BINOMIAL THEOREM

• **BINOMIAL THEOREM.** THIS IS THE FORMULA THAT REPRESENTS THE EXPRESSION $(a + b)^n$ FOR A POSITIVE INTEGER n AS A POLYNOMIAL:

$$(a+b)^{n} = a^{n} + C a^{n-1}b + C a^{n-2}b^{2} + n$$

$$(a+b)^{n} = a^{n} + C a^{n-1}b + C a^{n-2}b^{2} + n$$

$$+ C a^{n-3}b^{3} + \dots + C ab^{n-1} + b^{n}.$$

$$n$$

• NOTE THAT THE SUM OF THE EXPONENTS OF a AND b IS CONSTANT AND EQUAL TO n.

$$C_n^k = {n \choose k} = \frac{n!}{k! (n-k)!}$$

- BINOMIAL COEFFICIENTS, n - NON-NEGATIVE INTEGER

EXAMPLE:

FROM THE SET n {1,2,3,4}, SELECT ALL THE POSSIBLE COMBINATIONS OF TWO ELEMENTS, $k = \{1,2\}$ {1,3} {1,4} {2,3} {2,4} {3,4} IT TURNS OUT SIX OPTIONS. SUBSTITUTING VALUES INTO THE FORMULA, WE CHECK THE RESULT: BINOMIAL COEFFICIENT EXAMPLE

$$C_4^2 = \frac{4!}{2! (4-2)!} = 6$$

THE PROPERTIES OF BINOMIAL COEFFICIENTS

1. THE SUM OF THE COEFFICIENTS OF EXPANSION $(a + b)^n$ IS EQUAL TO 2^n . IT IS SUFFICIENT TO PUT a = b = 1. THEN THE RIGHT SIDE OF NEWTON'S BINOMIAL EXPANSION WE WILL HAVE a SUM OF BINOMIAL COEFFICIENTS, AND ON THE LEFT:

$$(1+1)^n = 2^n$$
.

2. THE COEFFICIENTS MEMBERS EQUIDISTANT FROM THE ENDS OF THE EXPANSION, ARE EQUAL.

THIS PROPERTY FOLLOWS FROM THE RELATION:

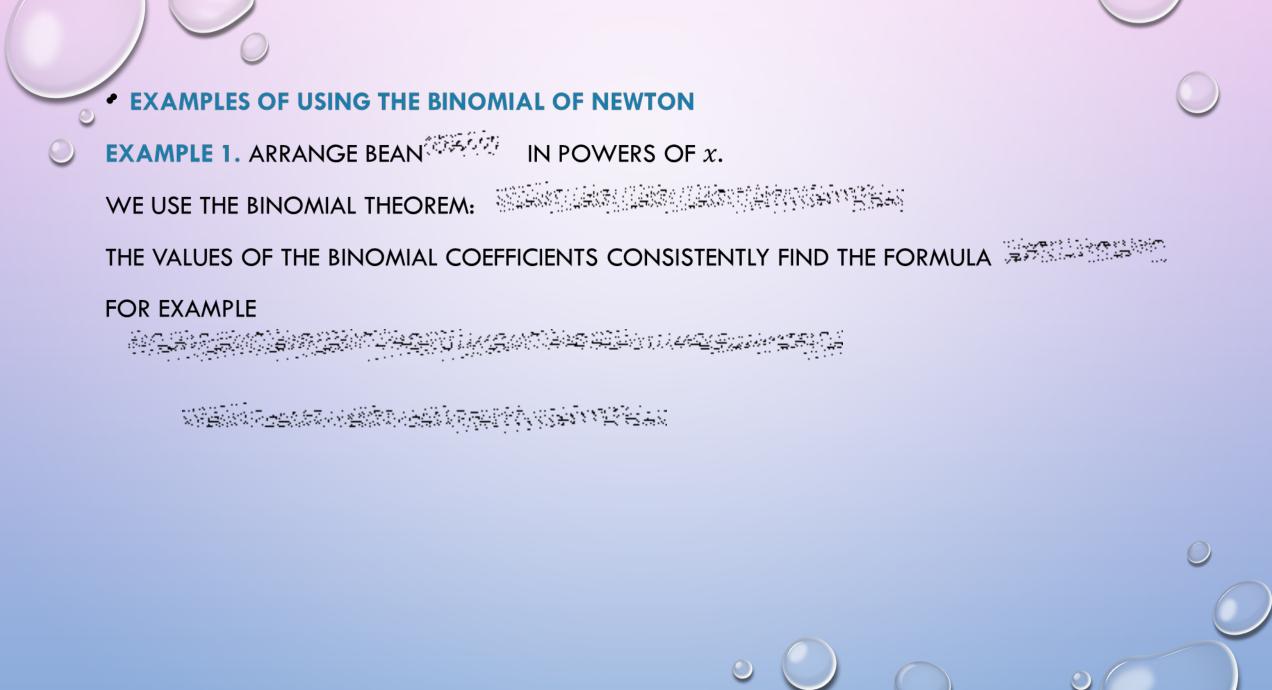
$$C = C = n - k$$

$$n = n$$

3. THE AMOUNT OF THE EVEN TERMS IN THE EXPANSION COEFFICIENT EQUAL TO THE SUM OF THE ODD TERMS IN THE EXPANSION COEFFICIENTS; EACH OF THEM IS

 2^{n-1}

TO PROVE THIS WE USE THE BINOMIAL: $(1-1)^n = 0^n = 0$. HERE THE EVEN MEMBERS ARE $\ll+\gg$ SIGN, AND THE ODD - $\ll-\gg$. AS A RESULT TURNS DECOMPOSITION 0, THEREFORE, THE AMOUNT OF BINOMIAL COEFFICIENTS ARE EQUAL TO EACH OTHER, SO EACH OF THEM IS: 2^n : $2 = 2^{n-1}$ GET TO PROVE.



EXAMPLE 2. PROVE FORMULA SUBSTITUTING IN THE FORMULA FOR EXPANSION VALUE CALLED GET THE DESIRED RESULT.





THANK YOU FOR ATTENTION