4.2 Notes
Adding, Subtracting, & Multiplying Polynomials

Learning Targets:

- I can add and subtract polynomials.
- I can multiply polynomials.
- I can use Pascal's Triangle to expand binomials.

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

$(x + 1)(x + 1)(x + 1)$

$(x^2 + 1x + 1x + 1)(x + 1)$

$(x^2 + 2x + 1)(x + 1)$

$x^3 + x^2 + 2x^2 + 2x + x + 1$

$x^3 + 3x^2 + 3x + 1$

Adding & Subtracting Polynomials

When you add and subtract polynomials, you must be sure to only combine like-terms.

$5xy + 6yx$ $6x + 9x^2$ $2x^2 + 7y^2$ $8x^2 + 4x^3$

Examples:

1) $(3x^3 + 2x^2 - x - 7) + (x^3 - 10x^2 + 8) =$

$$3x^3 + 2x^2 - x - 7 + x^3 - 10x^2 + 8$$

$$4x^3 - 8x^2 - x + 1$$

2) $(2x^3 + 6x^2 - x + 1) - (8x^3 - 3x^2 - 2x + 9) =$

$$2x^3 + 6x^2 - x + 1 - 8x^3 + 3x^2 + 2x - 9$$

$$-6x^3 + 9x^2 + x - 8$$

You try:

3) $(2x^2 - 6x + 5) + (7x^2 - x - 9) =$

$$2x^2 - 6x + 5 + 7x^2 - x - 9$$

$$9x^2 - 7x - 4$$

4) $(3x^3 + 8x^2 - x - 4) - (5x^3 - x^2 + 17) =$

$$3x^3 + 8x^2 - x - 4 - 5x^3 + x^2 - 17$$

$$-2x^3 + 9x^2 - x - 21$$

Multiplying Polynomials

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

$$-x^3 + 3x^2 + 2x^2 - 6x + 4x - 12$$

$$\boxed{-x^3 + 5x^2 - 2x - 12}$$

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

$$12x^4 + 4x^3 + 24x^2 - 9x^3 - 3x^2 - 18x - 15x^2 - 5x - 30$$

$$\boxed{36x^4 - 5x^3 + 6x^2 - 23x - 30}$$

6) $(x - 1)(x + 4)(x + 5)$
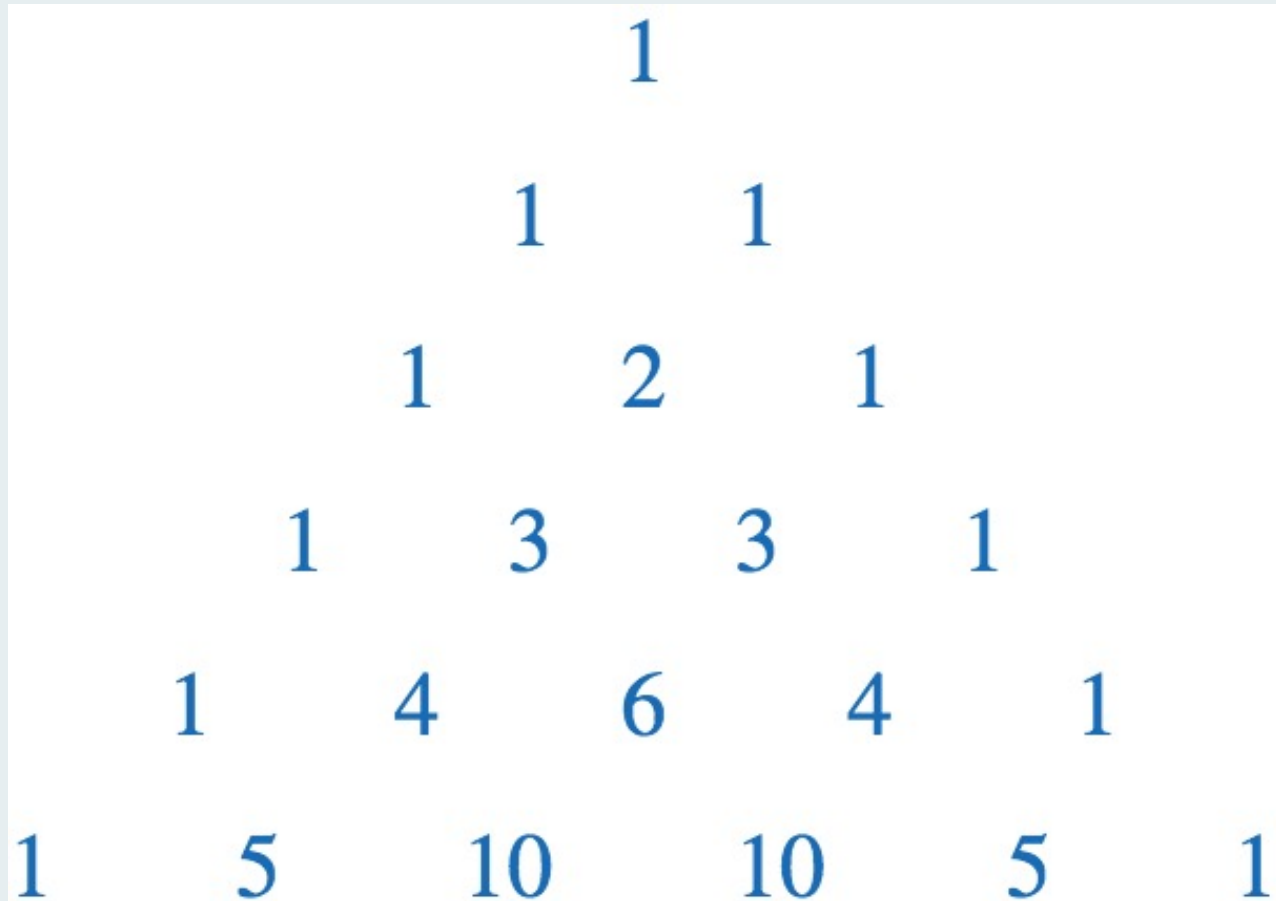
$(x^2 + 4x - x - 4)(x + 5)$

$(x^2 + 3x - 4)(x + 5)$

$x^3 + 5x^2 + 3x^2 + 15x - 4x - 20$

$x^3 + 8x^2 + 11x - 20$

Pascal's Triangle

```
                    1
                1       1
            1       2       1
        1       3       3       1
    1       4       6       4       1
1       5       10      10      5       1
```

$$11^0 = 1$$

$$11^1 = 11$$

$$11^2 = 121$$

$$11^3 = 1331$$

$$11^4 = 14641$$

$$11^5 = 161051$$

$$11^6 = 1771561$$

			1			
		1		1		
	1		2		1	
1		3		3		1
1	4		6		4	1
1	5	10		10	5	1
1	6	15	20	15	6	1

$1 = 2^0$

$1 + 1 = 2 = 2^1$

$1 + 2 + 1 = 4 = 2^2$

$1 + 3 + 3 + 1 = 8 = 2^3$

$1 + 4 + 6 + 4 + 1 = 16 = 2^4$

$1 + 5 + 10 + 10 + 5 + 1 = 32 = 2^5$

$1 + 6 + 15 + 20 + 15 + 6 + 1 = 64 = 2^6$

$1 + 7 + 21 + 35 + 35 + 21 + 7 + 1 = 128 = 2^7$

$1 + 8 + 28 + 56 + 70 + 56 + 28 + 8 + 1 = 256 = 2^8$

$1 + 9 + 36 + 84 + 126 + 126 + 84 + 36 + 9 + 1 = 512 = 2^9$

$1 + 10 + 45 + 120 + 210 + 252 + 210 + 120 + 45 + 10 + 1 = 1{,}024 = 2^{10}$

$1 + 11 + 55 + 165 + 330 + 462 + 462 + 330 + 165 + 55 + 11 + 1 = 2048 = 2^{11}$

$1 + 12 + 66 + 220 + 495 + 792 + 924 + 792 + 495 + 220 + 66 + 12 + 1 = 4{,}096 = 2^{12}$

$1 + 13 + 78 + 186 + 715 + 1287 + 1716 + 1716 + 1287 + 715 + 186 + 78 + 13 + 1 = 8{,}192 = 2^{13}$

$1 + 14 + 91 + 364 + 1001 + 2002 + 3003 + 3432 + 3003 + 2002 + 1001 + 364 + 91 + 14 + 1 = 16{,}384 = 2^{14}$

$1 + 15 + 105 + 455 + 1365 + 3003 + 5005 + 6435 + 6435 + 5005 + 3003 + 1365 + 455 + 105 + 15 + 1 = 32{,}768 = 2^{15}$