

# Binomialkoeffizienten / Fakultäten

I

$$n! := 1 \cdot 2 \cdot 3 \cdot 4 \cdot \dots \cdot (n-1) \cdot n$$

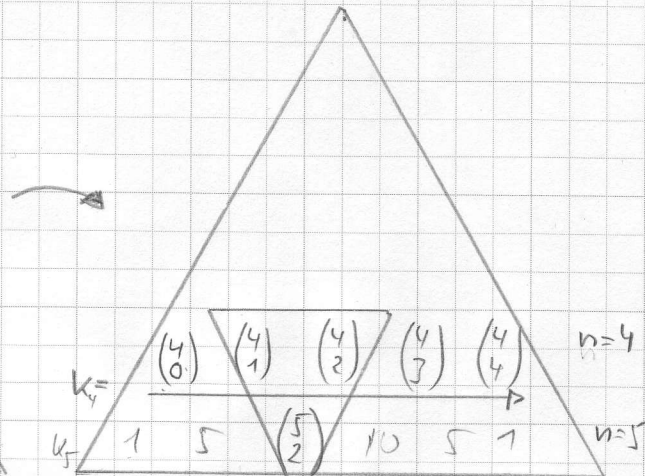
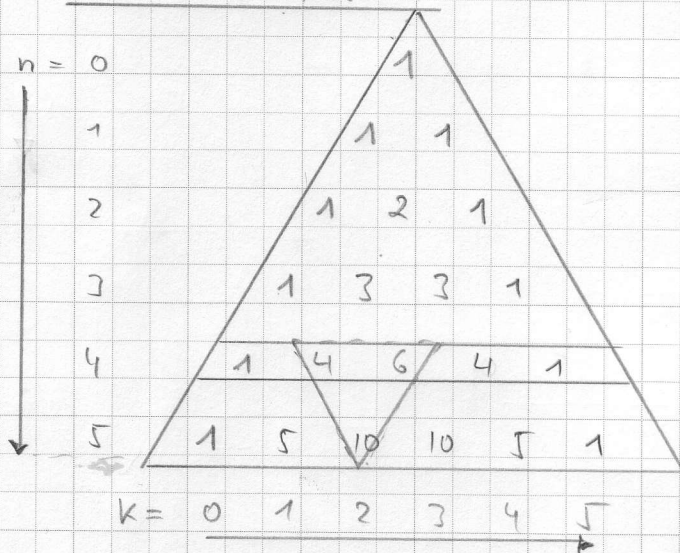
$$0! := 1$$

II

$$\binom{n}{k} := \frac{n!}{k! (n-k)!} = \frac{n \cdot (n-1) \cdot (n-2) \cdot \dots \cdot (n-k+1) \cdot \cancel{(n-k)} \cdot \cancel{(n-k-1)} \cdot \dots \cdot 3 \cdot 2 \cdot 1}{1 \cdot 2 \cdot \dots \cdot k \cdot \cancel{(n-k)} \cdot \cancel{(n-k-1)} \cdot \dots \cdot 3 \cdot 2 \cdot 1}$$

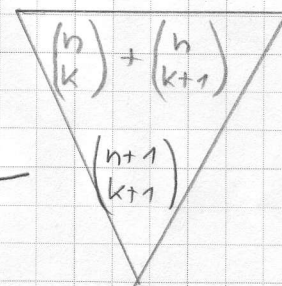
III

Pascalsches Dreieck:



⇒ allgemein:

$$\binom{n}{k} + \binom{n}{k+1} = \binom{n+1}{k+1}$$



IV

Binomischer Lehrsatz:

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

$$\text{Bsp. } (a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4 = \sum_{k=0}^4 \binom{4}{k} a^{n-k} b^k$$