

3.6 Polynomials of the Form $ax^2 + bx + c$

Example: To expand $(3x + 5)(4x + 2)$, make an area with dimensions $3x + 5$ and $4x + 2$.

		$4x$	$+ 2$	
$3x$	$12x^2$	$6x$		$= 12x^2 + 15x + 10$
$+ 5$	$9x$	10		

This "area model" method is just like using the distributive property and multiplying each term in the first binomial by each term in the second binomial.

Example: Expand and simplify.

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

b) $(-5a - 8)(7 - 2a)$

Use the area model:

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		$3x$	$- 5$
$2x$	$6x^2$	$-10x$	
$+ 3$	$9x$	-15	

		$-5a - 8$	
$-2a$	$10a^2$	$+16a$	$= 10a^2 - 9a - 56$
$+ 7$	$-35a$	-56	

$= 6x^2 - 7x - 15$

$= 10a^2 - 9a - 56$

Use the distributive property:

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

$(-5a - 8)(7 - 2a)$

$= 6x^2 + 9x - 10x - 15$

$= -35a + 10a^2 - 56 + 16a$

$= 6x^2 - 7x - 15$

$= 10a^2 - 9a - 56$

Example: Factor using the area model.

a) $4x^2 + 20x + 9$ $\underline{2} \times \underline{18} = 36$
 $\underline{2} + \underline{18} = 20$

	$2x$	$+1$
$2x$	$4x^2$	$2x$
$+9$	$18x$	9

$(2x+1)(2x+9)$

$\underline{10} \times \underline{-21} = -210$

$\underline{-10} + \underline{-21} = -31$

b) $6a^2 - 11a - 35$

	$3a$	5
$2a$	$6a^2$	$10a$
-7	$-21a$	-35

$(3a+5)(2a-7)$

Example: Factor by **decomposition**.

a) $4x^2 + 11x + 6$ $\underline{3} \times \underline{8} = 24$
 $\underline{-3} + \underline{8} = 5$

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

b) $6x^2 - 7x - 10$ $\underline{-12} \times \underline{5} = -60$
 $\underline{-12} + \underline{5} = -7$

$6x^2 - 12x + 5x - 10$
 $= 6x(x-2) + 5(x-2)$
 $= (x-2)(6x+5)$

c) $8x^2 - 18x - 5$ $\underline{-20} \times \underline{2} = -40$
 $\underline{-20} + \underline{2} = -18$

$8x^2 - 20x + 2x - 5$
 $= 4x(2x-5) + 1(2x-5)$
 $= (2x-5)(4x+1)$

d) $24x^2 - 20x - 24$ $\underline{-9} \times \underline{4} = -36$
 $\underline{-9} + \underline{4} = -5$

$= 4(6x^2 - 5x - 6)$
 $= 4(6x^2 - 9x + 4x - 6)$
 $= 4(3x(2x-3) + 2(2x-3))$
 $= 4(2x-3)(3x+2)$