Discrete Mathematics – Day 14-Oct. 1, 2003

We looked at a Rubik's cube and learned that there are 43,252,003,274,489,856,000 ways to arrange the cube, from the start position, using legal moves.

	Corners	**Edges**
Orient	$3^8/3$ (3 is the # of orientations of each corner)	$2^{12}/2$ (2 is the # of orientations of each edge)
Place	8! All are possible	12! All are possible

The product of those numbers equals the number of possible of the cube, except that we have to divide by 2 because the parities of the placements of the corners and edges of the cube must be the same. Corners and edges in Rubik's cube have to have same parity, because each rotation of a face changes the parity of both permutations simultaneously.

A randomly generated cube has a 1 in 12 chance of being solvable. (3x2x2=12)

*Cube not on any test, nor the final

<u>Anagrams</u>

Take letters of one word or phrase and change into something else.

Ex. George Bush = He Bugs Gore

How many anagrams are there of the word "STAR"? 4!

How many anagrams are there for the word "OFF"?

OFF
FOF = 3 anagrams 4!/2!
FFO

<u>Total number of anagrams</u>
Number of anagrams in each group

KISS = 4!/2!

KISS
KISS
ISKS With different S's, there are 4! Anagrams.
ISKS

What about the word “EPEE”?
Suppose each “e” is different.

PEEE
PEEE
PEEE
PEEE
PEEE
PEEE

In this group the three distinct E’s are arranged in 3! many ways, that are really the same when we ignore color or distinctness. The answer is really 4!/3!.

How about EPPE? 4!/(2!*2!)

MOMMY? 5!/3!

BOOBOO? 6!/(2!*4!)

MISSISSIPPI? 11!/(4!*4!*2!)

In general, to find the number of anagrams of a given word, we make a fraction with:
Numerator equal to n!, where *n* is the number of letters in the word
Denominator equal to the product of the *r*!, where the *r*’s stand for the number of times each letter is repeated.