

Name: _____

Converting to Factored Form when a isn't 1
By Factoring

When $a = 1$, factoring is fairly straightforward: (1) determine what two numbers multiply to AC & add to B , (2) split the x term using those two values, (3) factor the GCF out of each set of two terms, (4) use backwards distribution to write the equation in two (groups). Factoring when $a \neq 1$ works the same way, except for extra step that you have to add to the end: factoring out a (even when it doesn't divide evenly).

Before we start factoring from standard form, we need to practice this extra step.

<p>Example 1: $f(x) = (-6x + 12)(x - 4)$ <i>$(-6x+12)$ should not have the -6 Factor it out of that ()!</i> $-6(x + ?)(x-4)$ $f(x) = -6\left(\frac{-6x}{-6} + \frac{12}{-6}\right)(x - 4)$ <i>Simplify.</i> $f(x) = -6(x - 6)(x - 4)$</p>	<p>Example 2: $g(x) = (x + 5)(7x + 9)$ <i>$(7x+9)$ should not have the 7 Factor it out of that ()!</i> $7(x+5)(x + ?)$ $g(x) = 7(x + 5)\left(\frac{7x}{7} + \frac{9}{7}\right)$ <i>Simplify.</i> $g(x) = 7(x + 5)\left(x + \frac{9}{7}\right)$</p>	<p>Example 3: $h(x) = (2x + 3)(3x - 6)$ <i>$(2x+3)$ should not have the 2! Factor it out of that ()!</i> $2(x + ?)(3x-4)$ $h(x) = 2\left(\frac{2x}{2} + \frac{3}{2}\right)(3x - 6)$ $h(x) = 2\left(x + \frac{3}{2}\right)(3x - 6)$ <i>$(3x-6)$ should not have the 3! Factor it out of that ()!</i> <i>3 multiplies to the $2(x+3/2)(x + ?)$</i> $h(x) = 3(2)\left(x + \frac{3}{2}\right)\left(\frac{3x}{3} - \frac{6}{3}\right)$ <i>Simplify.</i> $h(x) = 3(2)\left(x + \frac{3}{2}\right)(x - 2)$ $g(x) = 6\left(x + \frac{3}{2}\right)(x - 2)$</p>
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1. $f(x) = (3x + 3)(x - 2)$	2. $g(x) = (2x + 4)(x - 5)$	3. $h(x) = (-5x + 10)(x + 1)$
4. $j(x) = (3x + 6)(2x - 2)$	5. $k(x) = (2x + 4)(-x + 3)$	6. $m(x) = (-x + 6)(x - 8)$
7. $n(x) = (5x + 1)(x - 3)$	8. $p(x) = (3x + 2)(-5x - 1)$	9. $r(x) = (2x - 3)(-2x + 5)$

Answers

1. $f(x) = 3(x + 1)(x - 2)$	2. $g(x) = 2(x + 2)(x - 5)$	3. $h(x) = -5(x - 2)(x + 1)$
4. $j(x) = 6(x + 2)(x - 1)$	5. $k(x) = -2(x + 2)(x - 3)$	6. $m(x) = -(x - 6)(x - 8)$
7. $n(x) = 5\left(x + \frac{1}{5}\right)(x - 3)$	8. $p(x) = -15\left(x + \frac{2}{3}\right)\left(x - \frac{1}{5}\right)$	9. $r(x) = -4\left(x - \frac{3}{2}\right)\left(x - \frac{5}{2}\right)$

Now that you know how to finish factoring, use the same process from factoring when $a = 1$, then finish by factoring out a .

Example 4:

$h(x) = 6x^2 + x - 12$		
<p>What multiplies to AC and adds to B?</p> <p>Split the x term using those two numbers.</p>		
$h(x) = 6x^2 + 9x - 8x - 12$		
<p>What is the GCF for each group of 2?</p> <p>Put that in the front of each group then re-write: GCF ()</p>	$6x^2 + 9x$ $3x(6x^2 \div 3x + 9x \div 3x)$ GCF: $3x$	$-8x - 12$ $-4(-8x \div -4 - 12 \div -4)$ GCF: -4
$h(x) = 3x(2x + 3) - 4(2x + 3)$		
Use backwards distribution to rewrite the equation.		
$h(x) = (2x + 3)(3x - 4)$		
<p>Factor out the numbers in front of x & divide out a.</p>	2 in front $\left(\frac{2x}{2} + \frac{3}{2}\right)$	3 in front $\left(\frac{3x}{3} - \frac{4}{3}\right)$
$h(x) = (3)(2) \left(x + \frac{3}{2}\right) \left(x - \frac{4}{3}\right)$		
Simplify a .		
$h(x) = 6 \left(x + \frac{3}{2}\right) \left(x - \frac{4}{3}\right)$		

10. $f(x) = 3x^2 - 3x - 6$	11. $g(x) = 2x^2 - 6x - 20$	12. $h(x) = -5x^2 + 5x + 10$
13. $j(x) = 6x^2 + 6x - 12$	14. $k(x) = -2x^2 + 2x + 12$	15. $m(x) = -x^2 + 14x - 48$
16. $n(x) = 5x^2 - 14x - 3$	17. $p(x) = -15x^2 - 13x - 2$	18. $r(x) = -4x^2 + 16x - 15$

Answers

10. $f(x) = 3(x + 1)(x - 2)$	11. $g(x) = 2(x + 2)(x - 5)$	12. $h(x) = -5(x - 2)(x + 1)$
13. $j(x) = 6(x + 2)(x - 1)$	14. $k(x) = -2(x + 2)(x - 3)$	15. $m(x) = -(x - 6)(x - 8)$
16. $n(x) = 5 \left(x + \frac{1}{5}\right) (x - 3)$	17. $p(x) = -15 \left(x + \frac{2}{3}\right) \left(x - \frac{1}{5}\right)$	18. $r(x) = -4 \left(x - \frac{3}{2}\right) \left(x - \frac{5}{2}\right)$