Investigation of Binomial Expansion

$(a + b)^0 = 1$

$(a + b)^1 = 1a + 1b$

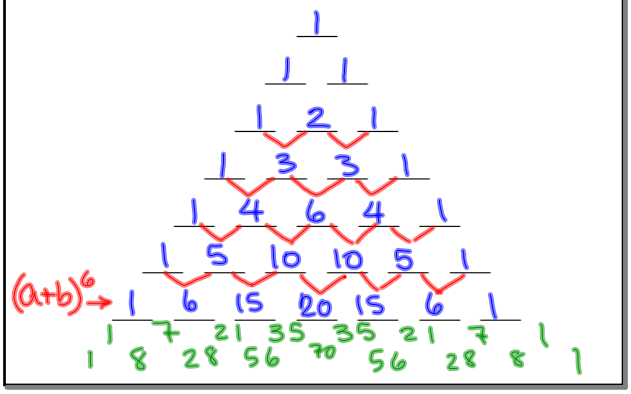
$(a + b)^2 = 1a^2 + 2ab + 1b^2$

$(a + b)^3 = 1a^3 + 3a^2b + 3ab^2 + 1b^3$

$(a + b)^4 = 1a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + 1b^4$

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

Pascal's Triangle



The Binomial Theorem & Pascal's Triangle Examples

Ex. 1

Find the numbers on the ninth row of Pascal's Triangle. (n = 8) → 8th power $(a+b)^8$

1 8 28 56 70 56 28 8 1

Find the 5th term of $(x + y)^8$.

$70x^4y^4$

Ex. 2: Expand each binomial.

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

a. $(x + 5)^3$ ← 4th row

$= 1x^3 + 3x^2 \cdot 5^1 + 3x^1 \cdot 5^2 + 1 \cdot 5^3$

$= x^3 + 15x^2 + 75x + 125$

b. $(m + 1)^4 = 1m^4 + 4m^3 \cdot 1^1 + 6m^2 \cdot 1^2 + 4m^1 \cdot 1^3 + 1 \cdot 1^4$

$= m^4 + 4m^3 + 6m^2 + 4m + 1$

c. $(x - 2)^3 = 1x^3 + 3x^2(-2)^1 + 3x(-2)^2 + 1(-2)^3$

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

d. $(a + 3b)^4$

$= 1a^4 + 4a^3(3b) + 6a^2(3b)^2 + 4a(3b)^3 + 1(3b)^4$

$= a^4 + 12a^3b + 54a^2b^2 + 108ab^3 + 81b^4$

e. $(2x - 1)^5$

$1(2x)^5 + 5(2x)^4(-1) + 10(2x)^3(-1)^2 + 10(2x)^2(-1)^3 + 5(2x)(-1)^4 + 1(-1)^5$

$= 32x^5 - 80x^4 + 80x^3 - 40x^2 + 10x - 1$