Monday, September 25th

What do you call friends that love math?

Algebros

Warm-Up

Expand the following binomails.

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

Review of Last Week

Combining like terms

Classifying polynomials

Adding and subtracting polynomials

Multiplying polynomials

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

This guy distributes into these!

$$= 5x^2+3x-6-3x^2+x-5$$

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

$$= 2x^2+4x-11$$

Review

$$(a+b)(c+d)$$

Last

Inner

$$(a+b)(c+d) = ac + ad + bc + bd$$

F O I L

First

Outer

$$(4x-1)(3x+7)$$

	$4x$	-1
$3x$	$12x^2$	$-3x$
$+7$	$28x$	-7

$$= 12x^2 + 25x - 7$$

What is an exponent?

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G

x^2

$(x+1)^2$

$3x^2$

$3(16)$
$12x^2$
19

$3(x)(x)$

$(3\cdot 4)^2$

What if...

$(x+1)^3$

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

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

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

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

$(x+1)^4$

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

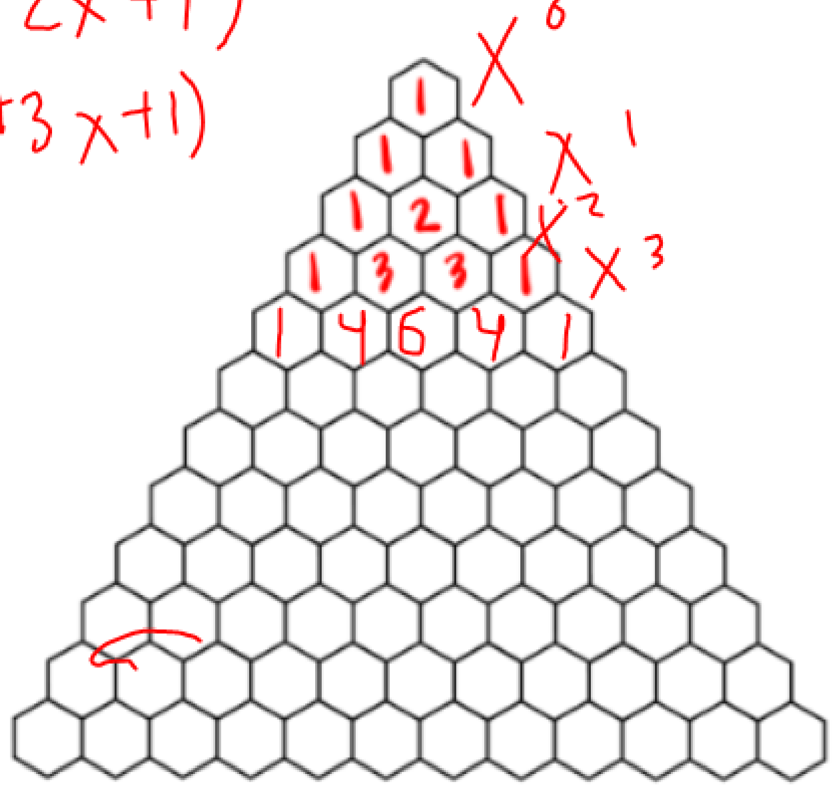
$(x+1)^7$

Pascal's Triangle

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

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

Pascal's Triangle is a famous mathematical pattern that has been studied for hundreds of years by mathematicians and students, and it contains many interesting patterns. The concept behind the triangle is simple: each cell in the triangle is the sum of the two numbers above it. Fill in the next three rows of the triangle.

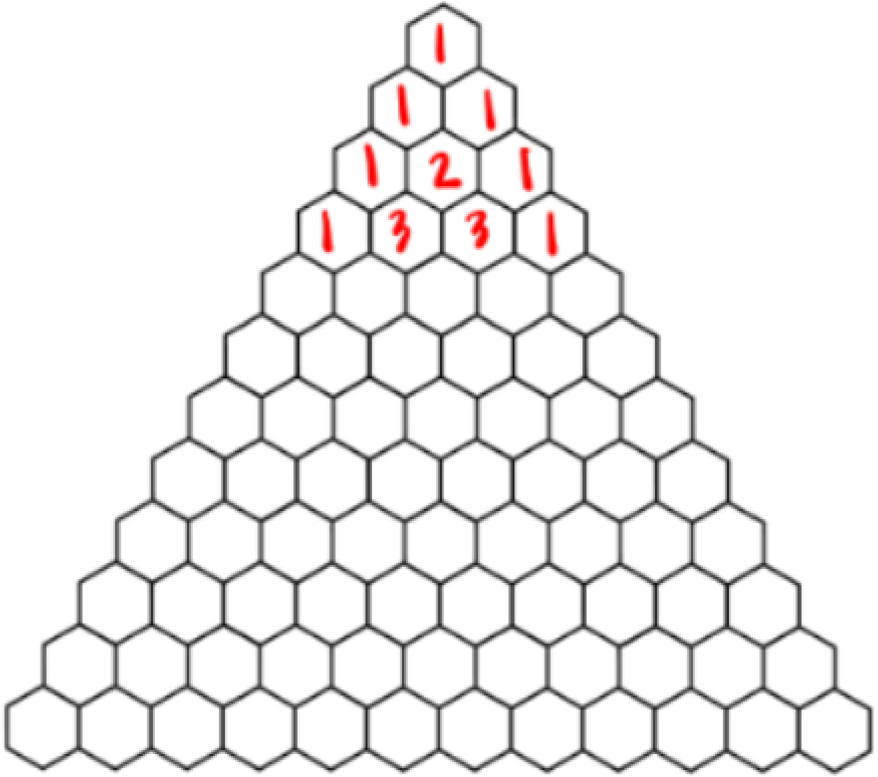


Compare

$(x+1)^2 =$

$(x+1)^3 =$

$(x+1)^4 =$



Let's go back

How can we use Pascal's Triangle to answer:

$(x+1)^7$ $\quad$ $(x+1)^n$

In the spirit of generalizing..

$(a+b)^2$ $(a+b)(a+b)$

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

$(a+b)^3$

Connecting the Dots

$$1$$

$$1a + 1b$$

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

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

Understanding the Binomial Theorem

$n=3$

$$(a+b)^{3} = \underbrace{a^3}_{0} + \underbrace{3a^2b}_{1} + \underbrace{3ab^2}_{2} + \underbrace{b^3}_{3}$$

$a^{n-k}\,b^{k}$

$a^{3-1}\,b^{1}$

$a^{2}\,b^{1}$

$a^{3-3}\,b^{3}$

$\cancel{a^0}\,b^3$

each term $= a^{n-k}\,b^{k}$

$a^{3-0}\,\cancel{b^0}$

a^3

$a^{3-2}\,b^{2}$

$a^1b^2 = ab^2$

Understanding the Binomial Theorem

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

exp

Factorial

$n = 3 \quad k = 1$

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

$$\binom{3}{1} \quad \frac{3!}{1!(3-1)!} = \frac{3 \cdot 2 \cdot 1}{1 \cdot 2 \cdot 1} = \frac{6}{2} \to 3$$

$$\binom{0}{0}$$
$$\binom{1}{0} \quad \binom{1}{1}$$
$$\binom{2}{0} \quad \binom{2}{1} \quad \binom{2}{2}$$
$$\binom{3}{0} \quad \binom{3}{1} \quad \binom{3}{2} \quad \binom{3}{3}$$
$$\binom{4}{0} \quad \binom{4}{1} \quad \binom{4}{2} \quad \binom{4}{3} \quad \binom{4}{4}$$

Let's Apply This

$$(a+b)^3 = \underbrace{a^3}_{k^0} + \underbrace{3a^2b}_{k^1} + \underbrace{3ab^2}_{k^2} + \underbrace{b^3}_{k^3}$$

FBO (Facebook Official)

add 'em up!

$$\sum_{k=0}^{n-1} \underbrace{\binom{n}{k} a^{n-k} b^{k}}$$

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Review

- 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.

Practice

Together, let's expand the following binomial.

$\sum \binom{n}{k} a^{n-k} b^{k}$

$(x+2)^4$

4

0

Practice Examples on Notes!!