7.5 Solving Quadratic Equations by Factoring (Review of Factoring)

Review of Factoring using GCF, Inspection and Window Method

$y = (x - 4)(x + 3)$ ⟷ $y = x^2 - x - 12$

FACTORED FORM — EXPANDED FORM

Note:

- **Factoring quadratics is the opposite of expanding(FOIL'ing/Binomial Bob). Factoring adds the brackets while FOIL/BB removes the brackets**

Greatest Common Factor

EXAMPLE #1:

FACTOR THE FOLLOWING:

a) $y = x^2 + 2x$ GCF: x

$y = x(x+2)$

b) $f(x) = -2x^2 - 8x$ GCF: $-2x$

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

c) $y = 6x^2 - 9x + 30$ GCF: 3

$y = 3(2x^2 - 3x + 10)$

d) $f(x) = -15x^2y^6 - 10x^3y^9 + 15x^{11}$ GCF: $-5x^2$

$f(x) = -5x^2(3y^6 + 2xy^9 - 3x^9)$

Trinomials Where a = 1

EXAMPLE #2: Factor the following:

a) $y = x^2 - 10x + 16$

$x \cdot -2 = -2x$, $x \cdot -8 = -8x$, $-2x + -8x = -10x$ ← middle term.

$y = (x-2)(x-8)$

b) $y = x^2 + 2x - 8$

$x \cdot 4 = 4x$, $x \cdot -2 = -2x$, $4x + -2x = 2x$

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

c) $y = x^2 + 3x - 10$

$x \cdot 5 = 5x$, $x \cdot -2 = -2x$, $5x + -2x = 3x$

$y = (x+5)(x-2)$

d) $f(x) = x^2 + 13x + 40$

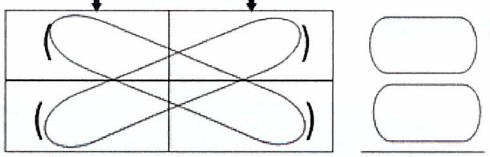
$x \cdot 8 = 8x$, $x \cdot 5 = 5x$, $8x + 5x = 13x$

$f(x) = (x+8)(x+5)$

Trinomials Where a ≠1

FACTORING WHEN "A" IS A NUMBER OTHER THAN 1:

$y = ax^2 + bx + c$



ANSWER WILL BE:

y = ( )( )

EXAMPLE #3: Factor the following

a) $y = 2x^2 - 10x - 12$

$2x \nearrow -2 \quad -2x$
$x \searrow 6 \quad 12x$
$10x$

$y = (2x-2)(x+6)$

☆ (b) $f(x) = -x^2 + 12x - 35$ GCF = -1

$f(x) = -1(x^2 - 12x + 35)$

$x \nearrow -5 \quad -5x$
$x \searrow -7 \quad -7x$
$-12x$

$f(x) = -1(x-5)(x-7)$

c) $g(x) = 2x^2 + x - 3$

$2x \nearrow 3 \quad 3x$
$x \searrow -1 \quad -2x$
$1x$

$g(x) = (2x+3)(x-1)$

d) $y = 3x^2 - 20x - 7$

$3x \nearrow 1 \quad 1x$
$x \searrow -7 \quad -21x$
$-20x$

$y = (3x+1)(x-7)$

☆ (e) $y = 8x^2 - 18x - 5$

$4x \nearrow 1 \quad 2x$
$2x \searrow -5 \quad -20x$
$-18x$

$y = (4x+1)(2x-5)$

f) $y = 5x^2 + 7x - 6$

$5x \nearrow -3 \quad -3x$
$1x \searrow 2 \quad 10x$
$7x$

$y = (5x-3)(x+2)$

Difference of Squares

What do we need in order for a question to be a difference of squares?

- Binomial
- Terms being subtracted
- Both terms are perfect Squares.

EXAMPLE #4: Factor the following

a) $y = x^2 - 4$

$y=(x-2)(x+2)$

b) $f(x) = 4x^2 - 25$

$f(x)=(2x-5)(2x+5)$

FACTORING FLOWCHART:

Putting it all Together

1. **ALWAYS CHECK FOR GCF FIRST, factor it out if there is one**
2. **Do you have ax^2+bx+c where a = 1? Do the "easy factoring"**
3. **Do you have ax^2+bx+c where a is NOT 1? Use the "Window" method of factoring**
4. **Do you have $ax^2- b$ where "a" and "b" are perfect squares? Use difference of squares**

EXAMPLE #5: Factor the following

a) $h(x) = 2x^2 - 10x - 12$

$2x \quad -6 \;\Big|\; -6x$
$x \quad -2 \;\Big|\; -4x$
$\qquad\qquad -10x$

$h(x)=(2x-6)(x-2)$

b) ~~$y = -x^2 + 12x - 35$~~ already did this.

$y=-1(x^2-12x+35)$

c) $y = 2x^2 + 18x + 28$

$2x \quad 4 \;\Big|\; 4x$
$x \quad 7 \;\Big|\; 14x$
$\qquad\qquad 18x$

$y=(2x+4)(x+7)$

d) $f(x) = 4x^2 - 100$ GCF = 4

$f(x)=(2x^2-10)(2x^2+10)$

$f(x)=4(2x^2-25)$

$f(x)=4(x-5)(x+5)$

e) $y = -9x^2 + 48x + 36$ GCF = -3

$y=-3(3x^2-16x-12)$

$y=-3(3x+2)(x-6)$

Review of Factoring Assignment

1. Factor the following questions:

a)	$y = 15x^2 - 65x + 20$	b)	$g(x) = 18x^2 + 15x - 18$
c)	$y = 12x^2 - 52x - 40$	d)	$f(x) = 24x^2 - 2x - 70$
e)	$y = 4x^2 + 4x - 48$	f)	$y = -5x^2 + 40x - 35$
g)	$h(x) = -3m^2 - 18m - 24$	h)	$f(x) = 10x^2 + 80x + 120$
i)	$y = 7x^2 - 35x + 42$	j)	$y = 18x^2 - 2$
k)	$f(x) = 16x^2 - 1$	l)	$g(x) = -x^2 + 1$
m)	$y = 16x^2 - 81$	n)	$h(x) = 2 - 8x^2$

2. Factor fully . Use the strategy that you prefer.

a)	$9k + 6$	b)	$3x^2 - 6x^4$	c)	$-3c^2 - 13c^4 - 12c^3$
d)	$x^2 + 12x - 28$	e)	$y^2 - 2y - 48$	f)	$8a^2 + 18a - 5$
g)	$15a^2 - 65a + 20$	h)	$s^2 + 11s + 30$	i)	$2x^2 + 14x + 6$
j)	$3x^2 + 15x - 42$	k)	$15a^3 - 3a^2b - 6ab^2$	l)	$w^2 + 10w - 24$
m)	$3c^2d - 10cd - 2d$	n)	$f^2 + 17f + 16$	o)	$4t^2 + 9t - 28$
p)	$h^2 - 25j^2$	q)	$6x^2 - 17xy + 5y^2$	r)	$28a^2 - 7a^3$
s)	$25t^2 + 20tu + 4u^2$	t)	$3x^2 - 3x - 60$	u)	$18m^2 - 2n^2$

SOLUTIONS:

1.

a)	$y = 5(x-4)(3x-1)$	b)	$g(x) = 3(2x+3)(3x-2)$	c)	$y = 4(3x+2)(x-5)$
d)	$f(x) = 2(3x+5)(4x-7)$	e)	$y = 4(x+4)(x-3)$	f)	$y = -5(x-7)(x-1)$
g)	$h(x) = -3(x+4)(x+2)$	h)	$f(x) = 10(x+6)(x+2)$	i)	$y = 7(x-3)(x-2)$
j)	$y = 2(3x-1)(3x+1)$	k)	$f(x) = (4x-1)(4x+1)$		
l)	$g(x) = -(x-1)(x+1)$ or $g(x) = (1-x)(1+x)$			m)	$y = (4x-9)(4x+9)$
n)	$h(x) = 2(1-2x)(1+2x)$				

2.

a)	$3(3K+2)$	b)	$3x^2(1-2x^2)$	c)	$-c^2(3+13c^2+12c)$
d)	$(x+14)(x-2)$	e)	$(y-8)(y+6)$	f)	$(4a-1)(2a+5)$
g)	$5(3a-1)(a-4)$	h)	$(s+5)(s+6)$	i)	$2(x^2+7x+3)$
j)	$3(x+7)(x-2)$	k)	$3a(5a^2-ab-2b^2)$	l)	$(w+12)(w-2)$
m)	$d(3c^2-10c-2)$	n)	$(f+16)(f+1)$	o)	$(4t-7)(t+4)$
p)	$(h-5j)(h+5j)$	q)	$(3x-y)(2x-5y)$	r)	$7a^2(4-a)$
s)	$(5t+2u)^2$	t)	$3(x-5)(x+4)$	u)	$2(3m-n)(3m+n)$