6.3 Factoring Trinomials of the Form $ax^2 + bx + c$ & Perfect Square Trinomials DAY ONE
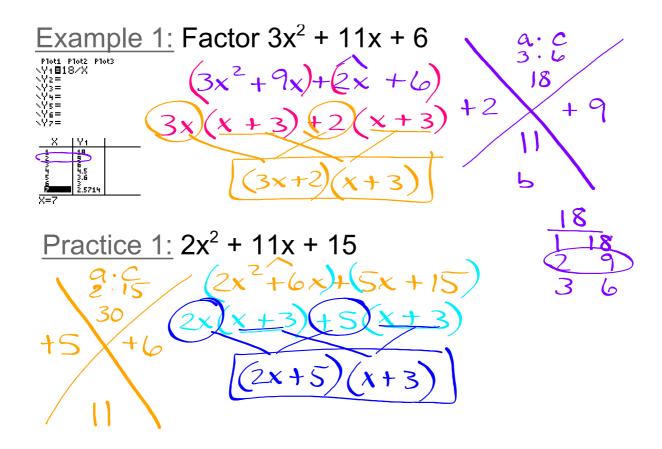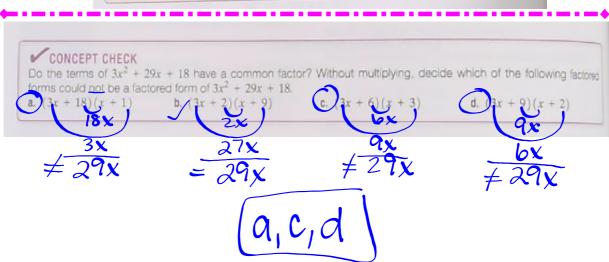
OBJECTIVE 1: Factoring Trinomials of the Form $\underline{a}x^2 + bx + c$

$a \neq 1$

Notice now the leading coefficient or your a something other than one. We will use an X method and factor by grouping each time for consistency! It ALWAYS works!

Example 1: Factor $3x^2 + 11x + 6$

$(3x^2 + 9x) + (2x + 6)$

$3x(x + 3) + 2(x + 3)$

$(3x + 2)(x + 3)$

$a \cdot c$
$3 \cdot 6$
18

$+2 \quad +9$

11

b

18
$1 \quad 18$
$2 \quad 9$
$3 \quad 6$

Practice 1: $2x^2 + 11x + 15$

$a \cdot c$
$2 \cdot 15$
30

$+5 \quad +6$

11

$(2x^2 + 6x) + (5x + 15)$

$2x(x + 3) + 5(x + 3)$

$(2x + 5)(x + 3)$

1

Helpful Hint

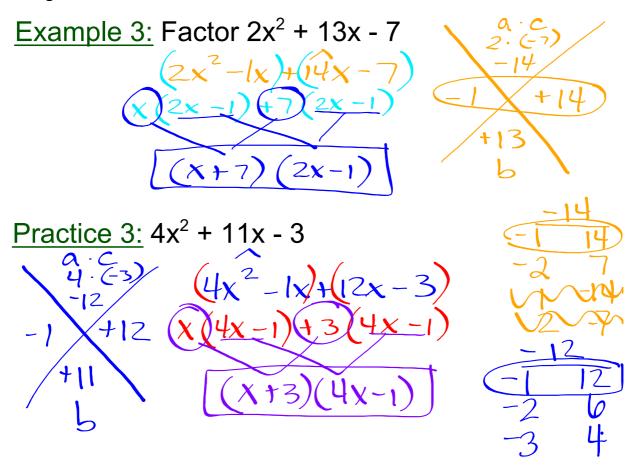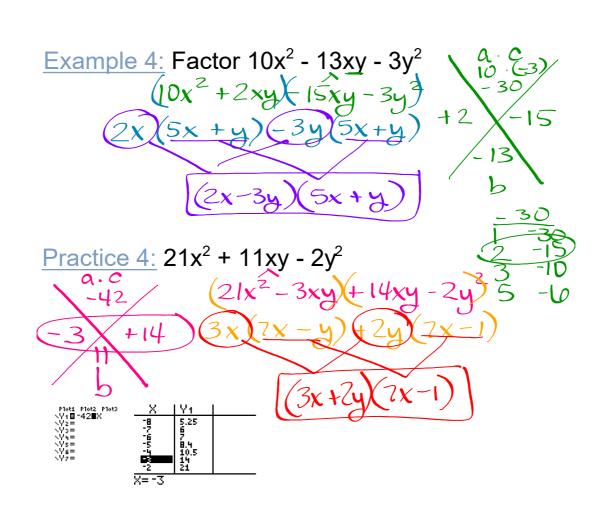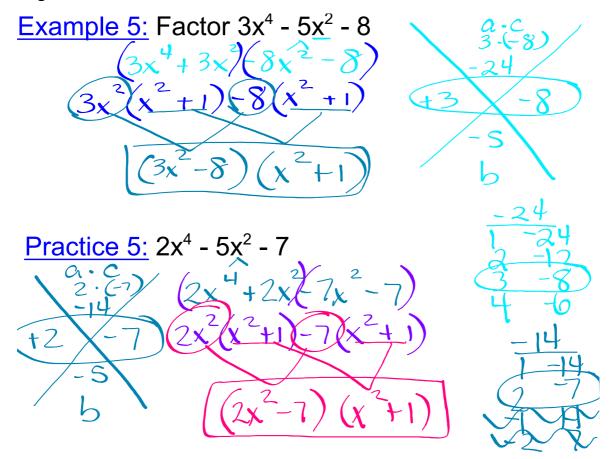If the terms of a trinomial have no common factor (other than 1), then the terms of neither of its binomial factors will contain a common factor (other than 1).

✓ **CONCEPT CHECK**

Do the terms of $3x^2 + 29x + 18$ have a common factor? Without multiplying, decide which of the following factored forms could not be a factored form of $3x^2 + 29x + 18$.

a. $(3x + 18)(x + 1)$ b. $(3x + 2)(x + 9)$ c. $(3x + 6)(x + 3)$ d. $(3x + 9)(x + 2)$

a. $18x$ / $3x$ $\neq 29x$

b. $2x$ / $27x$ $= 29x$

c. $6x$ / $9x$ $\neq 29x$

d. $9x$ / $6x$ $\neq 29x$

$\boxed{a, c, d}$

Example 2: Factor $8x^2 - 22x + 5$

$(8x^2 - 2x)(-20x + 5)$

$2x(4x - 1) -5(4x - 1)$

$\boxed{(2x - 5)(4x - 1)}$

$a \cdot c$
$8 \cdot 5$
40

$-2 \qquad -20$

-22

b

Practice 2: $15x^2 - 22x + 8$

$a \cdot c$
$15 \cdot 8$
120

$-10 \diagdown -12$

-22

b

$(15x^2 - 10x)(-12x + 8)$

$5x(3x - 2) -4(3x - 2)$

$\boxed{(5x - 4)(3x - 2)}$

40
$1 \quad 40$
$2 \quad -20$
$4 \quad -10$
$5 \quad -8$

Plot1 Plot2 Plot3
\Y1 ◘120/X█
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=

X	Y1
-10	-12
-9	-13.33
-8	-15
-7	-17.14
-6	-20
-5	-24
-4	-30

X=-10

Example 3: Factor $2x^2 + 13x - 7$

$(2x^2 - 1x) + (14x - 7)$

$x(2x - 1) + 7(2x - 1)$

$(x + 7)(2x - 1)$

$a \cdot c$
$2 \cdot (-7)$
-14

| -1 | $+14$ |

$+13$
b

Practice 3: $4x^2 + 11x - 3$

$a \cdot c$
$4 \cdot (-3)$
-12

| -1 | $+12$ |

$+11$
b

$(4x^2 - 1x) + (12x - 3)$

$x(4x - 1) + 3(4x - 1)$

$(x + 3)(4x - 1)$

-14

| -1 | 14 |
| -2 | 7 |

-12

-1	12
-2	6
-3	4

Example 4: Factor $10x^2 - 13xy - 3y^2$

$(10x^2 + 2xy) + (-15xy - 3y^2)$

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

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

$a \cdot c$
$10 \cdot (-3)$
-30

$+2$ -15

-13
b

-30

1	-30
2	-15
3	-10
5	-6

Practice 4: $21x^2 + 11xy - 2y^2$

$a \cdot c$
-42

| -3 | $+14$ |

11
b

$(21x^2 - 3xy) + (14xy - 2y^2)$

$3x(7x - y) + 2y(7x - 1)$

$(3x + 2y)(7x - 1)$

```
Plot1 Plot2 Plot3
\Y1 = -42■X
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
```

X	Y1
-8	5.25
-7	6
-6	7
-5	8.4
-4	10.5
-3	14
-2	21

X= -3

Example 5: Factor $3x^4 - 5x^2 - 8$

$(3x^4 + 3x^2)(-8x^2 - 8)$

$3x^2(x^2 + 1) - 8(x^2 + 1)$

$(3x^2 - 8)(x^2 + 1)$

$a \cdot c$
$3 \cdot (-8)$
-24

$+3 \quad -8$

-5
b

Practice 5: $2x^4 - 5x^2 - 7$

$a \cdot c$
$2 \cdot (-7)$
-14

$+2 \quad -7$

-5
b

$(2x^4 + 2x^2)(-7x^2 - 7)$

$2x^2(x^2 + 1) - 7(x^2 + 1)$

$(2x^2 - 7)(x^2 + 1)$

-24
1	-24
2	-12
3	-8
4	-6

-14
1	-14
2	-7

Helpful Hint

Study the last two lines of Example 5. If a factoring attempt gives you a middle term whose numerical coefficient is the opposite of the desired numerical coefficient, try switching the signs of the last terms in the binomials.

Switched signs
$(3x^2 + 8)(x^2 - 1) = 3x^4 + 5x^2 - 8$ Middle term: $+5x^2$

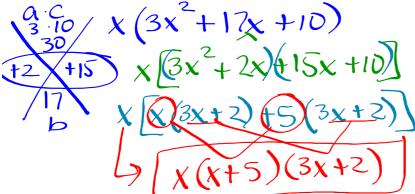$(3x^2 - 8)(x^2 + 1) = 3x^4 - 5x^2 - 8$ Middle term: $-5x^2$

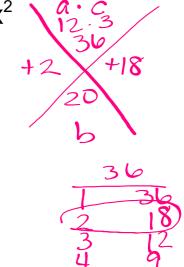# OBJECTIVE 2: Factoring Out The Greatest Common Factor (GCF)

Don't forget that the FIRST STEP in factoring ALWAYS is to look for a greatest common factor to factor out of EVERYTHING! Do not forget the GCF in the final factored form.
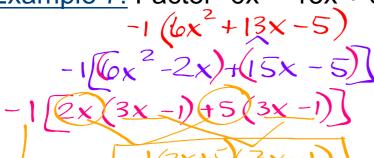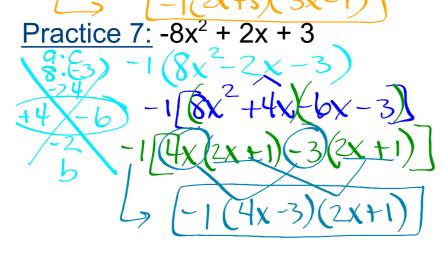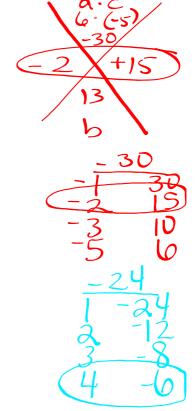
Example 6: Factor $24x^4 + 40x^3 + 6x^2$

$2x^2(12x^2 + 20x + 3)$

$2x^2[(12x^2 + 2x) + (18x + 3)]$

$2x^2[2x(6x + 1) + 3(6x + 1)]$

$2x^2(2x + 3)(6x + 1)$

$a \cdot c$
$12 \cdot 3$
36
$+2 \quad\quad +18$
20
b

36

1	36
2	18
3	12
4	9
6	6

Practice 6: $3x^3 + 17x^2 + 10x$

$x(3x^2 + 17x + 10)$

$x[(3x^2 + 2x) + (15x + 10)]$

$x[x(3x + 2) + 5(3x + 2)]$

$x(x + 5)(3x + 2)$

$a \cdot c$
$3 \cdot 10$
30
$+2 \quad\quad +15$
17
b

When "a" is negative, you may want to factor out a -1.

Example 7: Factor $-6x^2 - 13x + 5$

$-1(6x^2 + 13x - 5)$

$-1[(6x^2 - 2x) + (15x - 5)]$

$-1[2x(3x - 1) + 5(3x - 1)]$

$-1(2x + 5)(3x - 1)$

$a \cdot c$
$6 \cdot (-5)$
-30
$-2 \quad\quad +15$
13
b

-30

-1	30
-2	15
-3	10
-5	6

Practice 7: $-8x^2 + 2x + 3$

$-1(8x^2 - 2x - 3)$

$-1[(8x^2 + 4x) + (-6x - 3)]$

$-1[4x(2x + 1) - 3(2x + 1)]$

$-1(4x - 3)(2x + 1)$

$a \cdot c$
$8 \cdot (-3)$
-24
$+4 \quad\quad -6$
-2
b

-24

1	-24
2	-12
3	-8
4	-6

6.3 DAY ONE HW Assignment:

pg. 400: 1 - 37 (o)