

4.11 Connectivity

Goal: Understand the relationships and connectivity between Counting, Permutations, Combinations, Binomial Theorem, and Pascal's Triangle.

1. Match the correct notation to the appropriate situation. Each problem relates to an instance where a class is working with a set of blocks. Each block has one of the following shapes drawn on it: Star, Square, Circle, Triangle, or Hexagon.

- A. ${}_5C_3$ _____ How many different ways can 5 blocks be arranged given that no shape can repeat?
- B. ${}_5P_3$ _____ How many different ways can 3 of the 5 blocks be arranged given that no shape repeats?
- C. $5!$ _____ How many different ways can 5 blocks be arranged given that shapes can repeat?
- D. 5^5 _____ How many different groups of 3 blocks could be selected out of a bag that contained the 5 different blocks?
- E. 5^3 _____ How many different ways could you arrange 3 of the 5 blocks, given that shapes can repeat?

2. Compare and contrast the three statements: $n!$, ${}_nP_k$, and ${}_nC_k$.

3. Using the fact that ${}_nC_k$ counts subsets, explain why ${}_nC_k = {}_nC_{n-k}$.

4. Where in Pascal's Triangle do you see the idea ${}_nC_k = {}_nC_{n-k}$ represented?

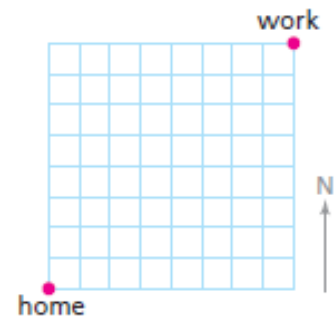
5. Write ${}_nC_k$ in terms of ${}_nP_k$.

- Discuss at least 5 different ways that you could compute the entries in Pascal's triangle. (You may also interpret this question as finding 5 different patterns in Pascal's Triangle)

- Discuss two different methods that could be used to solve the problem of Mrs. Pascal. (Make sure to state the answer to the problem)

Pascal's Paths

Ms. Pascal likes to take a different route to work every day. She will quit her job the day she has to repeat a route she has already taken. The grid of streets below shows her home and her workplace. She only travels north and east and never backtracks. How many days will she work at this job?



- Discuss two different approaches that can be used to determine the coefficient values when computing terms in a binomial expansion.

- There are 26 people in Mr. Deal's 1st hour Geometry Class. What is the probability that at least two people share a birthday? (Assume that all 365 birthdays are equally probable.)