

Factoring Quadratics...when  $a = 1$ 

Factoring is all about solving a puzzle—figuring out what two numbers will give you the result that you want.

<p><b>EXAMPLE</b> What 2 numbers will: multiply to equal 12 &amp; add to equal 7? (1)(12) = 12, but <math>1 + 12 \neq 7</math>. NOPE. (2)(6) = 12, but <math>2 + 6 \neq 7</math>. NOPE. (3)(4) = 12, and <math>3 + 4 = 7</math>! Found it. <span style="border: 1px solid black; padding: 2px;">3 &amp; 4</span></p>	1. What numbers will: multiply to equal 10 & add to equal 7?	2. What numbers will: multiply to equal 16 & add to equal 8?
<p><b>EXAMPLE</b> What 2 numbers will: multiply to equal 22 &amp; add to equal -13? (1)(22) = 22, but <math>1 + 22 \neq -13</math>. NO. (-1)(-22) = 22 but <math>-1 + -22 \neq -13</math>. NO. (-2)(-11) = 22, and <math>-2 + -11 = -13</math>! <span style="border: 1px solid black; padding: 2px;">-2 &amp; -11</span></p>	3. What numbers will: multiply to equal 15 & add to equal -8?	4. What numbers will: multiply to equal 20 & add to equal -12?
<p><b>EXAMPLE</b> What 2 numbers will: multiply to equal -36 &amp; add to equal 5? (1)(-36) = -36, but <math>1 + -36 \neq 5</math>. (-1)(36) = -36, but <math>-1 + 36 \neq 5</math>. (-6)(6) = -36, but <math>-6 + 6 \neq 5</math>. (4)(-9) = -36, but <math>4 + -9 \neq 5</math>. (-4)(9) = -36, and <math>-4 + 9 = 5</math>. <span style="border: 1px solid black; padding: 2px;">-4 &amp; 9</span></p>	5. What numbers will: multiply to equal -24 & add to equal -5?	6. What numbers will: multiply to equal -18 & add to equal 3?

Now, to factor a quadratic, you have to do the exact same thing you did above, but the question will be written differently, as will the answer—the process is the same! **When the problem says: Factor.  $ax^2 + bx + c$ , you're looking for two numbers that multiply to equal C, and add to equal B! This only works when  $a = 1$ !**

<p><b>EXAMPLE</b> Factor. <math>x^2 + 7x + 12</math> <math>a = 1</math>, so... What numbers multiply to = 12 (c), and add to = 7 (b)? (3)(4) = 12 &amp; <math>3 + 4 = 7 \rightarrow 3 \&amp; 4</math>! <math>x^2 + 7x + 12 = \text{span style="border: 1px solid black; padding: 2px;"&gt;(x + 3)(x + 4)</math></p>	7. Factor. $x^2 + 7x + 10$	8. Factor. $x^2 + 8x + 16$
<p><b>EXAMPLE</b> Factor. <math>x^2 - 13x + 22</math> <math>a = 1</math>, so... What numbers multiply to = 22 (c), and add to = -13 (b)? (-2)(-11) = 22 &amp; <math>-2 + -11 = -13</math> <math>\rightarrow -2 \&amp; -11</math> <math>x^2 - 13x + 22 = \text{span style="border: 1px solid black; padding: 2px;"&gt;(x - 2)(x - 11)</math></p>	9. Factor. $x^2 - 8x + 15$	10. Factor. $x^2 - 12x + 20$
<p><b>EXAMPLE</b> Factor. <math>x^2 + 5x - 36</math> <math>a = 1</math>, so... What numbers multiply to = -36 (c), and add to = 5 (b)? (-4)(9) = -36 &amp; <math>-4 + 9 = 5</math> <math>x^2 + 5x - 36 = \text{span style="border: 1px solid black; padding: 2px;"&gt;(x - 4)(x + 9)</math></p>	11. Factor. $x^2 - 5x - 24$	12. Factor. $x^2 + 3x - 18$

**Quadratics Skill Review:** Determine the vertex.

13. $f(x) = 3x^2 + 18x - 2$ It's in standard form: $ax^2 + bx + c$ Use: $x = -\frac{b}{2a}$ , then plug that in for y!	14. $f(x) = -4(x + 6)^2 + 3$ It's in vertex form: $a(x - h)^2 + k$ Vertex is just $(h, k)$	15. $f(x) = 5(x - 7)^2$ It's in vertex form: $a(x - h)^2 + k$
16. $f(x) = -2x^2 + 16x + 9$ It's in standard form: $ax^2 + bx + c$	17. $f(x) = (x - 3)^2 + 8$	18. $f(x) = -x^2 + 10x - 3$

**Quadratics Skill Review:** Simplify.

19. $(-3 + 6i) + (2 - 7i)$	20. $(5 - 4i) - (9 - 2i)$	21. $(10 - 3i)(5 + 2i)$
22. Multiply top and bottom by same complex # with middle sign switched! $\frac{3}{2 - 2i}$	23. conjugate is...? $\frac{1}{-5 + 3i}$	24. $\frac{7}{6 + 5i}$

**Skill You'll Need:** Perform the magic step...I'm not going to explain it here. Just do what I do—even though it's weird.

<b>EXAMPLE:</b> $x^2 + 10x = -3$ $10 \div 2 = 5$ So... $(x + 5)^2 = -3 + (5)^2$	<b>EXAMPLE:</b> $x^2 - 8x = 17$ $-8 \div 2 = -4$ So... $(x - 4)^2 = 17 + (-4)^2$	<b>EXAMPLE:</b> $x^2 + 22x = 5$ $22 \div 2 = 11$ So... $(x + 11)^2 = 5 + (11)^2$	<b>EXAMPLE:</b> $x^2 - 14x = -50$ $-14 \div 2 = -7$ So... $(x - 7)^2 = -50 + (-7)^2$
25. $x^2 + 20x = -7$	26. $x^2 - 16x = -1$	27. $x^2 - 2x = 9$	28. $x^2 + 18 = 6$

**Skill You'll Need:** Simplify.

<b>EXAMPLE</b> $\frac{-18 \pm \sqrt{9}}{3} = \frac{-18 \pm 3}{3} = -6 \pm 1$ $= -6 + 1 = \boxed{-5}$ or $= -6 - 1 = \boxed{-7}$	29. $\frac{2 \pm \sqrt{36}}{2}$	30. $\frac{-15 \pm \sqrt{100}}{5}$
<b>EXAMPLE</b> $\frac{-8 \pm \sqrt{-12}}{2}$ $= \frac{-8 \pm i\sqrt{4}\sqrt{3}}{2} = \frac{-8 \pm 2i\sqrt{3}}{2} = \boxed{-4 \pm i\sqrt{3}}$	31. $\frac{6 \pm \sqrt{-45}}{3}$	32. $\frac{-10 \pm \sqrt{-50}}{5}$