

## Product Rule for Exponents

$$\text{Ex: } x^2 \cdot x^3 = (xx)(xxx) = x^5$$

$$x^3 (x^6) = x^9$$

$$x(x) = x^2$$

$$x^2 y^3 = x^2 y^3$$

$$(3^2)(2^3) \neq 6^5 \quad 3^2(2^3) \approx 72$$

$$(2^3)(2^4) = 2^7$$

$$a^m a^n = a^{m+n}$$

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

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

$$(y^5)^6 = y^{30}$$

$$(w)^4 = w^4$$

**Raising a Power to a Power**

$$(a^m)^n = a^{mn}$$

**p 417**

## 5.5 Multiplying Polynomials; Special Products

### Multiplying a Polynomial by a Monomial

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

$$\begin{aligned} \underbrace{2x}_a (\underbrace{3x}_b + \underbrace{4y}_c) &= (2x)(3x) + (2x)(4y) \\ &= ab + ac \\ &= 6x^2 + 8xy \end{aligned}$$

$$\underbrace{3x}_a (\underbrace{x^2}_b - \underbrace{2xy}_c + \underbrace{y^2}_d) = 3x^3 - 6x^2y + 3xy^2$$

$$2xy^2z^3 (x^4 - 3xy^2 + 2yz^3 + 3z - 2)$$

$$2x^5y^2z^3 - 6x^2y^4z^3 + 4xy^3z^6$$

$$+ 6xy^2z^4 - 4xy^2z^3$$

## Binomial Multiplication

Multiplying  $23 \cdot 15$

$$\begin{array}{r} 23 \\ \times \cancel{10} \cancel{5} \\ \hline 115 \\ 23 \\ \hline 335 \end{array}$$

compare with

$$\begin{array}{r} x+4 \\ \cancel{x} \cancel{+3} \\ \hline 3x+12 \\ x^2+4x \\ \hline x^2+7x+12 \end{array}$$

$$(x+3)(x+4) = x^2 + \underline{4x + 3x} + 12$$
$$x^2 + 7x + 12$$

$$(x+2)(x+3) = x^2 + 3x + 2x + 6$$
$$x^2 + 5x + 6$$

$$(2x+3)(4x+5) = 8x^2 + 10x + 12x + 15$$
$$8x^2 + 22x + 15$$

$$(x+3)(x-5) = x^2 - 5x + 3x - 15$$
$$x^2 - 2x - 15$$

$$(2x+7)(2x-7) = 4x^2 - 14x + 14x - 49$$

$4x^2$                        $-49$

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

$$2x^3 + 6x^2 - 10x$$

$$3x^2 + 9x - 15$$

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$$2x^3 + 9x^2 - x - 15$$

## Multiply Two Binomials

$$(x+4)(x+3)$$

## Special Products

$$(x+a)(x-a)$$

$$\begin{aligned} x^2 - ax + ax - a^2 \\ x^2 - a^2 \end{aligned}$$

## Conjugates

The conjugate of  $ax+b$  is  $ax-b$ .

Who cares?

$$(ax+b)(ax-b)$$

$$\begin{aligned} a^2x^2 - abx \\ + abx - b^2 \end{aligned}$$

$$a^2x^2 - b^2$$

## Squaring a Binomial

p 431

## 5.6 Exponent Rules and Dividing Polynomials

### Quotient Rule

$$\frac{x^6}{x^2}$$

### Dividing a Polynomial by a Monomial

## **Exponent Rules (p 444)**

**p 445**

**p 454**

**p 458**