#18 MTH1231 LEC

Combinations

- n choose k
- the number of subsets of len k formable. ★FINAL

Binomial theorem

- $(x+y)^3 = (x+y)(x+y)(x+y)$
  - $\binom{3}{0}x^3 + \binom{3}{1}x^2y + \binom{3}{2}y^2 + \binom{3}{3}y^3$
  - $= \sum_{k=0}^{3} \binom{3}{k} y^k x^{3-k}$

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

Identities

- $\sum_{k=0}^{n} \binom{n}{k} = 2^n \rightsquigarrow |\mathbb{P}(A)| = 2^{|A|}$
- $\sum_{k=0}^{n} (-1)^k \binom{n}{k} = 0$
  - $0^n = 0^n$
    $= 1 + -1$
    $= \sum \binom{n}{k} 1^{n-k} (-1)^k$
    $= \sum_{k=0}^{n} \binom{n}{k} (-1)^k$

corrolary

- $\sum_{k=0}^{\lfloor n/2 \rfloor} \binom{n}{2k} = \sum_{k=0}^{\lceil n/2 \rceil - 1} \binom{n}{2k+1}$