Math Circles - Intro to Combinatorics - Winter 2024

Problem Set 2

February 14th, 2024

1. Find the expansion of $(x+4y)^3$.
2. Find the expansion of $(x+\frac{1}{x})^5$.
3. Find the coefficient of x^4y^2 in $(x+2y)^6$.
4. Find the coefficient of x^6 in $(x^2+1)^5$.
5. Find the coefficient of x^6y^3 in $(x^3-2y)^5$
6. Expand $(x-\sqrt{2})^4$.
7. Pattern Investigation
   (a) Write down any patterns you have noticed in the coefficients of $(x+y)^n$?
   (b) How do the coefficients of $(x+y)^n$ compare to the coefficients of $(x+y)^{n+1}$?
   (c) How many different terms does $(x+y)^n$ have for any n? Why do you think it has this many terms?
   (d) Can you explain how the number of terms changes as n changes? Can you write down an argument for why this is true?