

Test 1 - Discrete Mathematics CS101

January 7, 2024

Questions

1. Using the Binomial Theorem, demonstrate that the limit of $(1 + \frac{1}{n})^n$ as n approaches infinity is e . Mention only the main steps, your proof needn't be very rigorous.
2. Describe Pascal's Triangle. Describe how it is constructed. What is the significance of the numbers in the triangle?
3. There is a candy jar which can hold 1000 candies. You are allowed to put any of the 7 coloured candies VIBGYOR in the jar. How many ways can you fill the jar? Assume that there is an infinite supply of each candy.
4. In how many ways can you use $2n$ parentheses to make n pairs of parentheses? For example, with $n = 3$, you can do it in 5 ways: $((()))$, $((()))$, $((()))$, $()(())$, $()()()$. Explain your answer.
5. Explain the triple-or-nothing Game.