

Discrete Mathematics – Day 15 – 10/3/03

How many Anagrams are there of each of the following?

$$\text{SCHOOL} - \frac{6!}{2!}$$

$$\text{TOOTH} - \frac{5!}{2! \cdot 2!}$$

$$\text{LEVELLED} - \frac{8!}{3! \cdot 3!}$$

How many ways are there to randomly select 2 of the following students to fail for no good reason at all?

A B C D E F G H (Lets do some examples)

N N N Y N N Y N
 Y N Y N N N N N-2 Y's and 6 N's

There is a one-to-one correspondence between selections of 2 students and strings of Y's and N's (YN-Strings) having 2 Y's and 6 N's. (Selection <-----> Strings)

How many NY-Strings are there with 2 Y's and 6 N's?

$$\frac{8!}{2! \cdot 6!} = 28$$

To see that this count correct more concretely, here are all the ways possibly

AB		BC		CD		DE		EF		FG	GH
A C		B D		C E		D F		E G		F H	
A D		B E		C F		D G		E H			
A E		B F		C G		D H					
A F		B G		C H							
A G		B H									
A H											
$7 + 6 + 5 + 4 + 3 + 2 + 1 = 28$											

How about 3 students?

$$\frac{8!}{3! \cdot 5!} = 56$$

There are 6 construction workers who work during class hours, we want to “talk to” 3 of them. In how many ways can this be done?

$$\frac{6!}{3!*3!} = 20$$

Definition: The number of ways to select k objects from a set of n distinct objects is “n choose k,” denoted $\binom{n}{k}$ (Sometimes nC_k or $C(n,k)$) and it equals $\frac{n!}{k!(n-k)!}$

Examples: $\binom{13}{4} = \frac{13!}{4!*9!}$

$$\binom{8}{5} = \frac{8!}{5!*3!} = 56$$

In general: $\binom{n}{k} = \binom{n}{n-k}$

Homework questions 3 and 4:

3. Find a formula for $\binom{n}{0} + \binom{n}{1} + \dots + \binom{n}{n} = ?$

4. Give proof justifying why that formula should be true.