Factoring Complex Trinomials

SOLUTIONS.

Learning Target: We are learning to… factor quadratics in the form: $ax^2 + bx + c$

Success Criteria: I can… factor quadratics in the form: $ax^2 + bx + c$

A complex trinomial is a trinomial ($y = ax^2 + bx + c$) where $a \neq 1$. Let's again look at expanding an expression that will give us a complex trinomial and see if we can come up with a pattern.

(a) $(3x + 1)(x + 2)$

$= 3x^2 + 6x + x + 2$

$= 3x^2 + 7x + 2$.

$a \times c = 6$ } #'s 1; 6
$b = 7$ }

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

$= 4x^2 + 2x - 10x - 5$

$= 4x^2 - 8x - 5$

$a \times c = -20$ } #'s -10; 2
$b = -8$ }

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

$= 8x^2 - 20x - 6x + 15$

$= 8x^2 - 26x + 15$

$a \times c = 120$ } #'s
$b = -26$ } -20; -6

There are several methods you can use to factor a complex trinomial. We are going to use the Criss-Cross Method. FYI: we can test to see if a trinomial in the form $ax^2 + bx + c$ can be factored:

- ***ac*** is the product
- ***b*** is the sum

} If you can come up with 2 numbers that multiply to ***ac*** and add to ***b***, then the trinomial can be factored!

Examples: Factor completely. *Remember, look for a* COMMON FACTOR. *first!*

(1) $3x^2 + 22x + 7$

Decomposition.

$= 3x^2 + x + 21x + 7$

$= (3x^2 + x) + (21x + 7)$

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

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

$a \times c = 21$

$b = 22$

#'s 1, 2.

(2) $6x^2 + 7x + 2$

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

6 1
3 2
2 1
1 2

(3) $5x^2 - 17x + 6$

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

5 1
6 1
1 6
-2 -3
3 2

(4) $4x^2 - 16x + 15$

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

4 1
2 2
1 15
15 1
-3 -5
5 3

(5) $7x^2 - 4x - 3$

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

7 1
1 3
+3 -1

(6) $3x^2 - 11x - 4$

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

3 1
+1 -4
4 1
2 2

(7) $70x^2 - 21x - 7$

$7(10x^2 - 3x - 1)$

$= 7(5x + 1)(2x - 1)$

5 2
10 1
+1 -1

(8) $-20x^2 - 24x + 32$

$= -4(5x^2 + 6x - 8)$

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

CRISS CROSS METHOD:

5 1
1 8
8 1
2 4
-4 2

$\therefore (5x - 4)(x + 2)$

ALTERNATIVE:

8 → 1, 2
10 → $(x + 2)$
5, -4 → $(5x - 4)$

$\therefore (x + 2)(5x - 4)$

BOX METHOD:

	x	$+2$
$5x$	$5x^2$	$10x$
-4	$-4x$	-8

$\therefore (5x - 4)(x + 2)$.

Homework: CP p. 78

Date: _____

Factoring Complex Trinomials - Extra

Let's practise some more!

Examples: Factor completely, where possible.

(1) $-12p^2 - 8pq + 15q^2$

$= 15q^2 - 8pq - 12p^2$

$= (5q - 6p)(3q + 2p)$

$S: -8$, $P: -180$

$15 \quad -18$

$15 \quad -10$

$(5q - 6p)$

$(3q + 2p)$

SIDE WORK!

(2) $10 - 27p - 28p^2$

$= (2 - 7p)(5 + 4p)$

$S: -27$

$P: -280$

$-35 \;\&\; 8$

$(2 - 7p)$

$10 \quad -35$

$10 \quad -8$

$(5 + 4p)$

SIDE WORK!

(3) $3a - 5ax + 2ax^2$

$= a(3 - 5x + 2x^2)$

$= a(2x^2 - 5x + 3)$

$= a(2x - 3)(x - 1)$

$S: -5$, $P: 6$ $\quad -1 \;\&\; -6$

$2 \quad 1$

$-3 \quad -1$

$1 \quad 3$

SIDE WORK!

(4) $10x^4y^4 - 21x^2y^2 - 10$

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

$5 \quad 2$

$10 \quad 1$

$5 \quad 2$

$-2 \quad 5$

$10 \quad 1$

$1 \quad 10$

SIDE WORK!

(5) $(p - 2q)^2 - 11(p - 2q) + 24$

Sub in x

$x = (p - 2q)$

$= x^2 - 11x + 24$

$= (x - 8)(x - 3)$

replace x with p-2q

$= (p - 2q - 8)(p - 2q - 3)$

(6) $3(2x + 4)^2 + 12(2x + 4)y - 36y^2$

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

$z = 2x + 4$

$= 3(z^2 + 4zy - 12y^2)$

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

$= 3(2x + 4 + 6y)(2x + 4 - 2y)$

$= 12(x + 2 + 3y)(x + 2 - y)$