

UW Math Circle

November 10, 2016

Homework

We talked in class about how to count how to choose k things out of n things. We call this quantity $\binom{n}{k}$, and discovered a formula: $\binom{n}{k} = \frac{n!}{k!(n-k)!}$. This may be useful below.

1. What is the number of ways to place 2 rooks on an 8×8 chessboard so that they don't attack one another? (A rook attacks all of the squares in its row or column.)

2. From a deck of 52 cards, how many different five-card poker hands could be dealt?



3. James has 14 boxes of girl scout cookies: 3 boxes of thin mints, 6 boxes of caramel delights, and 5 boxes peanut butter patties.

(a) He wants to eat one box of cookies each day for the next 2 weeks. How many ways are there for him to do this?

(b) Now, James is just going to eat the thin mints and the peanut butter patties, but he is still going to eat each box in one day, and eat all of them some time in the next two weeks. How many ways are there for him to do this?

(c) Finally, James is just going to eat the caramel delights and the peanut butter patties, but as before, he is still going to eat each box in one day, and eat all of them some time in the next two weeks. How many ways are there for him to do this?

(d) Think about the different ways for James to eat cookies, and discover a formula relating $\binom{a+b+c}{a}$, $\binom{b+c}{b}$, $\binom{a+b+c}{b}$, and $\binom{a+c}{a}$. You might verify this formula using what $\binom{n}{k}$ means as well as the formula for $\binom{n}{k}$

4. How many ways are there to give 11 pieces of candy to 5 students, if the first student must get at least 2 pieces of candy?