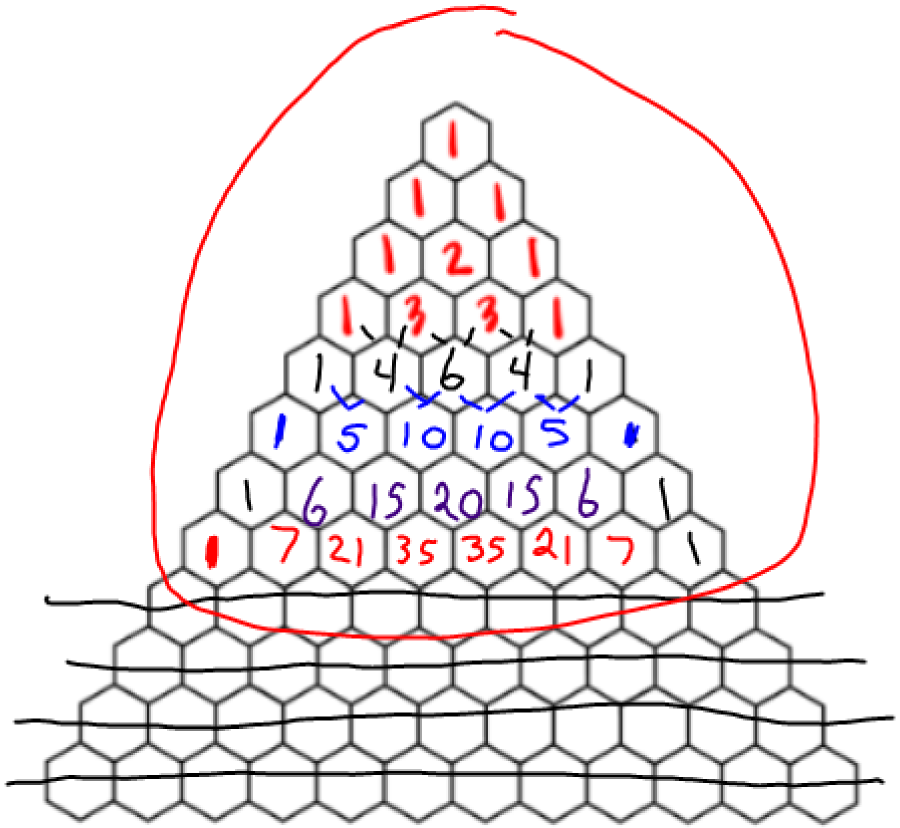
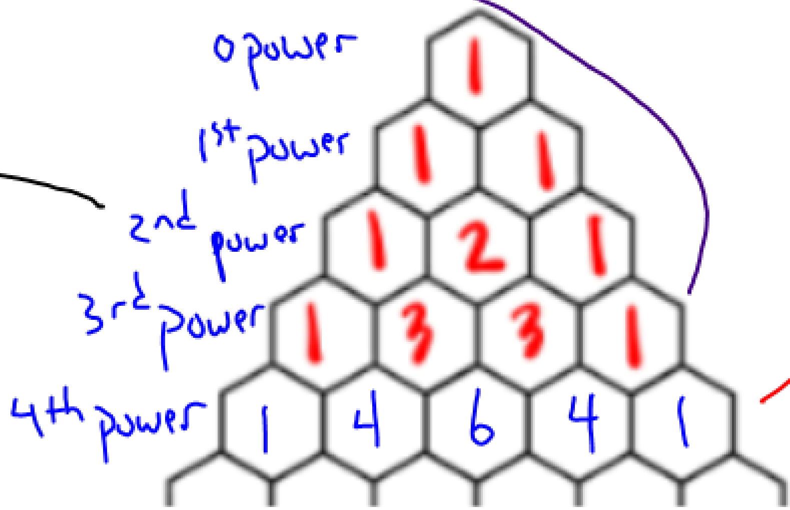
Pascal's Triangle

Complete Pascal's Triangle

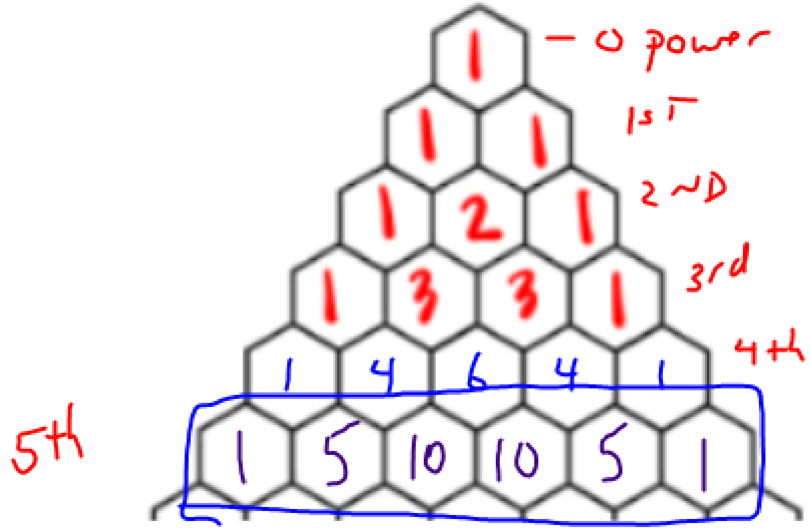


$(x+1)^2$ $(x+1)^3$ $(x+1)^4$

$x^2 + 2x + 1$ $x^3 + 3x^2 + 3x + 1$ $x^4 + 4x^3 + 6x^2 + 4x + 1$

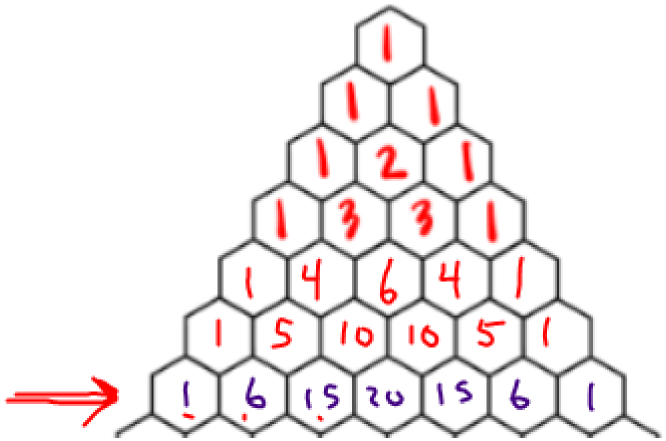


$$(x+1)^5 = ?$$



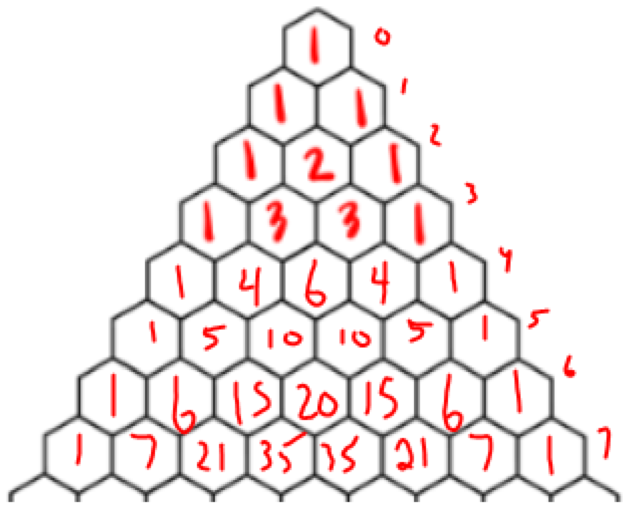
$$1x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$$

$(x+1)^6 = \,?$



$x^6 + 6x^5 + 15x^4 + 20x^3 + 15x^2 + 6x + 1$

$(1x+1)^7 = ?$



$x^7 + 7x^6 + 21x^5 + 35x^4 + 35x^3 + 21x^2 + 7x + 1$

What about when we have 2 different variables?

$(a+b)^2$

	a	$+b$
a	a^2	ab
$+b$	ab	b^2

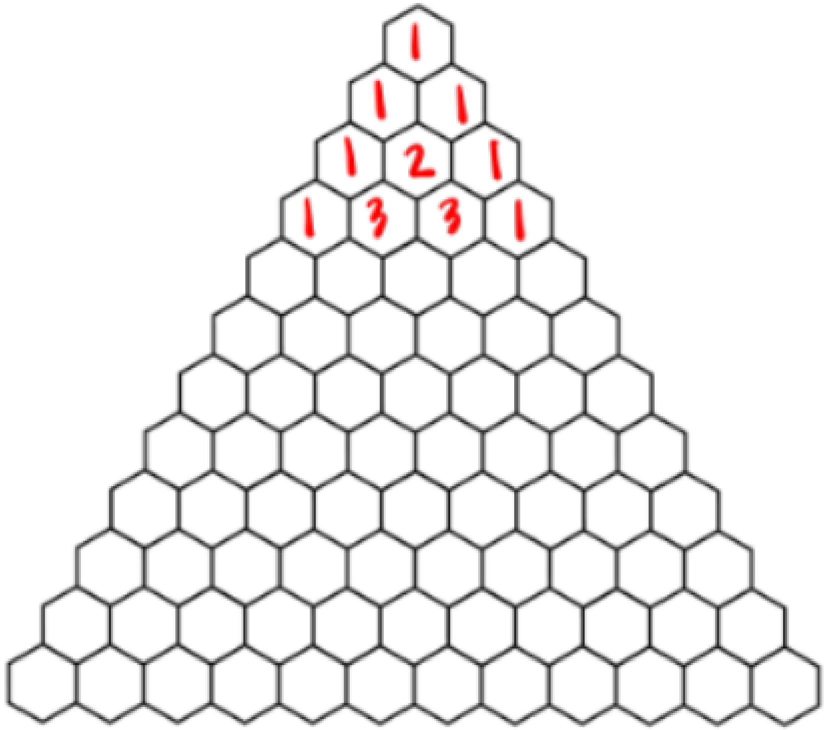
$1a^2 + 2ab + 1b^2$

$(a+b)^3$

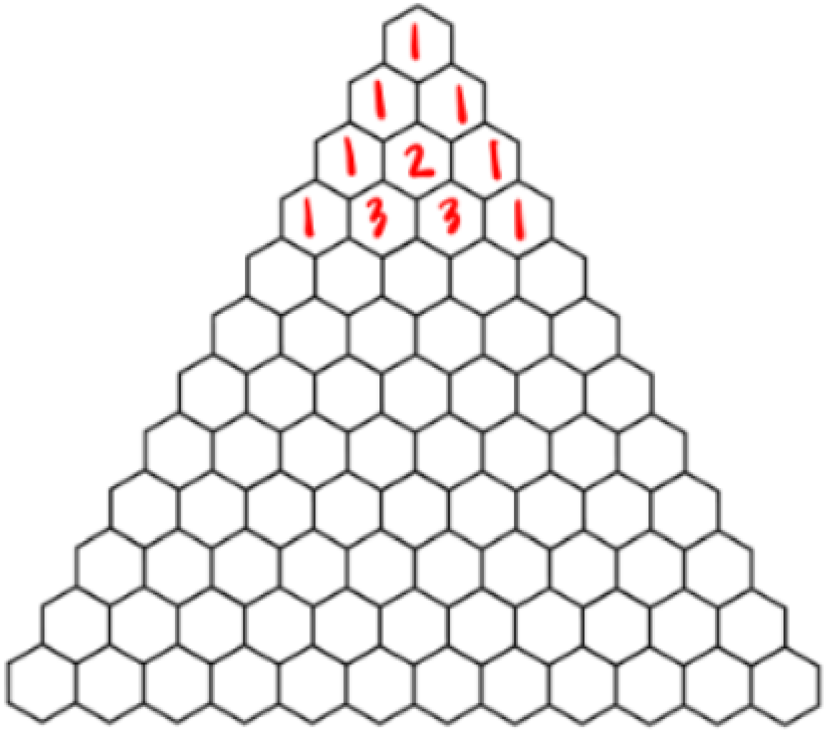
	a^2	$+2ab$	$+b^2$
a	$1a^3$	$2a^2b$	$1ab^2$
$+b$	$1a^2b$	$2ab^2$	$1b^3$

$1a^3 + 3a^2b + 3ab^2 + 1b^3$

$(a+b)^2$

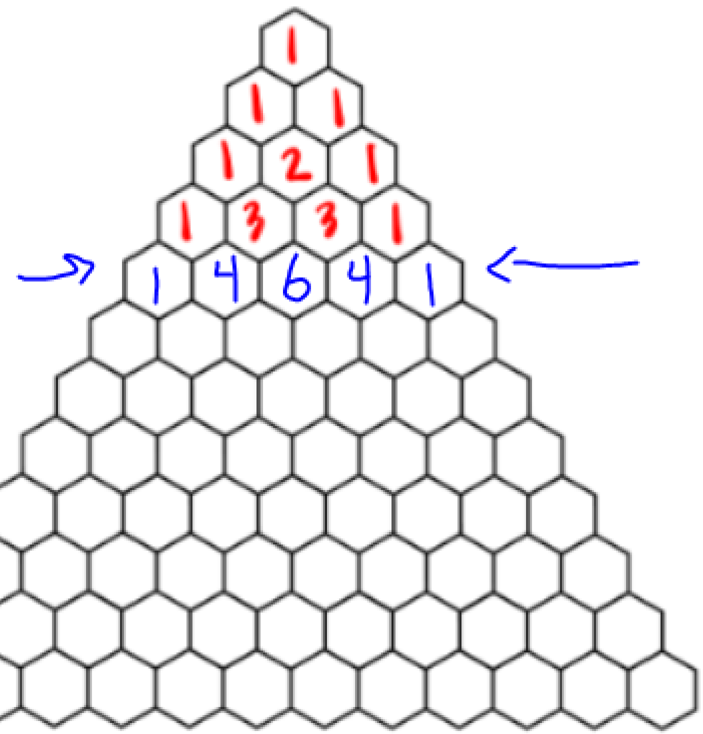


$$(a+b)^3$$



You try:

$$(a+b)^4$$



$$1a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + 1b^4$$

$(a+b)^{5}$

$1a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + 1b^5$

Let's apply that to when we have some values with coefficient's other than 1:

$(\boxed{x}+\boxed{2})^2 =$

	x	$+2$
x	x^2	$2x$
$+2$	$2x$	4

$= x^2 + 4x + 4$

1 2 1

$1x^2 \qquad 2x\cdot 2^1 \qquad 1\cdot 2^2$

$x^2 + 4x + 4$

$(\boxed{x}+\boxed{2})^3 =$

$(a)+(b)$

$3 \cdot 4$

$1x^3 + 3x^2 \cdot 2^1 + 3x^1 \cdot 2^2 + 1 \cdot 2^3$

$x^3 + 6x^2 + 12x + 8$

$$(x+2)^4 =$$

$$1x^4 + 4x^3 \cdot 2 + 6x^2 \cdot 2^2 + 4x \cdot 2^3 + 1 \cdot 2^4$$

$$x^4 + 8x^3 + 24x^2 + 32x + 16$$

Understanding the Binomial Theorem

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

$4! = 4 \cdot 3 \cdot 2 \cdot 1 =$

0 power $\binom{0}{0}$ 1

1st $\binom{1}{0}$ 1 $\binom{1}{1}$ 1

2nd $\binom{2}{0}$ 1 $\binom{2}{1}$ 2 $\binom{2}{2}$ 1

3rd $\binom{3}{0}$ 1 $\binom{3}{1}$ 3 $\binom{3}{2}$ 3 $\binom{3}{3}$ 1

4th $\binom{4}{0}$ 1 $\binom{4}{1}$ 4 $\binom{4}{2}$ 6 $\binom{4}{3}$ 4 $\binom{4}{4}$ 1

$(x+1)^4$ 3rd term only $6x^2 \cdot 1^2 = 6x^2$

Review

$(a+b)^5 \quad (x+1)^4$

- Specific examples of binomial expansions
- We tried to generalize with Pascal's Triangle
- Determined how to find the exponents of a and b for any binomial expansion.
- Used "n choose k" to determine the coefficients of each term for any binomial expansion.
- Used Summation notation to put the pieces together.

Σ Capital sigma

σ lower case sigma

Today we will practice only with coefficients of 1.

HW #3: Binomial Theorem

Tomorrow we will practice with coefficients other than 1 to make sure we can apply the Binomial Theorem and Pascal's Triangle together.