# Lecture 13 - 1348

Sections Covered So Far (2.3, 8.1, 8.5)
all will be on Midterm #2.

New Chapter - Ch5 - Counting
Will definitely be on Midterm #2

Sample Questions (all for fun tests)

Q1 (p336)
Chairs of an auditorium are to be labelled with a letter and a positive integer between 1 and 100.
How many ways to do this are there?

Q2 (p336)
How many functions are there from a set with m elements to a set with n elements?

Q3 (p337)
How many 1-1 functions are there?

Need a rule!

# Prod-U Rule p336

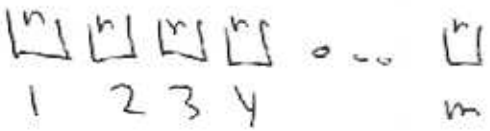
Suppose a procedure can be broken down into a sequence of two tasks. There are $n_1$ ways to do first task and $n_2$ ways to do second. Then there are $n_1 n_2$ ways to do procedure.

## Solutions

**Q1**

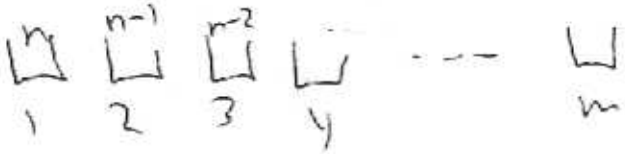

$A = 26 \cdot 100$ by prod-U rule

**Q2** Number to $m$ elements $1, 2, \ldots, m$




I have $m$ possibilities for each slot. So, by prod-U rule, there are $n^m$ such functions.

**Q3**



Then that are only $n-1$ choices for second slot, etc.

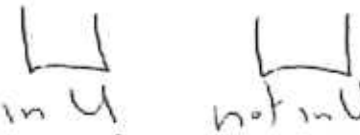
Why?

So Answer: $n(n-1)(n-2)\cdots(n-m+1)$

Subsets of a finite set, p338

Thm: If $X$ has $n$ elements, then there are $2^n$ subsets of $X$.

Pf: Let $U$ represent a subset. Draw 2 boxes




If $x \in X$, either $x$ is in $U$ or $x$ is not in $U$. □

Sum Rule

If a task can be done either in one of $n_1$ ways or in $n_2$ ways, where none of the set of $n_1$ ways is the same as any of the set of $n_2$ ways, then there are $n_1 + n_2$ ways of doing the task

EMPHASIZE

Ex: A student can choose a computer project from one of 3 lists. The 3 lists contain 23, 15, 19 projects respectively. No project is on more than one list. Then, by sum rule, there is

$23 + 15 + 19 = 57$ ways to choose a project.

Q: What do you do if there is overlap

Do #'s 7, 8, 9 on p344

7) How many different 3-letter initials can people have

$26^3$

8) How many different 3 letter initials can people have if no repeats?

$26 \cdot 25 \cdot 24$

9) How many begin with A

$26^2$

Finish with Ex 5, p340

Each user on a computer system has a password with lenght 6, 7 or 8. Each character is either a capital letter or a digit 0, 1, 2, 3, ... 7, 8, 9

How many different passwds include at least one digit?

$$(36^6 - 26^6) + (36^7 - 26^7) + (36^8 - 26^8)$$

Explain