

3.2

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Objective: I can factor a trinomial.

Binomial Analysis: Multiply the following.

a) $(x+3)(x+5)$

$x^2 + 8x + 15$

b) $(n-7)(n-4)$

$n^2 - 11n + 28$

c) $(t-8)(t-8)$

$t^2 - 16t + 64$

d) Explain how the numbers in your answer relate to the numbers in the factors?

in () add to middle term
& multiply to last term

$x^2 + bx + c$ Factoring a Trinomial where the 1st term is x^2 OR $a = 1$

<ol style="list-style-type: none"> GCF! If there is a GCF, factor it out. $x^2 + bx + c$, Find two numbers that multiply to c and add/subtract to b. NOTE: IF there are no numbers, then the polynomial is PRIME. Rewrite the middle term bx as 1st # · x + 2nd # · x. Factor the resulting polynomial. If you factored a GCF, remember to put it back in. 	<p>Example $x^2 - 4x - 45$</p> <p>Step 2: $b = -4$ $c = -45$ $(-9)(5) = -45$ $-9 + 5 = -4$</p> <p>Step 3: $x^2 - 9x + 5x - 45$</p> <p>Step 4: $(x^2 - 9x) + (5x - 45)$ $x(x - 9) + 5(x - 9)$</p> <p>Factors: $(x - 9)(x + 5)$</p>
<p>Shortcut where the 1st term is x^2 OR $a = 1$</p> <ol style="list-style-type: none"> GCF! If there is a GCF, factor it out. $x^2 + bx + c$, Find two numbers that multiply to c and add/subtract to b. The direct factored form of $x^2 + bx + c$ is $(x + 1st \#)(x + 2nd \#)$. If you factored a GCF, put it back in. 	<p>$2x^2 - 8x - 90$</p> <p>Step 1: GCF = 2 $2(x^2 - 4x - 45)$</p> <p>Step 2: $b = -4$ $c = -45$ $(-9)(5) = -45$ $-9 + 5 = -4$</p> <p>Step 3: $(x - 9)(x + 5)$</p> <p>Step 4: $2(x - 9)(x + 5)$</p>

Practice: Factor the following polynomials.

a) $x^2 + 11x + 30$

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

b) $m^2 - 8m + 16$

$(m-4)(m-4)$
OR
 $(m-4)^2$

c) $3t^2 + 18t - 120$ **GCF**

$3(t-4)(t+10)$

d) $-5g^2 + 25g - 30$

$-5(g-3)(g-2)$

★ if top # is pos - both # will same sign
★ if top # is neg - one of each sign

Binomial Analysis: Multiply the following

a) $(2x + 3)^2$

b) $(3v-1)(v+2)$

c) $(4c-3)(7c-2)$

$3v^2 + 5v - 2$

$ax^2 + bx + c$ Factoring a Trinomial where the 1st coefficient is NOT 1 OR $a \neq 1$

- GCF!** If there is a GCF, factor it out.
- $ax^2 + bx + c$, Find two numbers that multiply to the answer for $(a \cdot c)$ and add/subtract to b .
- NOTE:** IF there are no numbers, then the polynomial is **PRIME**.
- Rewrite the middle term bx as **1st # $\cdot x$ + 2nd # $\cdot x$** .
- Factor the resulting polynomial.
- If you factored a **GCF**, remember to put it back in.

Example

$12x^2 + x - 6$

Step 2: $b = 1$ $a \cdot c = -72$

$(8)(-9) = -72$

$8 - 9 = -1$

Step 3: $12x^2 + 8x - 9x - 6$

Step 4: $(12x^2 + 8x) + (-9x - 6)$

$4x(3x + 2) - 3(3x + 2)$

Factors: $(3x + 2)(4x - 3)$

Practice: Factor the following polynomials.

a) $9h^2 + 9h + 2$

~~$\frac{18}{9}$~~ ~~$\frac{3}{9}$~~ ~~$(h+2)(h+3)$~~

$9h^2 + 6h + 3h + 2$
 $3h(3h+2) + 1(3h+2)$
 $(3h+2)(3h+1)$

b) $2z^2 - 11z + 12$

~~$\frac{24}{-11}$~~ ~~$\frac{-3}{-8}$~~

$2z^2 - 3z - 8z + 12$
 $z(2z-3) - 4(2z-3)$
 $(2z-3)(z-4)$

check
 $(2z-3)(z-4)$
 $2z^2 - 3z - 8z + 12$
 $2z^2 - 11z + 12$

c) $4x^2 - 12x + 9$

~~$\frac{36}{-12}$~~ ~~$\frac{-6}{-6}$~~

$4x^2 - 6x - 6x + 9$
 $2x(2x-3) - 3(2x-3)$
 $(2x-3)(2x-3)$
 OR $(2x-3)^2$

d) $9w^2 + 18w - 6$ GCF = 3

$3(\frac{3}{1}w^2 + 6w - 2)$ ~~$\frac{-6}{6}$~~

e) $12y^2 + 30y - 72$

f) $4x^2 - 2xy - 12y^2$ GCF = 2

$2(2x^2 - xy - 6y^2)$ ~~$\frac{-12}{4}$~~ ~~$\frac{3}{-1}$~~

$2x^2 - 4xy + 3xy - 6y^2$
 $2x(x-2y) + 3y(x-2y)$
 $2(x-2y)(2x+3y)$

Factoring by looking for quadratic form expressions:

$ax^2 + bx + c$ **Standard Quadratic form.**

1. The given problem is a TRINOMIAL
2. The variables have the pattern of (variable) and (variable)²
3. Can factor using quadratic factoring rules.

Practice: Factor the following polynomials.

a) $x^4 - 18x^2 + 81$

$(x^2 - 9)(x^2 - 9)$
 $(x^2 - 9)^2$
 $\frac{9 \times 81}{-18} = -9$

b) $2x^6 + 8x^3 - 90$

$(x^3)(x^3)$

c) $4x^4 - 3x^2 - 10$

$(x^2)(x^2)$

d) $6x^8 + 22x^4 + 12$

$(x^4)(x^4)$

$ax^2 + bx + c = 0$ **Solving a Quadratic Equation:**

1. Make sure your equation is set = 0.
NOTE: If Equation is already factored, DO NOT multiply. Go to step 3.
2. Factor the equation using quadratic factoring rules.
3. Set each x-factor = 0.
4. Solve each factor.

Practice: SOLVE the following polynomials.

a) $(x - 1)(x + 4)(2x + 3) = 0$

factored ()
 $x - 1 = 0$ $x + 4 = 0$ $2x + 3 = 0$
 $x = 1$ $x = -4$ $x = -\frac{3}{2}$

b) $3x^2 - 12x = 0$

$(3x)(x - 4) = 0$
 $3x = 0$ $x - 4 = 0$
 $x = 0, 4$

c) $4y^2 - 4y + 1 = 0$

d) $4z^2 + 12z + 8 = 0$

$4(z^2 + 3z + 2) = 0$
 $4(z + 2)(z + 1) = 0$
 $z + 2 = 0$ $z + 1 = 0$
 $z = -2$ $z = -1$

e) $5x^3 - 15x^2 - 50x = 0$

f) $(w + 6)(w^2 - 9w + 20) = 0$