3w^2 - 6w + 5w - 10</math></p> <p><math>3w(w-2) + 5(w-2)</math></p> <p><math>(w-2)(3w+5)</math></p>	<p>5. <math>10p^2 - p - 2</math> <math>10 \cdot -2 = -20</math></p> <p><math>10p^2 - 5p + 4p - 2</math></p> <p><math>5p(2p-1) + 2(2p-1)</math></p> <p><math>(2p-1)(5p+2)</math></p>	<p>6. <math>9x^2 - 3x - 2</math> <math>9 \cdot -2 = -18</math></p> <p><math>9x^2 - 6x + 3x - 2</math></p> <p><math>3x(3x-2) + 1(3x-2)</math></p> <p><math>(3x-2)(3x+1)</math></p>
<p>7. <math>4a^2 - 4a + 1</math> <math>4 \cdot 1 = 4</math></p> <p><math>4a^2 - 2a - 2a + 1</math></p> <p><math>2a(2a-1) - 1(2a-1)</math></p> <p><math>(2a-1)(2a-1)</math></p> <p><math>(2a-1)^2</math></p>	<p>8. <math>2x^2 + 17x - 9</math> <math>2 \cdot -9 = -18</math></p> <p><math>2x^2 + 18x - 1x - 9</math></p> <p><math>2x(x+9) - 1(x+9)</math></p> <p><math>(2x-1)(x+9)</math></p>	<p>9. <math>6x^2 + x - 12</math> <math>6 \cdot -12 = -72</math></p> <p><math>6x^2 + 8x - 8x - 12</math></p> <p><math>3x(2x+3) - 4(2x+3)</math></p> <p><math>(2x+3)(3x-4)</math></p>

## Multi-Step Factoring

Look for a GCF first, then factor the trinomial.

<p>10. <math>20n^2 - 52n - 24</math> <math>5 \cdot 6 = 30</math></p> <p><math>4(5n^2 - 13n - 6)</math></p> <p><math>4(5n^2 - 10n + 2n - 6)</math></p> <p><math>4(5n(n-3) + 2(n-3))</math></p> <p><math>4(n-3)(5n+2)</math></p>	<p>11. <math>10k^2 + 75k + 35</math> <math>2 \cdot 7 = 14</math></p> <p><math>5(2k^2 + 15k + 7)</math></p> <p><math>5(2k^2 + 14k + 1k + 7)</math></p> <p><math>5(2k(k+7) + 1(k+7))</math></p> <p><math>5(k+7)(2k+1)</math></p>	<p>12. <math>12x^2 + 2x - 2</math> <math>6 \cdot -1 = -6</math></p> <p><math>2(6x^2 + x - 1)</math></p> <p><math>2(6x^2 + 3x - 2x - 1)</math></p> <p><math>2(3x(2x+1) - 1(2x+1))</math></p> <p><math>2(2x+1)(3x-1)</math></p>
<p>13. <math>15y^2 - 18y - 24</math> <math>5 \cdot -8 = -40</math></p> <p><math>3(5y^2 - 6y - 8)</math></p> <p><math>3(5y^2 - 10y + 4y - 8)</math></p> <p><math>3(5y(y-2) + 4(y-2))</math></p> <p><math>3(y-2)(5y+4)</math></p>	<p>14. <math>32x^2 - 16x + 2</math> <math>16 \cdot 1 = 16</math></p> <p><math>2(16x^2 - 8x + 1)</math></p> <p><math>2(16x^2 - 4x - 4x + 1)</math></p> <p><del><math>2(4x(4x-1) - 1(4x-1))</math></del></p> <p><math>2(4x-1)(4x-1)</math></p> <p><math>2(4x-1)^2</math></p>	<p>15. <math>12m^2 - 24m - 15</math> <math>4 \cdot -5 = -20</math></p> <p><math>3(4m^2 - 8m - 5)</math></p> <p><math>3(4m^2 - 10m + 2m - 5)</math></p> <p><math>3(2m(2m-5) + 1(2m-5))</math></p> <p><math>3(2m-5)(2m+1)</math></p>