

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

MATH 1010 ~ Intermediate Algebra

Chapter 5: POLYNOMIALS AND
FACTORING

Section 5.3: Multiplying Polynomials

Objectives:

- * Use the Distributive Property to multiply polynomials.
- * Use special product formulas to multiply two binomials.
- * Use multiplication of polynomials in application problems.

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

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

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

How do we multiply polynomials?

$$\begin{aligned}
 \text{a) } & 3x(-2x + 7) \\
 & = 3x(-2x) + 3x(7) \\
 & = -6x^2 + 21x
 \end{aligned}$$

Distribute

$$a(b+c) = ab + ac$$

mult. distributes
through addition/
subtraction

$$\begin{aligned}
 \text{b) } & (4x^2 - 7)(3x^2 + 2x + 1) \\
 & = 12x^4 + 8x^3 + \underline{4x^2} - \underline{21x^2} - 14x - 7 \\
 & = 12x^4 + 8x^3 - 17x^2 - 14x - 7
 \end{aligned}$$

$$\begin{aligned}
 \text{c) } & (x - 2)(3x + 4) \\
 & = 3x^2 + \underline{4x} - \underline{6x} - 8 \\
 & = 3x^2 - 2x - 8
 \end{aligned}$$

Look for a pattern.

$$\begin{aligned} \text{a) } & (x-2)(x+2) \\ & = x^2 + \underline{2x} - \underline{2x} - 4 \\ & = x^2 - 4 \end{aligned}$$

$$\begin{aligned} \text{b) } & (3x-5)(3x+5) \\ & = 9x^2 + \underline{15x} - \underline{15x} - 25 \\ & = 9x^2 - 25 \end{aligned}$$

$$\begin{aligned} & (a-b)(a+b) \\ & = a^2 + \underline{ab} - \underline{ab} - b^2 \\ & = a^2 - b^2 \end{aligned}$$

Difference of Squares

Look for a pattern.

$$\begin{aligned}
 \text{a) } & (4x + 7)^2 \\
 & = (4x+7)(4x+7) \\
 & = 16x^2 + 28x + 28x + 49 \\
 & = 16x^2 + 56x + 49
 \end{aligned}$$

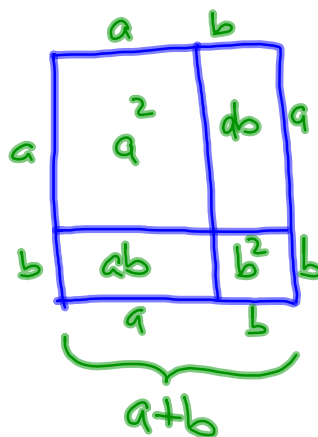
WARNING:
mistake

$$\begin{aligned}
 & (4x+7)^2 \\
 & = (4x)^2 + 7^2 \\
 & = 16x^2 + 49
 \end{aligned}$$

exponents do

NOT distribute
through addition/
subtraction

$$\begin{aligned}
 \text{b) } & (2x - 3)^2 \\
 & = (2x-3)(2x-3) \\
 & = 4x^2 - 6x - 6x + 9 \\
 & = 4x^2 - 12x + 9
 \end{aligned}$$



$$\begin{aligned}
 \text{Area} &= (a+b)^2 \\
 &= a^2 + ab + ab + b^2 \\
 &= a^2 + 2ab + b^2
 \end{aligned}$$

Multiply these.

$$\begin{aligned}
 \text{a) } & (w + (y+1))(w - (y+1)) \\
 & = w^2 - w(y+1) + (y+1)w - (y+1)^2 \\
 & = w^2 - \cancel{wy} - \cancel{w} + \cancel{wy} + \cancel{w} - (y+1)(y+1) \\
 & = w^2 - (y^2 + y + y + 1) \\
 & = w^2 - y^2 - 2y - 1
 \end{aligned}$$

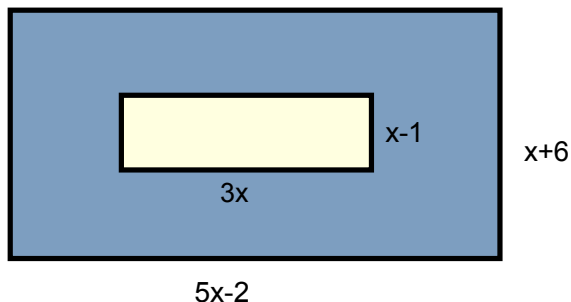
$$\text{b) } (a+b)^3 \stackrel{?}{=} a^3 + b^3 \quad \text{NO}$$

$$\begin{aligned}
 & = (a+b)(a+b)(a+b) \\
 & = (a^2 + ab + ab + b^2)(a+b) \\
 & = (a^2 + 2ab + b^2)(a+b) \\
 & = a^3 + \underline{a^2b} + \underline{2a^2b} + \underline{2ab^2} + \underline{b^2a} + b^3 \\
 & = a^3 + 3a^2b + 3ab^2 + b^3
 \end{aligned}$$

Application

Write an expression in terms of x for the perimeter and area of the shaded region.

Determine the value of each if $x = 4$ cm.



$P =$ distance
around
shape

$$= P_{\text{big}} + P_{\text{small}}$$

$$= 2(5x-2) + 2(x+6) + 2(3x) + 2(x-1)$$

$$= \underbrace{10x - 4} + \underbrace{2x + 12} + \underbrace{6x} + \underbrace{2x - 2}$$

$$P = 20x + 6$$

$$P = 20(4) + 6$$

$$P = 86 \text{ cm}$$

$$\text{Area} = A_{\text{big}} - A_{\text{small}}$$

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

$$- (3x)(x-1)$$

$$= 5x^2 + 30x - 2x - 12 - 3x^2 + 3x$$

$$A = 2x^2 + 31x - 12$$

if $x = 4$ cm

$$A = 2(4^2) + 31(4) - 12$$

$$= 32 + 124 - 12$$

$$= 20 + 124$$

$$= 144 \text{ cm}^2$$