

Binomial Identities

Examples

1. Show that $\binom{n}{r} \binom{r}{k} = \binom{n}{k} \binom{n-k}{r-k}$.
2. Prove that $\sum_{k=0}^n \binom{n}{k} = 2^n$.

Problems

3. Prove that $\sum_{k=0}^n 2^k \binom{n}{k} = 3^n$.
4. What is the coefficient of x^2y^3 in $(2x - 3y)^5$?
5. (Challenge) What is the coefficient of $x^2y^2z^2$ in $(x + y + z)^6$?

Distinguishable Boxes

Examples

6. How many different Yahtzee rolls are there (rolls are 5 die)?
7. How many four digit increasing numbers are there (1223 is an example)?
8. How many ways are there to put 7 balls in 3 boxes if each box must have at least one ball?
9. How many ways are there to be n balls in k boxes if each box must have at least one ball?