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

$$(x+y)^2 = x^2 + 2xy + y^2$$

$$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$

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

$$\vdots \qquad \vdots$$

$$\boxed{(x+y)^n = \sum_{k=0}^{n} \binom{n}{k} x^{n-k} \cdot y^{k}}$$

coefficient binomial

$$\binom{n}{k} = \frac{n!}{(n-k)!\,k!} = \frac{n\cdot(n-1)\cdot\ldots\cdot 1}{(n-k)\cdot(n-k-1)\cdot\ldots\cdot 1\cdot k\cdot(k-1)\cdot\ldots\cdot 1}$$

$$\binom{14}{5} = \frac{14!}{(14-5)!\,5!} = \frac{14\cdot 13\cdot 12\cdot 11\cdot 10\cdot\ldots\cdot 2\cdot 1}{(9\cdot 8\cdot 7\cdot 6\cdot\ldots\cdot 1)\cdot(5\cdot 4\cdot 3\cdot 2\cdot 1)}$$

$$(x+y)^n = \binom{n}{0} \underset{x^{n-0}y^0}{x^n} + \binom{n}{1} x^{n-1} y^1 + \binom{n}{2} x^{n-2} y^2 + \dots$$

$$\dots + \binom{n}{n-2} x^2 y^{n-2} + \binom{n}{n-1} x\, y^{n-1} + \binom{n}{0} y^n$$

$n-(n-2)=2$

$$= \sum_{k=0}^{n} \binom{n}{k} x^{n-k} y^k$$

$\boxed{n=3}$

$$\frac{3\cdot\cancel{2}\cdot\cancel{1}}{\cancel{2}\cdot\cancel{1}} = 3 = \frac{3!}{(3-2)!\,2!} = \binom{3}{2} = \underbrace{3\ \boxed{nCr}\ 2}_{TI\ 80}$$

$$(x+y)^3 = \sum_{k=0}^{3} \binom{3}{k} x^{3-k} y^k$$

$$= \binom{3}{0} x^{3-0} y^0 + \binom{3}{1} x^{3-1} y^1 + \dots$$

$$= x^3 + 3x^2y + \dots$$

$$x+y = \sum_{k=0}^{1} \binom{1}{k} x^{1-k} \cdot y^{k} = \binom{1}{0} x^{1} y^{0} + \binom{1}{1} x^{0} y^{1}$$

$\boxed{\text{Cas } n=1 \checkmark \quad (\text{étage } 1)}$

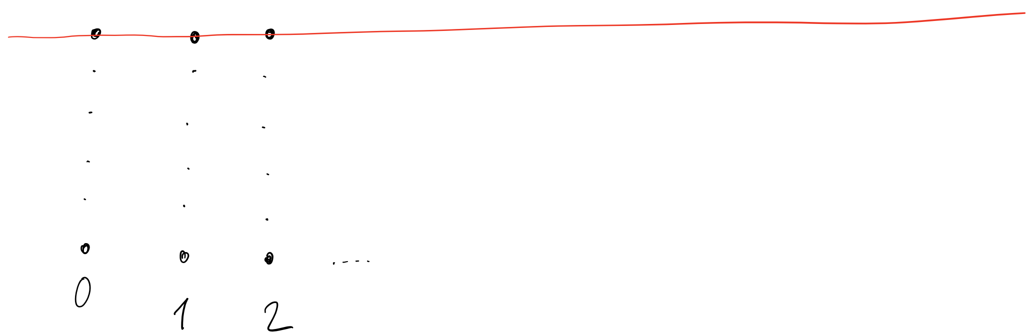
On suppose que c'est vrai pour $n \geq 1$.

$$(x+y)^{n} = \sum_{k=0}^{n} \binom{n}{k} x^{n-k} y^{k} \quad \checkmark$$

$\boxed{\text{A démontrer :}}$

$$(x+y)^{n+1} = \sum_{k=0}^{n+1} \binom{n+1}{k} x^{(n+1)-k} y^{k}$$

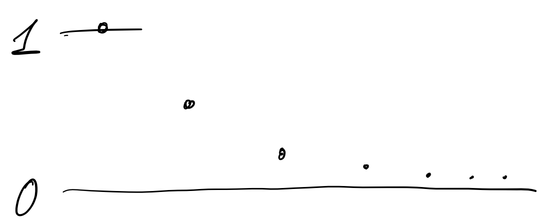
- $x_n = 5 \quad \forall n \in \mathbb{N}$



$$\boxed{\lim x_n = 5} \qquad \lim_{n \to +\infty} x_n = 5$$

- $y_n = 2^n \quad n \in \mathbb{N} \quad \lim_{n \to +\infty} y_n = +\infty$

- $\boxed{z_n = \frac{1}{n} \qquad n \geq 1}$



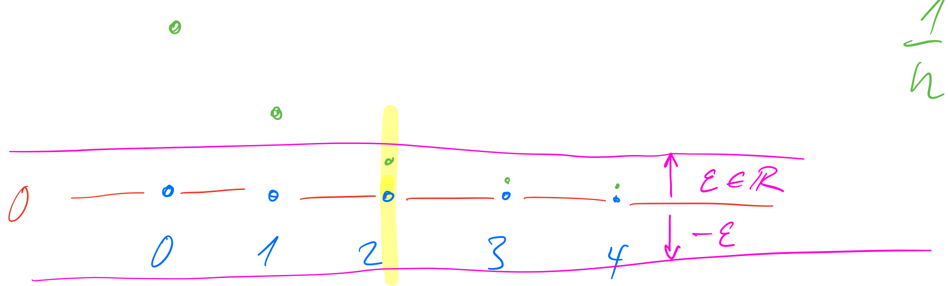
Soit x_n une suite, $n \in \mathbb{N}$. On dit que

$$\lim x_n = L$$

si pour tout $\varepsilon > 0$, il existe $N = N(\varepsilon)$ tq.

$$n \geq N(\varepsilon) \Rightarrow |x_n - L| < \varepsilon$$

$$\frac{1}{n} \xrightarrow{n\to\infty} 0$$



$x_n < x_{n+1}$ strict. croiss.

$x_n \leq x_{n+1}$ croiss.