Algebra 1 8.7

Factor trinomials with a leading coefficient

Solve quadratic equations by factoring

coefficient

leading coefficient

~~x-factor~~

factor by grouping

prime polynomial

zero product property

whiteboards

grouping

x^2+5x+6

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

$x^2+10x+24=0$

$(x+6)(x+4)=0$

$x+6=0$ $\quad x+4=0$

$-6\ -6 \quad -4\ -4$

$x=-6 \quad x=-4$

$x^2 + 6x - 16$

$(x+8)(x-2)$

-16, 8, -2, 6

$-3 + -10 = -13$

$-3x + -10x = -13x$

30

1 30

2 15

-3 -10

5 6

30

$5x^2 - 13x + 6$

$(5x^2 - 3x)(-10x + 6)$

x, $5x$, -3, $-3x$, 2, $-10x$, 6, -2

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

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

What is different about this one?
More complicated: x-factor is not helpful. (Why?)
What are factor pairs for 30?
Factor by grouping

Factor pairs and re-write

Example 1 Factor $ax^2 + bx + c$

Factor each trinomial.

a. $7x^2 + 29x + 4$

$(7x^2+1x)+(28x+4)$

$x(7x+1)+4(7x+1)$

$(7x+1)(x+4)$

What are factor pairs for 28?

28

1 28

2 14

4 7

$1+28=29$

$1x+28x=29x$

b. $3x^2 + 15x + 18$

$\left(\frac{3x^2}{3x} + \frac{6x}{3x}\right)\left(\frac{9x}{9} + \frac{18}{9}\right)$

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

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

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

Factor pairs for 54

54	
1	54
2	27
3	18
6	9

$6 + 9 = 15$

$6x + 9x = 15x$

GuidedPractice

1A. $5x^2 + 13x + 6$

$(5x^2 + 3x) + (10x + 6)$

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

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

30

1 30
2 15
3 10
5 6

$(5x^2 + 10x) + (3x + 15)$

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

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

Is there a GCF? Always check first.

1B. $\frac{6x^2}{2} + \frac{22x}{2} - \frac{8}{2} = 2(3x^2 + 11x - 4)$

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

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

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

-12

$-1 \quad 12$

$2 \quad 6$

$3 \quad 4$

Example 2 Factor $ax^2 - bx + c$

Factor $3x^2 - 17x + 20$.

$(3x^2 - 5x - 12x + 20)$

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

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

60

1	60
2	30
3	20
4	15
-5	-12
6	10

GuidedPractice

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2A. $2n^2 - n - 1$

2B. $10y^2 - 35y + 30$

Is there a GCF?

Some things are just not factorable: but you have to try everything first…

Example 3 Determine Whether a Polynomial is Prime

Factor $4x^2 - 3x + 5$, if possible. If the polynomial cannot be factored using integers, write *prime*.

GCF
x-factor
factor by grouping

GuidedPractice

Factor each polynomial, if possible. If the polynomial cannot be factored usin integers, write *prime*.

3A. $4r^2 - r + 7$

3B. $2x^2 + 3x - 5$

How is this problem different?

6. $3x^2 + 17x + 20 = 0$

5. $2x^2 + 9x + 9 = 0$