L4 – Factor $ax^2 + bx + c$ where $a \neq 1$ Unit 3

MPM2D

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Steps for factoring $ax^2 + bx + c$ when $a \neq 1$

1) Check for any common factors that can be factored out
2) Replace the middle term bx with two terms whose coefficients have a sum of b and a product of $a \times c$
3) Group pairs of terms and remove a common factor from each pair
4) Remove the common binomial factor

Example 1: Factor each of the following

a) $3x^2 - 5x - 2$

$-6 + 1 = -5$

$-6 \times 1 = 3(-2) = -6$

$= 3x^2 - 6x + 1x - 2$

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

$= 3x(x-2) + 1(x-2)$ Common factor the common binomial

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

b) $2x^2 + 11x + 12$

$8 + 3 = 11$

$8 \times 3 = (2)(12) = 24$

$= 2x^2 + 8x + 3x + 12$

$= (2x^2 + 8x) + (3x + 12)$

$= 2x(x+4) + 3(x+4)$ Common factor the common binomial

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

c) $6x^2 + 13x - 5$

$15 + -2 = 13$

$15 \times -2 = 6(-5) = -30$

$= 6x^2 + 15x - 2x - 5$

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

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

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

d) $4x^2 - 5xy - 6y^2$

$-8 + 3 = -5$

$-8 \times 3 = 4(-6) = -24$

$= 4x^2 - 8xy + 3xy - 6y^2$

$= (4x^2 - 8xy) + (3xy - 6y^2)$

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

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

e) $6x^2 + 14x + 4$

$6 + 1 = 7$

$6 \times 1 = 3(2) = 6$

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

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

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

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

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

f) $16x^2 + 26x - 12$

$16 + -3 = 13$

$16 \times -3 = 8(-6) = -48$

$= 2(8x^2 + 13x - 6)$

$= 2(8x^2 + 16x - 3x - 6)$

$= 2[(8x^2 + 16x) + (-3x - 6)]$

$= 2[8x(x+2) - 3(x+2)]$

$= 2(x+2)(8x-3)$