M95, Mod 3, Sec. 5.4: Multiplying Polynomials Part A:

I. Multiplication of monomials:

Ex. 1: \((-2y^7)(-4y)\)

Ex. 2: \((-2)(-4)(7x^4y)\)

Ex. 3: \((-11x^3y^2z^4)(-3xy^5z^6)\)
II. Using the **distributive property** when multiplying a monomial times other polynomials.

Ex. 4: \( 3y(y^2 - 4y) \)

Ex. 5: \( 5xy(8x + 3y) \)
Ex. 6: $-2x^2(3x^2 - 2x + 1)$

Ex. 7: $3(x^2 + 2x - 1)$
Ex. 8: \[-(2x^2 - 2x + 4)\]

Ex. 9: \[-6x^2 \left(4x^3 - 11x^2 + 3x - 5\right)\]

III. Multiplying Binomials or by a binomial: M95, Sec. 5.4 PTA, p.

Ex. 10: \[(x + 1)(x + 2)\]

A. Using the distributive property twice:
B. Visual: Think of it as the area of a rectangle = l x w

Ex. 11: \((x+7)(x+11)\)
Ex. 12: \((y+8)(y-12)\)

Ex. 13: \((2x+5)(7x+2)\)
Ex. 14: \[(x - 3)(-2x + 7)\]

Ex. 15: Use the distributive property to find: \[(x - 2)(3x^3 + x^2 - 1)\]
Looking for special patterns:

IV. **Squaring a binomial:**

Squaring a binomial: \((a + b)^2 = (a + b)(a + b)\)

**FOIL:** \(a^2 + 2ab + b^2\)

---

**Ex. 16:** \((x + 4)^2\)

\((x + 4)(x + 4) = x^2 + 8x + 16\)
Ex. 17: 
\[
(x+3)^2
\]

\[(x+3)(x+3) = x^2 + 6x + 9\]

What if it was a difference instead of a sum?
\[
(a-b)^2 = (a-b)(a-b)
\]
\[
Q^2 - 2ab + b^2
\]
Ex. 18: \[(x - 3)^2\]
\[(x - 3)(x - 3) = x^2 - 6x + 9\]

Ex. 19: \[(x - 1)^2\]
\[x^2 - 2x + 1\]
Ex. 20: \[(2x+y)^2\] (Pay attention!)
\[= (2x+y)(2x+y)\]
\[= 4x^2 + 4xy + y^2\]
V. Multiplying binomials that are the sum and difference of the same two terms.

\[(a + b)(a - b) = a^2 - ab + ab - b^2 = a^2 - b^2\]

Ex. 22: \[(x + 3)(x - 3)\]

\[x^2 - 9\]
Ex. 23: \((x+4)(x-4)\)
\[x^2 - 16\]

Ex. 24: \((y-11)(y+11)\)
\[y^2 - 121\]
Ex. 25: \(\chi^2 - \frac{1}{4}\)

\(\left( x + \frac{1}{2} \right) \left( x - \frac{1}{2} \right)\)

Ex. 26: \(9\chi^2 - 4\)

\((3x - 2)(3x + 2)\)
Ex. 27: \[(2x + 1)(2x - 1)\]

\[4x^2 - 1\]