

Combinatorics Homework Problems

Sunday, October 18th, 2009, Math Circle Group A

Addition Principle: if there are a number of objects in the first set, a number of objects in the second set, and a number of objects in every set until the last set, and if none of these sets overlap, then the *total number of ways* to select an object from all of the sets is the total of all the objects.

Multiplication Principle: if a procedure can be broken into a number of steps, and all the steps are independent, then the *total number of outcomes* is the number of possibilities in step one times the possibilities in step two time each step until the last one.

1. One six-sided die, one twelve-sided die, one twenty-sided die, and one million-sided die are rolled. How many combinations are there? Which principle do you use?
2. How many unique sets of fruit (of any size up to 4 fruits) can you make using 2 orange, 1 apple, and 1 banana? Order does not matter, so 1 orange, 1 apple, 1 banana is the same as 1 apple, 1 orange, and 1 banana.
3. Answer all of the following:
 - (a) How many *different* three-digit numbers can you form by arrangements of the digits 1, 2 and 3?
 - (b) How many *different* three-digit numbers can you form by arrangements of the digits 1, 1 and 4?
 - (c) How many *different* five-digit numbers can you form by arrangements of the digits 1, 1, 1, 2 and 3?