

# Binomial Theorem

shows you have to expand  
binomial

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

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

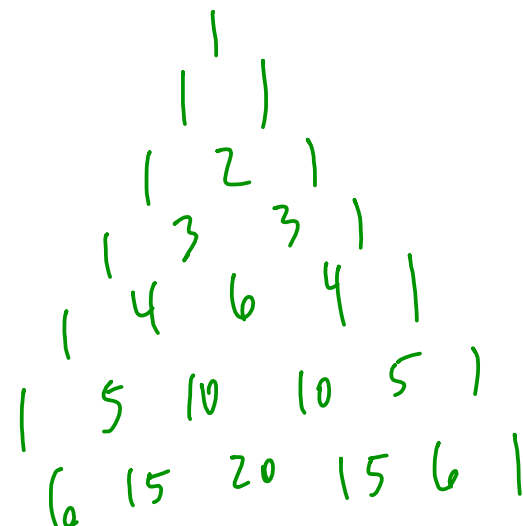
$$(a+b)^3 = 1a^3 + 3a^2b + 3ab^2 + 1b^3$$

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

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

Coefficients

Blaise Pascal



$$(a+b)^6 = a^6 + 6a^5b + 15a^4b^2 + 20a^3b^3 + 15a^2b^4 + 6ab^5 + b^6$$

6th row: if you have 6 diff lts.

$${}_6C_0 = 1 \quad {}_6C_1 = 6 \quad {}_6C_2 = 15 \quad {}_6C_3 = 20$$

$${}_6C_4 = 15 \quad {}_6C_5 = 6 \quad {}_6C_6 = 1$$

we know 
$$(a+b)^n = \sum_{k=0}^n {}^nC_k a^{n-k} b^k$$

Binomial Theorem.

let  $a=1$

$$(1+b)^n = \sum_{k=0}^n {}^nC_k b^k = \left( 1 + nb + n(n-1)/2 b^2 + n(n-1)(n-2)/6 b^3 + \dots \right)$$

$$(1+b)^{\frac{1}{2}} \approx \left( 1 + \frac{1}{2}b - \frac{1}{8}b^2 + \dots \right)$$

$$5,000 \left( 1 + \frac{0.04}{12} \right)^{12t} 15, \sum_{t=1}^{30} \left( 1 + \frac{0.04}{12} \right)^t = 15000$$

$$\boxed{{}^nC_k = \frac{n!}{(n-k)!k!}} = \frac{n(n-1)\dots(n-k+1)}{k!} {}^nC_r = {}^nC_{n-r}$$

$$\frac{1}{2}C_1 = \frac{\frac{1}{2}}{1} = \frac{1}{2}$$

$$\frac{1}{2}C_2 = \frac{\frac{1}{2}(-\frac{1}{2})}{2!}$$

$$\frac{1}{2}C_3 = \frac{\frac{1}{2}(-\frac{1}{2})(-\frac{3}{2})}{3!}$$

$$8C_5 = \frac{8!}{3! \cdot 5!} = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4}{5!}$$

